Introduction of Six Sector Studies' Volumes

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Terms of reference, Deliverables, and two 'framework' Issues to be covered in the Six Sector Studies' Report

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Volume-1

Terms of reference, Deliverables, and two 'framework' Issues to be covered in the Six Sector Studies' Report

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A study for SME Foundation, Dhaka

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June 2010

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Introduction to the succeeding volumes

What follows is a collection of several large, even substantial, reports relating to six important, emerging, manufacturing sectors in Bangladesh. These sectors are perceived at the cutting edge of emerging market opportunities, and upgradation possibilities from the perspective of the technology and process innovation, and the forging of more remunerative market linkages. Eight hundred and forty six manufacturing firms in six sectors have been interviewed in-depth, using one of the most comprehensive questionnaires ever utilized in SME policy research in Bangladesh to-date. Our team, which includes diligent SME scholars and a high-caliber innovator, strongly believe that taken in combination, these six sector reports, plus the synthesis volume, is as serious a professional offering as it gets. That said, it would of course be presumptuous to pretend that the completion of even this major collection of research, with a fairly expansive terms of reference (TORs) to match, exhaustively answers all questions one might reasonably ask about these six sectors.[1] We whole-heartedly believe that, faced with one of the most demanding terms of reference that has ever been brought to a bid by any institution in Bangladesh, our team of consultants put our best feet forward and produced the best could be done.

1.1.1 Terms of reference for the six sector studies

The following are the terms of reference that were provided to the Center for Development Studies (CDS) team of consultants.

. The sector reports will:

- Narrate the policy framework, including the anomalies, if any, in the border-taxation regime;

- Identify the 3-digit Bangladesh Standard Industrial Classification (BSIC) code that corresponds to the industrial sub-group, total number of establishments and total persons employed in it for an appropriate year, broken down into the major geographical clusters.;

- Profile the industry in terms principal products, and bye-products if any, giving off estimates of total sectoral value of gross output and value added.

- Within each industrial, produce an enterprise-cum-entrepreneurial profile of each industry, highlighting the business-development capabilities of say 5-6 market incumbents.

- Describe accurately the technology platform(s), the production technique(s) in use, and factor proportions prevalent in these industrials, using an acceptable standard

[1] Naturally enough, the discussants marshaled by the SMEF to read our reports in draft form raised issues that ran the gamut from additional statistical measurements, to additional analytics, to additional policy refrains, over and above the cold print of the TORs that our team was offered. While, therefore, we have with all due respect refused to be drawn into responding to the gratuitous or the over-the-top among the observations that our esteemed discussants made, we shall be unabashed in announcing our considerable debt to them for bringing to the fore several important strands of further research when it comes to these six sectors.

definition of technology. Will estimate average physical productivities (APP), marginal physical productivity (MPP) and total factor productivity (TFP) based on sample survey(s) to be custom-designed and carried out for all industrials within each industrial category. Will pinpoint major diagnoses that might lead to the discovery of prescriptive therapies in the study sectors. For each industrial category, the productivity gap of each of the clusters relative to some well-agree productivity benchmark for that industry will be highlighted.

- Will assess and establish in broad terms the reasons for such productivity gaps.
- Will describe the access-to-finance regime within which the enterprises in these industrials have to work, and characterize their needs and requirement for financing.
- Will comprehensively understand the marketing chain within each industrial.
- Will accurately understand the drivers of unit costs of production, and suggest action-able plans for lowering them.
- Will drawing up of a tactical plan whereby to mitigate each of the competitive gaps in the performance of sample of enterprises form each of these industrials.

1.1.2 Broad Objectives of the study

These studies were motivated by the imperative to distil enough accurate 'benchmarking' kind of knowledge ---at once relating to the magnitude, composition, characteristics, performance, binding constraints and mitigating actions from the perspectives especially of micro and small manufacturing enterprises---that can become the leitmotif in the plotting of future strategies, and formulation of platforms of policies for spurring the development of small and medium enterprises' sector in Bangladesh. The SME Foundation would be the principal catalyst for implementing the resulting tactical action plans.

More specifically, the objectives of the studies are as follows:
To obtain a very thorough capture of the size, significance, growth dynamic and other salient characteristics a representative sample of enterprises drawn from the study sector while crystallizing an accurate economic baseline of those sectors that might become the bedrock of policy interventions;

To provide a narrative of the composition of the study sectors---especially in terms of the relative importance of various specialization models and marketable products, core versus auxiliary machinery, hired versus family labour, and gender-division of labour, just to name the four most important specimens used in the studies.

To narrate the nature and effect of the technology platform that surrounds the study industries in terms of average and, more importantly, marginal productivity on the ground, as also to investigate whether the returns to scale is increasing or constant.

To advance the SME Foundation's ability to put in place diagnostic perspectives as to what works and what does not in positively driving the economic and financial performances of the sample firms in the study sectors;

1.1.3 Scope of the studies

The scope of the study was about presenting, in some details, a compelling narrative and a characterization---involving the magnitude, the composition, salient economic characteristics and performance--- of enterprises running the gamut from micro through small to medium and large, in the study six sectors. The desired end-result was that the effort should produce comprehensive and accurate ‘baseline profile’ in terms of quite a few metrics that are likely to be of use to policy-making and future policy research. The metrics run the gamut from (i) enterprise size in terms of both employment, (ii) the number and productive capacity of core and auxiliary machines, (iii) (partial) factor productivity and capacity utilization in production, (iv) debt-equity ratio and the incidence of institutional credit and non-institutional credit, (v) the nature and effect of what may be called growth experience, etc.

The objective was also to carry out diagnostic analyses---what works and what doesn’t---highlighting the factors driving firm’s edge in productivity and achieving ‘closeness’ to the stochastic production frontiers. The accent in the estimation of these operational ‘gaps’ had to be on financing, technology and quality-of-product variables.

As well, the objective was to put the spotlight on the binding constraints that hobble the financial and economic performance of the enterprises. In particular, whether access to finance was a crippling constraint was especially moot Naturally enough, the ultimate objective was to lay out a tactical plan of action for each study sectors that might concretely address the upgrading of capacities, proficiencies and performance metrics.

1.1.4 A ‘broad-brush’ survey of market failure issues in the context of manufacturing

1.1.4.1 Policy framework: a brief survey of the literature

The government sets indirect tax rates, and also fiscal and monetary incentives for export-oriented industries such as readymade garments and knitwear industries, and puts in place a posse of regulatory interventions, such as about complying with fire regulations, getting registered with the VAT administration, etc. It has various capsules of direct income tax incentives in place regarding various groups of industries. Anomalies can exist in the way VAT system is administered, and VAT assessed and enforced. Border taxes’ regime can be ‘inverted’. Our treatment regarding policy framework will of necessity touch upon each of these preliminaries.

1.1.4.2 Tax holiday benefit information

Under the section 46 A of 1984’s Income Tax Act, companies to have been established by June 2008 in Dhaka and Chittagong will receive 4 years’ of tax holiday with effect from 2008. Companies to be incorporated outside Dhaka and Chittagong will be enjoying 6 years’ tax holiday. The following industries are eligible to tax inducement under this facility as follows:

Plastics;
Agricultural machinery;
Production of computer hardware;
Furthermore, incomes earned from agro-processing will be liable to income taxation at a promotional rate.

1.1.4.3 Studies regarding the impact of border taxation regime on financial incentives

The Team Leader and Professor Khondker Siddique-e-Rabbani were formed in 2005 into a committee constituted by the Ministry of Industries to look into the problems of Electricals and Electronics Goods Industry. Whether prevailing customs duties were 'inverted' in handing out higher effective indirect tax burden to domestic manufacturers that compete with commercial importers of competing finished goods that import from China and elsewhere had for long been a vexing issue. Industries are hobbled by 'inverted' border-taxation duty structure when the total tax incidence (TTI) that commercial importers who import finished goods are liable to pay is lower than or equal to *versus* domestic producers of competing goods. That precisely was the focal point before the committee. The committee found that the border-taxation regime was conspicuously 'inverted' in the case of electronics goods and key components comprising photo-voltaic generating sets (Chowdhury et al., 2006). Subsequent research by the Team Leader has established similar inversions in diesel generating sets (Chowdhury, 2007a). Professor Dr. Siddique-e-Rabbani has also demonstrated similar inversion sapping the financial incentives of the manufacturers of railway sleepers.

1.1.4.4 Studies regarding the impact of the regulatory regime

The Investment Climate Survey (ICS), under the aegis of the World Bank, is a flagship series of studies of business climate prevailing client countries. The World Bank bankrolls the ICS in more than 50 countries worldwide. Bangladesh had one ICS in 2002. One of the metrics used by the ICS is about the impact of industrial and enterprise regulation on firms' 'performance'. On the ICS' anvil were such things as how much delay is caused by the compliance with various mandated regulations (with respect to fire rules, environmental rules, Factories' Act rules, the need for a valid trade license, etc.); how much such compliance costs in days' of output lost, and the like. The study found that the regulatory environment did not have any substantial impact, one way or the other, on the performance of businesses. It found that 'unofficial' payments were a very small part of the cost of doing business in Bangladesh, even though occasionally it took a substantial time for pre-requisite licenses and other necessary papers to come through the bureaucracy. Using the data from the ICS 2002, staff of the International Finance Corporation (IFC) prepared, in 2006, a draft paper that reported that it was only the availability of electricity that significantly impacted upon firm capacity utilization. The provisioning of electricity is, however, not strictly a part of the regulatory environment, although it is an important part of what the World Bank calls "the business climate".

1.1.4.5 Studies regarding the technology platform and total factor productivity

In Bangladesh, some, but not a whole lot, of material exists on the nature and effects of technology platform, whether in a given industry, or across industries. Much of the material is of an engineering or industrial-product engineering disposition: economic tenor is not all that prominent in it. Some of it, contextualized by the setting of Bangladesh's cotton textiles industry, is economic in tenor. Some other parts of it is devoted to technological economics. Analysts have decomposed inter-firm differences between a capacity-utilization component *versus* the characteristics of the plant and machinery. Chowdhury's is the only study of the technology platform in an industry that characterizes the very **shelf** of production techniques available in each of the three segments of any given industry, in this case the cotton textiles industry, and then launches into a comparative analysis of the economic efficiency of various techniques of production (Chowdhury, 1981; Chowdhury, 1982).

Some of the six sectors under study now have already attracted the focus of research in the past. There is growing literature concerning the food and agro processing industries, the light engineering industry, the electronics industries, the plastics and leather (Ahmed, 1998; KATALYST, 2004; Chowdhury et al. 2006). Much of this material is narrative, and insufficiently diagnostic or prescriptive. There remain therefore important gaps in our understanding when it comes to sizing up, not to speak of mitigating, the pernicious effects of 'market failure', and 'government failure' ---the two most pervasive dampeners of economic performance of firms.[2] The diagnostic footprint of existing studies is anaemic, as is the relevance of their prescriptive recommendations. There is a need therefore for conceiving vigorous designs for policy research from the perspectives of the SMEs development. That is the avowed goal of the succeeding volumes under offer.

1.1.4.6 Other dimensions of policy environment: Total Tax Incidence

Firms operate amid policy environments, especially the trade policy environment. Such environment may or may not be conducive to the fostering of a level competitive playing field as between large establishments on the one hand, and SMEs on the other. Incorporating estimation of the effective rate of protection (ERP) or effective rates of subsidies (ERS), as the case may be, on a sector-by-sector basis is imperative. ERP or ERS are measure(s) of how much domestic production incentives are divergent versus incentives based on 'border prices'---ie the prices at which international trade takes place. More concretely, ERP is the ratio of value added in domestic prices to value added in 'border prices' in a given manufacturing activity, making allowance for quality variations. ERP is about capturing protection of value added---the ultimate arbiter of the well-being of firms or industries---when when all inputs and outputs are evaluated in 'border prices'. The relative attraction of using border prices as the yard-stick of value arises from the abstraction or distance that they offer at any rate from the egregious and at times politically-motivated distortions that national regimes of border taxes might translate into. Likewise, ERS is about capturing subsidies when all inputs and outputs are evaluated in 'border prices'. That said, however, accurately measuring ERP or ERS is very challenging: making due allowances for quality or grade differentials can be fiendishly difficult, as can be making accurate estimates of 'border prices' if the underlying goods. The saving grace in this situation is that ERPs across industries are likely to be closely related with the total tax incidence (TTI) as defined in this series of reports. In general, the higher is the TTI for a given industry, the higher is the ERP for enterprises in that industry likely to be. For instance, if the NBR were to admit a Supplementary Duty in the border tax structure for a given industry, both the TTI and the ERP with it, would rise instantaneously. Therefore, the role and impact of government policies on firm incentives can be discussed using the TTI for each study industry.

[2] It can be exceedingly difficult, given the adverse, even at times hostile environment within which primary data, of the kind necessitated by this kind of a deliverable are to be collected, to establish even the fact, not to speak of the extent, of loss of economic performance that can be caused by each of these three kind of failures. This stricture applies especially to the last-noted, that is 'internal management failure'. That said, we shall make an earnest and honest effort to probe the nature and effect of market failure with respect to credits market. And we shall probe the nature and effect of the government's border-taxation policies in some detail.

1.1.5.1 Pro-poor Growth, Market Failures, Gender focus, and the need for 'targeting'[3]

In this study, we take the position that the paradigm to be engaged for formulating policies seeking pro-poor growth has to have many planks, depending upon what time frame---the short, the medium, the long-term---that one has in mind. The planks that have been neglected longest and can have the loudest bang for the bark need to upstaged in priority and must comprise the short-run repertoire of ameliorative action. We believe that identifying and ameliorating markets failures is the first major element of the emerging paradigm for formulating policies for pro-poor growth. The second such element is about identifying factors that facilitate the integration of women in the world of commerce and industry, to the point of mainstreaming those factors. We begin with the first.

1.1.5.2 The analytical nexus between market failures and the need to 'target' interventions

In the ultimate analysis, it is market failures that rationalizes the design and carry-through of public (or public-private partnership) policy interventions---whether in a generic or targeted form. The existence of poverty in an economy is the most palpable exhibit of a market failure. Naturally enough, pro-poorness of growth is a valid motif of a discussion of market failure as a cross-cutting blight in development. According to Nobel laureate Joseph Stiglitz, market failures can, broadly speaking, stem from three structural features: increasing returns to scale; externalities; and asymmetric information. Sometimes, Government's own policy action(s), at times by initiating and harbouring anomalies, can trigger the second category of market failures.

Market failures are of crucial importance in assessing how credit markets work suboptimally from the perspective of the society as a whole.[4] Concepts such as adverse selection, moral hazard, externalities, etc. are also important while discussing management behaviour and entrepreneurial choices under uncertainties of the kind that prevail in many markets. We take this opportunity to clarify at the very outset what precisely we are to mean about this concept of market failure. We use various nuances from the credit market terminology in order to illustrate our points of view.

At the very outset, we need a back-to-basics primer relating to the concept of market failure in credit markets which deny or at any rate diminish credit provisioning for micro, small and medium enterprises. Asymmetric information is central to the causation of market failures in credit market.[5] These topics are important enough to merit an elaborate discussion within the size limitation of this body of reports. 'Targeting' of credit for micro and small entrepreneurs especially is a reaction to a growing recognition that these failures exist and that inequities especially to the micro and small enterprises can not be abated without an informed campaign of targeting.

Banks are just that, mostly for-profit market institutions, whose shareholders and chief executives don't typically have much patience beyond their immediate profitability, and the integrity and sustainability of their asset base. And the same applies to the providers of

[3] The following several paragraphs owes debt to a large literature relating to credit market failure, and especially to articles written by Dr. Timothy Besley. Specific citations would be made available in the final draft.

[4] Such failures can also be important in several other markets of importance, such as for technical assistance expertise.

[5] There is a whole class of goods and services---lumped by economists as credence goods---where, too, the specter of informational asymmetry raises its head. The irreducible characteristic of the market for credence good is that sellers of such goods or services have significantly greater information and knowledge compared with the buyers. Such goods include sophisticated machinery and equipment, business automation software,

technical-assistance services or, for that matter, any other ‘credence goods’.[6] Safety will typically come first with them. The allocative deficiencies that result from informational asymmetries, while they may result in outcomes of severe under-provisioning of credit and finance for many real-life small and micro enterprises, may not impinge upon them as palpable economic compulsions. Credit market failures and problems of asymmetric information are real anomalies for the model of perfectly competitive markets---these are the assumptions on which virtually all pronouncements of its policies stand. It is therefore necessary to present an account of why is it that issues of market failures and asymmetric information is such an important preliminary to be taken care of in the methodological part of this set of sector reports.

A market failure occurs when a competitive market does not bring about efficient credit allocation. The interest rate at which a loan is granted must therefore be high enough for some individuals to postpone their consumption and low enough for individuals who take out loans to be willing to repay, given their investment opportunities. In an ideal situation, loans are traded competitively and the interest rate is determined through supply and demand interacting. Because individuals with the most lucrative investment opportunities are willing to pay the highest interest rates, the most remunerative investment opportunities should theoretically be selected. Such a loan market would be efficient, in the standard economic sense of Pareto optimality; that is, it is not possible to make someone better off without making someone else worse off (no Pareto improvement is possible). Allowing two individuals to trade typically generates such an improvement. If one has an investment opportunity and no capital, for example, and the other has some capital, both may gain by having the second individual lend to the first. They need only to find some way to share the gains from their trade for both to benefit. Both must be at least equally well off with the trade for them to participate in it voluntarily. An outcome is thus Pareto efficient when all Pareto improvements are exhausted--which happens for credit when the loans cannot be reallocated to make one individual better off without making another worse off. In particular, Pareto efficiency is achieved when an individual who gets a loan has no incentive to resell it to another and become a lender himself.

Competitive markets where no externalities exist yield Pareto-efficient outcome. That said, the standard model of perfect competition, where large numbers of buyers and sellers trade and there are no transactions costs, is not an accurate description of the credit markets, whether in theory and in practice. Especially problematic is the issue of repayment, because a debtor may be unable to repay or unwilling to repay (if the lender has insufficient heft and clout against delinquent borrowers).

Credit markets diverge from the idealized version of the market because the lenders’ information, despite efforts to the contrary, is often imperfect. A lender may agree to lend money to a particular borrower based on having enough information about the borrower's reliability: the keyword is being sure that the borrower will use the borrowed funds wisely. The lender’s conviction that the borrower can be relied upon to repay the loan is crucial. The absence of this credibility---which spring from information that is in reality good or has the appearance of being good --- will often explain why certain lenders will lend to some ‘favourite’ among borrowers at the drop of a hat, while they will cussedly choose not to serve some other individuals with attributes that “reflexively” turn them off. Efficiency in credit markets has to be conditioned by these realities.

[6] Credence goods display a profound disproportionality in the specialist knowledge possessed by the sellers as distinct from buyers. Doctors, car mechanics, lawyers are *stock examples* of purveyors of credence goods.

Suppose, for example, that a bank is considering providing credit for a project to someone who, after receiving the loan, will choose how hard to work to make his project successful. If the project is successful, then the loan is repaid, but, if it fails, the individual is assumed to default. As the size of the loan increases, the borrower's effort is likely to slacken, because a larger share of the proceeds of the project go to the bank. If the bank cannot monitor the borrower's actions (perhaps because doing so is prohibitively costly), a bigger loan tends to be associated with a lower probability of repayment. A bank that wants to maximize profits is therefore likely to offer a smaller loan than it would if monitoring were costless. This may result in less investment in the economy and, in comparison with a situation in which information is costless, would appear to entail a reduction in efficiency. With full information, the bank should be willing to lend more, to the advantage of both the borrower and the lender. Thus, tested against the benchmark of costless monitoring, there appears to be a market failure--that is, the market has not realized a potential Pareto improvement. But in the real world monitoring is not costless and information and enforcement are not perfect.

To deal with the "unwillingness to repay" contingency, credit markets require a system of legal enforcement. But if enforcement costs too much, a lender may simply cease to lend--a situation that may well arise for micro, start-up enterprises, including, in many cases, enterprises that women without access to or prior connections with the high-up in the banking industry.

A standard of efficiency impossible to achieve in the real world is not a useful test against which to define market failure. The test of efficiency should still be that a Pareto improvement is impossible to find, but such an improvement must be sought taking into account the imperfections of information and enforcement that the market in question has to deal with--that is using the concept of constrained Pareto efficiency. By this standard, the outcome described above, where the lender reduced the amount lent to a borrower because of monitoring difficulties, could in fact be efficient in a constrained sense. The information problem may still have an efficiency cost to society, but from an operational point of view that cost has no relevance.

The argument that problems in credit markets result in a lower level of output, and perhaps too much risk-taking relative to some ideal situation where information is freely available, is frequently used to justify subsidized credit or the establishment of government-owned banks in areas that appear to be poorly served by the public sector. This argument is not tenable. In thinking about market failure and constrained Pareto efficiency, all feasibility constraints for allocating resources have to be considered. Market failure must be taken to mean the inability of a free market to bring about a constrained Pareto-efficient allocation of credit, in the sense defined above.

Applying the norm of constrained Pareto efficiency narrows the field for market failure, but it still leaves room for a fairly broad array of cases in which resources could end up being inefficiently allocated. In addition to the well-being of the two individuals involved in a trade considered thus far, externalities must also be allowed to enter the picture by allowing the treatment of third parties in the fray. If a third party is affected, possibly negatively, by decision(s) taken by the other two--a Pareto improvement is clearly not guaranteed, even if the two principals are get better off. It is well known that markets operate inefficiently if there are externalities, and specific types of externalities may particularly afflict credit markets. (One important role for government policy to improve the working of credit markets is to deal impartially with externality problems. But taking them into account is not required in this particular study.)

Chapter 1.2

Significant features of credit markets in Bangladesh

What makes credit markets in Bangladesh different from other markets? The three principal features distinguished here--collateral security, underdevelopment in complementary institutions, and covariant risks—characterize Bangladesh's credit markets.

1.2.1 Scarce collateral

One solution to the repayment problem in credit markets is to have the borrower put up a physical asset that the lender can seize if the borrower defaults. Such assets are usually hard to come by to the possession of women entrepreneurs, partly because they are often not well-off to possess the kind of assets that could be collateralized to the bankers' full satisfaction, and partly because poorly developed property rights make appropriating collateral in the event of default difficult for women entrepreneurs in Bangladesh. Improving the codification of property rights is often suggested, therefore, as a way to extend the domain of collateral and improve the working of financial markets.

1.2.2 Underdeveloped complementary institutions

Women entrepreneurs in Bangladesh also display economic features that are taboo in countries that sport more developed credit markets. One example is a the lack of literate and numerate population among women entrepreneurs. The relative invisibility of women entrepreneurs and the ensuing poorly-developed communications where women entrepreneurs are concerned may also make the use of formal bank arrangements costly in many individual cases. In addition, complementary markets may be missing where not just women entrepreneurs but any one is concerned. The virtual absence of insurance markets to mitigate the problems of income uncertainty is a typical example. If individuals could insure their incomes, default might be less of a problem. Another way to mitigate default problems is to assemble individual credit histories and to sanction delinquent borrowers. Such means of enforcing repayment are commonplace in more developed economies, but they require reliable systems of communication among lenders that seldom exist in developing countries such as Bangladesh.

Deficiencies in complementary institutions are mostly ancillary to the credit market and suggest policy interventions of their own. One of the things that this suggests is the programs that raise educational and training levels and that target women entrepreneurs outside urban areas may improve the operation of credit markets.

1.2.3 Covariant risk and segmented markets

Women entrepreneurs are not without their share of the risk of income shocks. These include fluctuations in the economic environment that affect whole regions as well as sudden changes in macro- and exchange rate conditions that affect all the producers in a particular industry. Such shocks affect the operation of credit markets if they create the potential for a group of entrepreneurs to default at the same time. The problem is exacerbated if all depositors simultaneously try to withdraw their savings, thus generating the early signs of a run on the bank in question. This risk could be averted if lenders held loan portfolios that were well diversified. But credit markets in Bangladesh tend to be segmented, meaning that a lender's portfolio of loans is concentrated on a group of individuals facing common shocks to their incomes--in one particular industry (such as the readymade garments, or knitwear and the like, for example.

Segmented credit markets in Bangladesh often depend on informal credit, such as local moneylenders, friends and relatives, rotating savings, and credit associations. Informal credit institutions tend to operate locally, using local information and enforcement mechanisms.

The cost of segmentation is that funds fail to flow across regions or groups of individuals even though there are potential gains from doing so, as when needs for credit differ across locations. For example, a sudden downward price shock may create a significant demand for loans to rebuild after the losses created by the shock.

1.2.4 Enforcement problems

Arguably, the issue of enforcing loan repayment constitutes the central difference between Bangladesh credit markets and credit markets elsewhere. An enforcement problem is defined as a situation in which the borrower is able but unwilling to repay. Most models of credit markets do not concern themselves with enforcement and assume that, where projects are sufficiently profitable, loan repayment is guaranteed. Enforcement problems are broadly of two kinds. First, the lender must attempt to enforce repayment after a default has occurred. But for this to be worthwhile, the lender must reap a benefit from enforcement that exceeds the cost. And the costs of sanctions, such as seizing collateral, may not be the only cost involved. It is sometimes argued that rich borrowers (with powerful male relatives or protectors) who fail to repay are not penalized because the political costs are too high, or because the social costs are too high. Furthermore debt forgiveness programs--where a government announces that beneficiaries of targeted credit programmes are forgiven their past debts--are quite frequent. So borrowers, aware that they can default on a loan with impunity, come to regard loans as grants, with little incentive to use the funds wisely.

Second, enforcement problems are exacerbated by the poor development of property rights mentioned earlier. In Bangladesh, many credit contracts are backed by collateral requirements, but the ability to foreclose on many assets is far from straightforward. Land--which, as a fixed asset, might be thought of as an ideal candidate to serve as collateral--is a case in point. But where, as in Bangladesh, property rights to land are poorly codified, which severely limits its usefulness as collateral. Rights to land are often usufructual, that is, based on using the land, and have limited possibilities for transfer to others, such as a lender who wishes to realize the value of the land as collateral. Reclaiming assets through the courts is similarly not a well-established and routine procedure. The difficulties of enforcement also help explain the widespread use of informal financial arrangements. Such arrangements can replace conventional solutions, such as physical collateral, with other mechanisms, such as social ties (social collateral). Informal sanctions may persuade individuals to repay loans in situations where formal banks are unable to do so. Delinquent borrowers may be barred from social ceremonies as a sanction.

1.2.5 Imperfect information

Credit markets can face significant problems that arise from imperfect information. This section examines information problems that cause market failure from the perspective of constrained Pareto efficiency. The two main categories of information problem discussed are adverse selection and moral hazard.

1.2.6 Adverse selection

Adverse selection occurs when lenders do not know particular characteristics of borrowers; for example, a lender may be uncertain about a borrower's preferences for undertaking risky projects. One much-discussed implication is that lenders may consequently reduce the amount that they decide to lend, resulting in too little investment in the economy. Ultimately, credit could be rationed.

If the projects to be financed with debt are risky, borrowers sometimes might not earn enough to repay their loans. If in addition funds are lent at the opportunity cost of funds to the lenders, lenders will lose money because sometimes individuals do not repay. Therefore, lenders must charge a risk premium, above their opportunity costs, if they wish to break even. However, raising the interest rate to combat losses is not without potentially adverse consequences for the lender. If all projects have the same mean return, differing only in their variance, the adverse selection problem is then characterized as individuals having privately observed differences in the riskiness of their projects. If the interest rate is increased to offset losses from defaults, it is precisely those individuals with the least risky projects who will cease to borrow first. These individuals are most likely to repay their loans and hence are most discouraged from borrowing by facing higher interest rates. By contrast, those who are least likely to repay are least discouraged from borrowing by higher interest rates. Profits may therefore decrease as interest rates increase beyond some point. A lender may thus be better off rationing access to credit at a lower interest rate rather than raising the interest rate further. The interest rate therefore has two effects. It serves the usual allocative role of equating supply and demand for loanable funds, but it also affects the average quality of the lender's loan portfolio. For this reason lenders may not use interest rates to clear the market and may instead fix the interest rate, meanwhile rationing access to funds.

A credit market with adverse selection is not typically efficient, even according to the constrained efficiency criterion. Because all borrowers are charged the same interest rate, the average probability of repayment over the whole group of borrowers, multiplied by the interest rate that they have to pay, must equal the opportunity cost of funds to the lender. Each borrower thus cares about the average repayment rate among the other borrowers because that rate affects the interest rate that he or she is charged. But an individual who is deciding whether or not to apply for a loan may ignore the fact that doing so affects the well-being of the other borrowers--which generates an externality as described above. Situations of adverse selection give a lender an incentive to find ways to separate borrowers into different groups according to their likelihood of repayment. One device for screening out poor-quality borrowers is to use a collateral requirement. If the lender demands that each borrower put up some collateral, the high-risk borrowers will be least inclined to comply because they are most likely to lose the collateral if their project fails. Given the scarcity of collateral and the difficulty of foreclosure discussed earlier, sorting out high-risk borrowers is certainly difficult and may be impossible. The discussion that follows therefore assumes that the lender is unable to distinguish between those borrowers who are likely to repay and those who are not. The Stiglitz-Weiss model of the credit markets seems relevant for thinking about formal lending, where it is reasonable to suppose that banks will not have as much information as their borrowers. The model also appears to yield an unambiguous policy conclusion that lending will be too low from a social point of view. In fact, it can be shown that a government policy that expands lending--through subsidies, for example--raises welfare in this model by offsetting the negative externality that bad borrowers create for good ones and by encouraging some of the better borrowers to borrow. In other words, adverse selection examined in the context of Stiglitz and Weiss's model argues for government intervention on the grounds of an explicit account of market failure.

1.2.7 Moral hazard

The Stiglitz-Weiss model of credit markets can also be extended to allow for moral hazard, a problem that can arise when lenders are unable to discern borrowers' actions. The central risk for the lender is that individuals who are in debt might slacken their efforts to make the project successful or they might change the type of project that they undertake. Borrowing money to invest in a project shares the risk between lender and borrower: if the project fails and the loan is not repaid, the lender bears the cost of the loan. There is a tendency, therefore, for the borrower to increase risk-taking, reducing the probability that a loan will be repaid. Moral hazard is elaborated by Stiglitz and Weiss in their model where all projects have identical mean returns but different degrees of risk. As with their adverse selection model, they find that an increase in interest rates affects the behavior of borrowers negatively, reducing their incentive to take the actions conducive to repaying their loans. Riskier projects are more attractive at higher interest rates because, at the higher rate, the borrower will prefer a project that has a lower probability of being repaid. Once again, a higher interest rate may have a counterproductive effect on lenders' profits because of its adverse effects on borrowers' incentives. Stiglitz and Weiss again suggest the possibility of credit rationing-- restricting the amount of money lent to an individual to correct incentives. In cases of moral hazard, it is not clear-cut that the outcome is inefficient. Individuals who increase the riskiness of their projects when they are more indebted affect only their own payoff. Thus, restrictions on the amount that an individual can borrow need not constitute a market failure, even though in a framework that allows for heterogeneous borrowers, such restrictions might compound the problems of adverse selection discussed above. There is no inefficiency from incentive effects if the lender is able to impose the cost of increased risk-taking on the borrower and no one else. This conclusion assumes, however, that the borrower borrows from a single lender. In reality, that assumption may not hold. Some borrowers obtain funding for a project from more than one lender, very often mixing formal and informal lenders. Each lender typically prefers that the others undertake any monitoring that has to be done, and the monitoring may then be less vigorous and effective than otherwise. And if borrowers undertake several projects funded from different sources, effort on each project may not be separable, so that the terms of each loan contract may affect the payoff to the other lenders.

It is unclear whether either of these difficulties leads to too much or too little lending relative to the efficient level. Depending on the exact specification of the model, one can obtain a result in either direction, which from a policy viewpoint compounds the ambiguities found in the analysis of adverse selection. These arguments suggest the possibility of efficiency gains if a borrower deals with a single lender. Such an arrangement could internalize the externalities that arise when more than one lender is involved in a project. Moral hazard may also lead to externalities in related markets, an obvious example being insurance. Individuals who have income insurance may make no effort to repay their loans, so that default ends up as a transfer from the insurer to the lender--a scenario reminiscent of the experience of some countries.

The incentive effects of moral hazard need not in themselves argue for government intervention in credit markets, but if they are combined with multiple indebtedness, outcomes are likely to be inefficient, and government intervention designed to deal with such externalities may increase efficiency.

1.2.8 Some Stylized Global Facts from the World of Financing versus Small Enterprises

Table-1.1 presents estimates relating to the relative share of various sources of finance for small enterprises---with employment of between 10 and 49 workers--- in a number of countries. The data are from surveys commissioned in various countries by International Finance Corporation (IFC), of the World Bank Group, and reported in Cull *et al.* 2006. The outstanding finding of this table is that small enterprises almost everywhere source the greatest bulk of their investment needs from own sources or retained earnings. The percentage contribution of retained earnings and family/friends ranges from 52% at a low ebb in Nigeria to 93% in erstwhile Communist Armenia. Banks are minnows as providers of finance to small enterprises. A third finding of note is that a high proportion of the small enterprises don't have any external sources of finance at all.

Table- 1.1
Sources of funds for small firms, by country

Country	N	Retained earnings	Family friends, informal sources	Banks	Equity, sale of stock	Leasing, trade credit, credit cards	Total	% share of firms with no external finance
Albania	70	77.4	9.1	5.3	0	3.6	95.4	62.9
Armenia	59	87.5	5.9	1.9	0	2.7	98.0	72.9
Azerbaijan	59	81.8	5.3	1.5	0	7.1	95.7	71.2
Bangladesh	175	67.4	7.8	20.2	0.3	3.5	99.2	40.6
Brazil	686	59	3.2	14.1	3.4	18.1	97.8	44.3
Estonia	37	53.5	0	12.6	2.7	26.3	95.1	29.7
Ecuador	131	45.7	7.8	24.1	3.5	16.6	97.7	34.4
Nigeria	34	47.8	4.4	13.1	6.1	1.2	72.6	44.1
Philippines	69	58.3	14.1	8.3	5.3	7.7	93.7	43.4
Turkey	99	80.5	4.7	6.6	0.8	1.4	94.0	62.6
Uzkek'n	47	81.9	2.6	5.9	0.5	5.5	93.5	64.9

Source: IFC's Investment Climate Surveys (ICS) in 2002-2003.

Note: Small firms had between 10 and 49 full-time workers.

1.2.9 Some Stylized Facts from the World of Financing versus Small Enterprises in Bangladesh

Table-1.2 reports on the same dimension of the relative importance of the same sources, with the difference that this time we contrast a range of enterprise sizes. The data in question are from the Investment Climate Survey (ICS) for Bangladesh commissioned in 2002 by the International Finance Corporation (IFC).[7] Micro enterprises are those with headcount of between 1 and 9 workers; small are as before; medium are those with headcount of between 50 and 99 workers; large are those with headcount of 100 or more workers. This is the definition used by Bangladesh Bureau of Statistics (BBS). The following findings need to be highlighted:

[7] This author is much in the debt of Mr. Farooq Sobhan, President, BEI and Mr. Hasan Khaleque, Director, Research, BEI, for generously sharing this data with him. All errors are of course attributable to the author.

- SMEs --- our policy focus --- source about 58% and 54%, respectively, of their need for working capital and new investment from retained earnings. They out-perform the large enterprises on both counts;
- They source about 30% of working capital needs from banks, with the corresponding percentage for new investment being 21%. Banks are keener to accommodate working capital demand, partly because this mostly comprises the need for short-term funds, compared with new loans, mostly comprising long-term exposure. This is also partly because working capital credit contracts typically spawn juicier fees by way of import margins, L/C facilities, etc.

- Large enterprises clearly enjoy an advantage compared with small enterprises --- the active core of our SME focus ---when it comes to bankability. For working capital, eight percentage points separate these two classes. For new investment, about 12 percentage points do. The probability that the typical large enterprise will have a bank loan on its books is significantly higher than for small enterprises. There is evidence in this of a statistically significant *debt-gap* to the relative disadvantage of small enterprises.[8] As of March 2006, Bangladesh had 25737 small enterprises on the foregoing definition and 4534 large enterprises. The former employed 483 thousand people, while the latter employed 1933 thousand. Closing this debt-gap is an important part of mitigating small enterprises' disadvantage. Bridging this gap will be a necessary, though not sufficient, condition for pro-poor SME development in Bangladesh.

- Statistically significant *debt-gap* sets apart not just large enterprises from small ones. Such a debt-gap also sets the small enterprises from medium enterprises.

- Employment size averages 19 workers for the small category. The corresponding average for the medium category is 66 workers. Medium enterprises out-employs small ones by more than a factor of three. If small enterprises happen to be 'chalk', medium ones are more like 'cheese'. The 'small' needs to be sharply differentiated compared with the 'medium' in terms of intrinsic vulnerability and the need for legitimate public assistance. This has not been systematically done in policy discourses in Bangladesh. The practice of lumping 'small' and 'medium' enterprises in the same category is therefore questionable, especially in the context of pro-poor development of SMEs. The Report of the SME Taskforce---whence came forth the SME Policy Strategies – 2005 --- is an exception to this.

- The probability that a given enterprise in any given size class will borrow from a leasing company as of 2002 was pretty small. That said, especially for new investment, that probability is faintly an increasing function of size of enterprise.

- For working capital financing, the relative importance of trade credit is found to be twice as sizeable for both medium and large enterprises as for small ones.

- Micro enterprises are really smallest of the small enterprises. As of 2001/2003, there were some 3.7 million micro enterprises, with head-count of between 1 and 9 workers. Merging micro with small class of enterprises would lead us to a situation in which this new composite category of enterprises would have, on weighted average basis, a coverage of bank financing the size of only 15% of their new-

[8] The term 'gap'---a kind of disability or disadvantage---in this case refers to the fact that large enterprises enjoy a higher degree of bankability versus small enterprises.

investment requirements.[9] And, as a percentage, that would compare with 30.2 for large enterprises, shown in Table-2. This is really one of the highlights of this body of evidence.

Table-1.2
SMEs' money trail: bank lending skewed towards large enterprises, 2002

Source of finance	Financing for working capital				Financing for new investment			
	Micro	Small	Medium	Large	Micro	Small	Medium	Large
Retained earning	62.1	63.6	55.75	52.8	52.8	62.2	47.8	52.4
Banks	24.9	26.07	34.51	34.24	14.38	18.52	25.02	30.22
Leasing Companies	0	0.31	.12	.44	0	.31	1.97	2.16
Trade credits	0.94	1.89	4.5	4.75	.63	2.23	2.48	2.24
Family	5.94	5.55	3.19	3.77	5.0	5.96	1.46	3.54
Sale of stocks	0.63	.67	0.37	.56	0	.21	.28	.6
Informal & Others	5.47	1.18	.24	3.01	22.78	1.36	12.0	3.0
Total	99.98	99.27	98.68	99.57	85.09	90.79	91.1	94.16

Source: BEI ICS Survey of 2002.

[9] For the purposes of this sentence, we have applied as weights the relative shares of enterprises per BBS Economic Census, 2001/2003, of 'micro' and 'small' enterprises, namely, 116220 and 25985 (BBS, 2005). These weights have been applied to the percentage share of bank financing of the respective new-investment requirements of these two classes of enterprises. The result is 15 odd percent.

Chapter 1.3

The Reality on the ground in terms of access to finance

ICS-2002 data showed that while large and medium enterprises doubled their annual revenue per enterprise between 1991/92 and 2001/2002---a compound annual growth rate of some 7.1%. The corresponding growth on mismall category of enterprises was equal to one-third or so---a compound annual growth rate of 2.9% (results available with the author). Export-oriented large enterprises as in readymade garment industry in Bangladesh have received considerable direct financial assistance through the budget, and from the Government's incentives-package for export industries. Small enterprises have had to very largely fend for themselves, and micro enterprises even more so. Note at this stage that while large and medium enterprises account for no more than 3% of enterprises, mismall category accounts for the remaining 97% of the roughly 4.1 million enterprises outside agriculture.

1.3.1 SMEs' Access to Finance

SMEs do not have appropriate access to finance, particularly for long-term loans. Their needs can vary quizzically, defying stereotypes. They could happily do with low interest rates. But they could also still live with high interest rates incident on a credit contract, if the alternative would imply financial hardship, or if they could generate a reasonably high return to investment. The last-noted outcome could, for example, arise if small businesses could count on a high turnover of their inventories into a high rate of return. Fast and hassles-free loan disbursement matters too, as does longer grace period in loan repayment commencement. Of course, to them long-term loan on low rates of interest is the best thing of all.

1.3.2 Mainstreaming gender equality: a second short-term framework issue

The second major element of the emerging paradigm for formulation of policies seeking pro-poor growth through the development of small and medium enterprises (SMEs) is about mainstreaming gender equality. This important refrain necessitates a discussion of the very diminutive role of women entrepreneurs in production, and the drivers that are motivating such diminution. It is to this aspect that we now turn.

Women are more than half of the human race, and yet they are virtually invisible when it comes to owning and operating businesses. Women have always remained marginalized in entrepreneurship. To quote: 'Women constitute about 55% of the human race, about 40% of its labour force, essentially do about two-thirds of the work, but earn less than one-tenth of the world's income and own only one-hundredth of the world's property' (Quoted in Chowdhury, 2006, p. 2).

Frankly, women know money better than men: they routinely get more developmental results than men. It is not remotely in jest that a former Prime Minster of Bangladesh is reported to have once said: "if you gave more money to a married man, he will start thinking of splurging it on a second wife". If you gave that money to a married woman, she will start thinking about how to spend it giving her kids a better future. Especially in societies with demographies dominated by young population and weighed down by ecological frailties and fragilities, more livelihood opportunities, incomes and wealth in the hands of women *versus* men leads to better nurture of the children, and greater investment in the human resource development including education of infants. From this standpoint, empowering women in general and women entrepreneurs in particular is one major ingredient of pro-poor development. This is probably one reason why the Millennial Development Goals (MDGs) have made it a point of specifically including gender equality as one of the imperative goals to be attained.

In Bangladesh, women own only 2.83% of all enterprises owned according to data generated by the Economic Census conducted by the Bangladesh Bureau of Statistics (BBS) in 2001-2003 (Table-1.3) (Chowdhury, 2006). To look at the problem of the gender merely in terms of this particular statistic---the proportion of women-owned businesses in the total ---is merely "ground zero" of the "woman-unfriendliness" of the economic landscape.

1.3.3 Drivers responsible for marginalization of women, and women entrepreneurs

The intractable marginalization of women in most developing societies is due not to a single factor but usually to a whole complex set of factors. Three of the most focal drivers of this are (i) a gender-segregated division of work and work-skills; (ii) a pervasive conditioning of women, with largely biological ancestry, into educational and skills streaming into 'womens work', and (iii) womens' distance from the core of power and policy-making.

Table-1.3: Invisibility of women-owned enterprises, 2001/2003

Types of enterprise	% of male-owned Enterprise	% of female owned Enterprise	Total
Micro	56.3	0.21	56.51
Small	36.7	0.40	37.1
Medium	2.13	0.87	3.0
Large	1.0	1.35	2.4
All	96.1	2.83	100

Source: Chowdhury, 2006, using data from the Economic Census, 2001/2003

Biology precedes and predominates culture, processing education and skills-acquisition differently across gender. This leads to a marked gender-differentiated gender roles, mores, norms, responsibilities, rewards and reprisals, incentives and injunctions in labour market outcomes, leading women to do work of low intrinsic "skill content", intermittent or no interactions with heavy or intricate machinery, low productivity and low wages, all in comparison with men. This affects the supply of women not only for blue- or white-collar jobs, but also that of women entrepreneurs (Chowdhury, 2006).

These activities are associated with caring (nursing, life sciences, pharmacy, etc.), food preparing (bed and breakfast, catering, fast-food, etc.), clothing (tailoring, embroidery, designer dresses, etc.), beautification (beauty parlour, hair-dressing, handicrafts-making, etc.), etc. While education prepares a generic collection of intellectual capacity for organizing ideas and communication, it is the subsequent training, including on-the-job training, that particularizes one's capability to relate to machines, computers, codified knowledge in production. Women and men often work in distinct activities that offer different rewards and career opportunities even though they have similar education and labour market skills. In many economies, women work in jobs characterised by low wages, high job insecurity, low levels of unionisation and poor working conditions. Women workers may face more insecure employment with fewer benefits and lower wages than their male counterparts. Unequal access to labour markets and highly gender-segregated occupations generate a host of inefficiencies that compound gender-wage inequalities, depress investment in women's human capital and can distort market signals.

Cross-country regressions show that the factors that positively drive the proportion of women-owned businesses within the total include (i) changing status of women in society; (ii) whether cultures are matriarchal; (iii) changing mean female educational attainment; (iv) the secular growth of physical infrastructure, signifying the catalytic effect of relaxing mobility constraints of women; (v) existence of affirmative-action programmes; and (vi) public policies to spur the development or the envigoration of markets of care-giving to children, to name the six most important ones.

1.3.4 Women's' handicaps

Women entrepreneurs confront a twin problem at start-up: the first is the fact that at start-up, they are tiny, and the second that they are women. The prospects of women getting ahead in their entrepreneurial careers face strong head winds, some caused by biological and cultural factors, others by a gender-differentiated allocation of work, worth and incomes, and yet others by a lack of awareness that can be impacted by generating all policy-relevant data in a "gender-aware" manner. The fact that nominally "gender-neutral" policies are not gender-neutral in fact does not help either. Women entrepreneurs are considered high risk by commercial banks due to insufficient assets of collateral quality, low capitalization of their business and lack of financial information (Chowdhury and Miah, 2006).

Gender policy need therefore to grapple not only with the pushing up (i) the unedifying women participation statistic (of 2.83%) in business ownership, but also (ii) jump-start the penetration of educated women entrepreneurs into some of these professionally more specialized lines of venture.

1.3.5 Constraints strewn in the road to women entrepreneurship

- Women entrepreneurs are more likely to own micro-enterprises with rudimentary technologies. Women require small loan amounts, considered prone to high overheads by banks.
- Gender-based stereotyping in domestic conditioning creates among girls a bent towards occupations steeped in liberal arts and humanities to the neglect of "hard sciences". Women start off under-capitalized, as they have less personal capital of collateral-grade. Social institutions make it somewhat difficult for women to own property: they are effectively barred from formal sector credit.
- Women entrepreneurs rate lower educational levels and professional experience than male entrepreneurs. They lack management skills and competencies in finance and accounting, prerequisites to improving access to finance.
- Women entrepreneurs lack information regarding credit facilities, financial instruments, business networks and borrowing conditions of financial institutions.
- Women entrepreneurs lack continuity in their business track record as they are the ones to interrupt their careers due to their family obligations.

1.3.6 The Industrial Policy 2005 of Bangladesh

Bangladesh has a policy of differentially affecting the financial incentives positively for establishments in a number of exports-oriented industries, such as the readymade garments industry. Subsequently, the Government has widened the range of the beneficiaries of such export incentives, by including establishments in the 'backward-linkage' niches.

The Industrial Policy 2005 ostensibly maintains that as many 35 industries are "thrust sectors". For all practical purposes, the boosting that the use of the word 'thrust' is about is confined within the pages of the policy document. The issuance of the Industrial Policy 2005 has not been followed up with the issuance of any Action Plan that rolls the Industrial Policy 2005 out. Likewise, Customs Duty policy does not accord *any* of these so-called thrust sectors any preferential treatment reflecting any priorities in industrialization. Occasionally, certain segments of the industries receive Supplementary Duty which have the effect of raising the effective rate of protection (ERP) and thus spur value added in the beneficiary segments. However, such material incentives seem fundamentally owing to the presence and, of greater importance, the prominence, of special interests. Both car unsealed batteries and sealed batteries of the kind that are used in solar generating panels, both belong to the electricals and electronics industry of Bangladesh, with similar import intensities in their input-mix. And yet while manufacturers of batteries used to be protected behind a total tax incidence (TTI) of some 135%, while sealed batteries, which could have been manufactured by smaller electronics companies, attract so SD at all. The results are quite predictable. While Bangladesh has more than five large manufacturers of car batteries, it has not a single manufacturer of sealed batteries. Differentials in tax treatment of industrial segments based on 'special interests' is called opportunism, but not Industrial Policy.

Some of the sectors in our scope of work do receive financial incentives of choice, of course. For instance, plastics manufacturers that produce accessories can document sales to registered exporters in the RMG industry are treated as 'deemed exporters' and receive all the statutory financial incentives. Deemed exporters receive 'cash subsidy' at the preset rate of percent based on the volume of output.

1.3.7 Identification of BSIC 3-digit code(s) that characterize the study sectors

The objective of this sub-section is to present the number of establishments and total person employed in them. Table 1.4 reports on the numbers at hand.

Table 1.4
Capture of 3-digit BSIC characterization of the six study sectors

	3-digit characterization of the six study sectors					
	Agro processing	**Leather/ leathergoods**	**Electricals**	**Light engineering**	**Designer industry**	**Plastics**
No. unit	26345	576	389	2349	697	2971
TPE	1412	67.1	15.0	73.28	85.9	188.95

Source: The Business Registry-2007

Chapter 1.4

Methodology to be followed in implementing the study[10]

This section presents our methodology in some detail.

1.4.1 Sampling methodology

One of the most important objective of these sector studies is that they will produce for the SMEF a set of baseline estimates about various important matters of statistics, such as about the scale of output, capital investment required, and the like. It is therefore important that the underlying sample be such that certain acceptable statistical confidence levels can be attached to the estimates from one's sample when it comes to making inferences from data at hand. This following discussion is about how to select the size of one's sample that one can say with say 95% confidence that the sample estimate will represent the relevant attribute of the population with an error margin of not more than say 10% or so.

We have already taken the following steps towards implementing such a methodology:

(1) We have already gotten a hold of the electronic copy of the Bangladesh Bureau of Statistics (BBS)' Business Registry 2005-2006.

(2) The BBS has itself admitted that the data in its Business Registry (BR) involves an under-coverage. The quality of the data in the Business Registry may not be the same as compared with other products from the BBS: this is because the BBS was not able to use BBS' own cadres of data generation staff in the implementation of the BR-2006. It had to supplement its own human resources by recruiting, on temporary bases, young men who were doing either casual jobs or were downright unemployed. Naturally, the educational level or the preparation for survey of such miscellaneous categories of employees is bound to be lower and less adequate as compared with BBS' own professional cadre. The quality of the data in the BR-2006 for present purposes is therefore not beyond reproach. More specifically, the processes of quality assurance, formalized and nurtured over many years, that one has come to expect from the other periodic data series that come out of the BBS' stable, such as the Census of Manufacturing Industries (CMI), could not be put to use when it comes to the data from the BR-2006. Given this, we decided to compare the resources of the BR-2006 with two other major manufacturing datasets available to us, each with a national footprint.

Bangladesh Bureau of Statistics (BBS) Business Registry 2006 is one among several benchmark statistical resources to which one can take recourse for guidance. The fact that the BR-2006 is a census and not purely a survey of manufacturing enterprises makes it somewhat different compared with a manufacturers' survey. There is also the Census of Manufacturing Industries (CMI), and one of the latest of the CMI is about the year 2001-2002. And finally, there is the World Bank's Investment Climate Survey 2002, which was conducted on behalf of the World Bank Group by the Bangladesh Enterprise Institute (BEI). Accordingly, we take recourse to each of these three basic statistical resources for purposes of getting an idea about the nature of the distribution of the most relevant 'marker' variable available for present purposes.

[10] Dr. K. S. Rabbani has contributed to the preparation of certain parts of this section.

Using three datasets (the Investment Climate Survey-2002; the Census of Manufacturing Industries (CMI), 2001-2002, and the BR-2006), we selected a marker variable to help set the sample size that is commensurate with adequate levels of confidence. The variable is employment per enterprise. (Details are presented in Table-1 below).

We follow the standard procedure for determining sample size based on an estimate of the confidence interval, the precision we want for the results and an available sample estimate (relating to the phenomenon we are interested in) from the population of interest. A 95% degree confidence is selected for this exercise. Invoking the standard normal distribution, we find that for each of the shaded tails in a normal-distribution function, $\alpha/2 = 0.025$, where α is the error probability level. The region to the left of $Z.\alpha/2$ and to the right of $Z=0$ is 0.475 (0.5-0.025). An area of 0.475 corresponds to a 'z' value of 1.96. The critical value therefore is $Z.\alpha/2 = 1.96$. Because we know the standard deviation of the 'marker variables' from published data, we were in a position to calculate the sample size(s) corresponding to this variables. That is how we generated a range of values for sample size(s) at which we could be 95% confident that the estimates of the parameters for the population that the survey data generate for us will be within the preset 'error margin' set for this particular exercise, of 10% (Table-2). On this basis, we calculate the alternative estimates of sample size from which we are able to choose the final sample size to underpin our work.

It always helps to have on one's hand a range of values to choose from. As well, we will then be able to quantify the alternative costs of carrying out the desired sample survey based on values of this marker variable. It is thus that we come to a final choice regarding the sample size. After a thorough analysis of all relevant data, we come to the condition that the sample size of our six-sector sample will be 835 (see below).

1.4.2 Final determination of the size of the sample for the manufacturers' survey

The variable we select from each of the three sources are depicted in the following:

Table-1.5
Three datasets in order to generate alternative sample sizes to choose from

Statistical resource	Variable that we shall use for our work
ICS-2002	Establishment head-count
CMI 2001/02	(2) Head-count in the manufacturing enterprises included in BBS CMI 2001/02
BR-2006	Establishment head-count

Table-1.6
Getting a range of value with respect to the size of the sample that generate adequate confidence in the ensuing estimates

Marker variable(s)	Arithmetic mean	Standard deviation	Sample size corresponding to
ICS-2002	278.79	381.35	719
CMI---Employment size per establishment (No)	990.46	641.22	160
BR-2006---Employment size per establishment (No)	33.9	112.38	Not used
Overall average of above values	-	-	439.5

Before going any further, it is absolutely important that we critically examine the results cited from the BR-2006. The combination of a value of mean of 33.9 and standard deviation of 112.38 led us to look more closely at the minimum and maximum values of the variable in question. The minimum value reported was 0, and the maximum value shown was 2716: more than 7000 cases were involved in the calculation. BBS had reported zero for the 'total persons employed' for many of the establishments in question. The exceptionally---almost absurdly high---value of the standard deviation in this case compared with the reported mean leads us to reject the data from the BR-2006 for present purposes.

We therefore only used the data from the ICS and CMI 2001/2002 (the first two rows of the results in Table-2). A simple average of the values yields 439.5. It turns out that the standard deviation of these two values is 395.27. Therefore, a confidence interval of the sample-size variable is between 44 and 835.
By dividing this up equally, we get a sectoral sample size, mostly, of 139. After consultation with SMEF, we raised the sample for the light-engineering industry to 150. Table-3 presents the sectoral breakdown of the overall sample of 846.

Table-1.7
Sampling plan for the six subsectors

Name of target sectors	Intended sample size (Nos.)
Electricals and electronics	139
Light engineering	150
Plastics	139
Designer goods industry	140
Leather & footwear	139
Food processing	139
Total: manufacturing interviews	846
Interviews among traders	100
Total surveys/interviews	946

Note: The Eastern Tube Limited, a very large enterprises under the Bangladesh Steel and Engineering Corporation (BSEC), was originally on our desired sample for the Electricals and Electronics sector. However, the interview was done as required. However, it was afterwards found to be extremely large relative to the rest of that sub-sample: its inclusion would have posed the problems typical of ‘outliers’. Eastern Tubes Limited was omitted from the sample, thus leaving 138 enterprises in the E & E sector, and 845 enterprises in the total. We did 100 traders’ interview, too, as required by the SME Foundation.

In defense of this methodology, we merely need to touch base with some of the most fundamental principles governing the size of the sample in any given case. According to a Professor of Communications at Rugers University, sample size is dependent on three properties of the study: (a) the complexity of the characteristics under study (the number of categories used to measure it), (b) the precision required to approach these characteristics, and (c) the resources available. Characteristics which are very complex and must be approached with high precision require large samples and considerable resources.

The logic of confidence levels and confidence intervals provides the basis for determining the appropriate sample size for a study. Once you have decided on the degree of sampling error you can tolerate, you will be able to calculate the number of cases needed in your sample. Thus, for example, if you want to be 95% confident that your study findings are accurate within plus or minus 5% of the population parameters, you should select a sample of at least 400. A very rough rule of thumb for the novice researcher is that samples of less than 30 are generally considered inadequate except for pretesting; samples in the 100 to 200 range are rarely brought into question; and few research questions require samples of greater than 500 (Friedrich, 2002).

Further Analysis[11]

Sample size determination

Traditional method

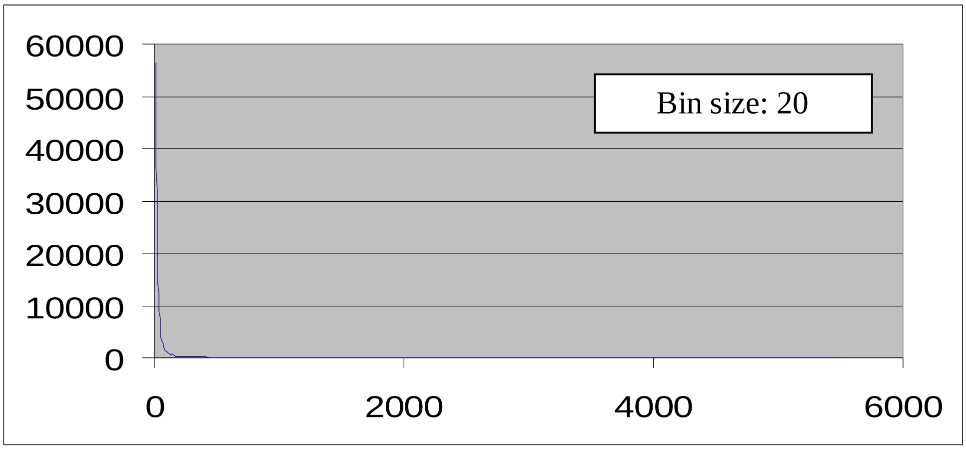
$$\sigma^2 = \frac{\sum (x - \bar{x})^2}{n} = \frac{\sum x^2}{n} - (\bar{x})^2$$

Sample size = $\left(\frac{1.96\,\sigma}{E}\right)^2$ E =Error

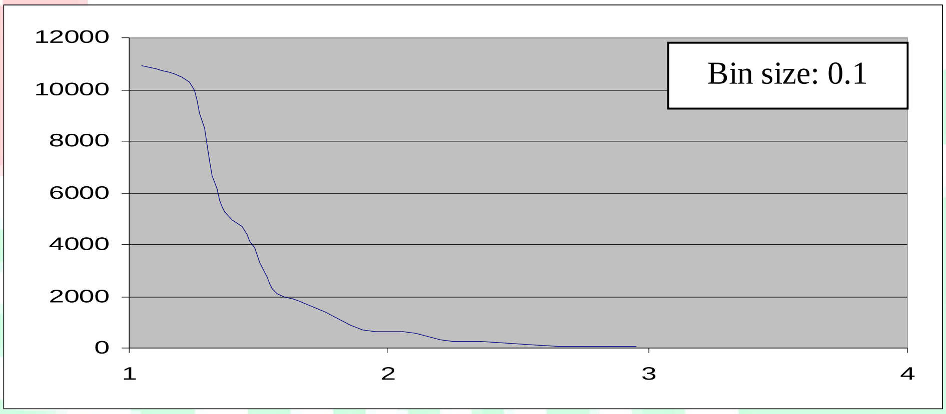
Table-1.8.1: Traditional analysis of all enterprises surveyed in BR 2006					
Total no of enterprises n	Total no. of employees x	Mean $\bar{x}$	Standard Deviation (SD)	sample size E * (Error=5% of SD=9.45)	sample size E * (Error=10% of SD=18.9)
91031	4308004	47	189	1537	384
* Error taken as a percentage of SD (Dr. Rabbani’s choice)					

[11] This further analysis was performed by Prof K S Rabbani, a member of the CDS team.

The distribution shown below, is heavily skewed. The log distribution is also skewed. There is no second hump as presumed.



Horizontal: No. of employees Vertical: No of enterprises



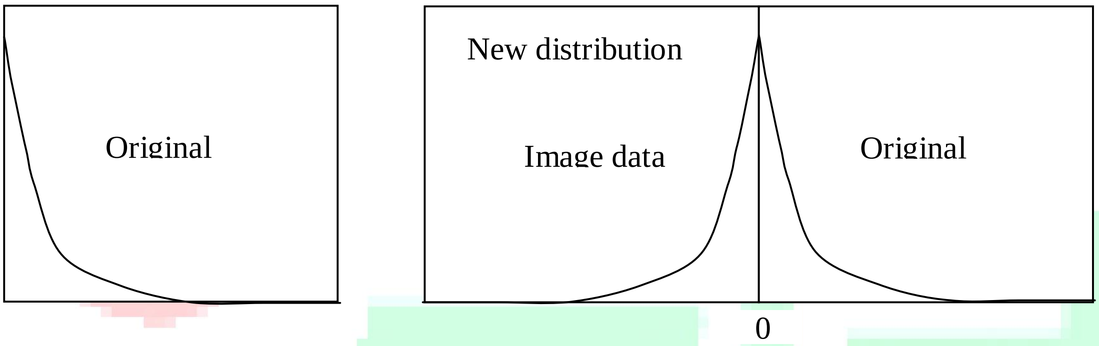
Horizontal: Log of No. of employee Vertical: No of enterprises

<u>Sample size determination using Image method suggested by Dr. Rabbani</u>

To make the distribution more like a normal distribution, it is suggested this new method be also considered at times.

- Take image of data around '0', add the two, mean will be '0' and the whole distribution will be approximate a normal distribution better as shown below.

- Find sample size for this new distribution for 5% or 10% of S.D. as Error
- Half of this sample size will be applicable for the original data.



In this study, enterprises with employees less or equal to 9 has been rejected (very few,131 enterprises) to avoid a sharp dip at ‘0’. The data has been modified accordingly. In the new distribution the total no. of employees and the total no. of enterprises will be double the original (except the ones rejected). Sample size has been calculated based on two schemes of error estimation. In Table 2, error has been taken as 5% or 10% of Standard Deviation (% of SD is more relevant than % of mean for error). In Table 3 error has been estimated arbitrarily as 10 or 20 (in terms of number of employees per enterprise, which is small considering the maximum range, about 20,000 employees). This gives a total sample size for all the enterprises.

Table-1.8.2: Analysis using new image method. Error taken as 5% or 10% of SD

Total no of enterprises n	Mean $\ddot{x}$	Standard Deviation (SD)	**sample size** (Error=5% of SD=9.7)	**sample size** (Error=10% of SD=19.4)
181800	0	194	768	192

Table-1.8.3: Analysis using new image method. Error taken as absolute values of 10 or 20 (number of employees per enterprise)

Total no of enterprises n	Mean $\ddot{x}$	Standard Deviation	sample size (Error=10)	sample size (Error=20)
181800	0	194	723	181

1.4.3 Information on the specific 6 sectors

A sample size analysis has not been made for these as that for the whole of the enterprises fall well under the number taken up by CDS. However, the data extracted from BR2006 and summarised in the following table has been used to plot the distribution below. It shows that this distribution is also heavily skewed. For the BR2006, sample size was proportionally based on BR 2005-2006.

No. of enterprises surveyed for BR2006		
Sl	**Sector**	**No. of enterprises**
1	Food & Agro-processing, BSIC:1510-1559	6298
2	Designer Goods, BSIC:1721-1723, 1813	459
3	Leather & Footwear, BSIC: 1911-1929	731
4	Plastics, BSIC: 2511-2519, 2520-2529	740
5	Light Engineering, 2811-2819, 2891-2899, 2911-2919, 2921-2923	1114
6	Electricals & Electronics, BSIC: 3110-3239	268
Total:		**9610**

-- Heavily skewed distribution

The variation in the product and technology type in the Electrical & Electronics sector is much greater than that in Light Engineering, although the latter may have a much larger number of units. This is because there are more experimentation and R&D in the former sector than in the latter. It can generally be said that in the sectors with more number of units, it is usual to have many units copying the same type of work, doing less of experimentation, while in the sectors with relatively less number of units, there is considerable experimentation, and therefore more variation. This information is not available from any previous survey. Therefore, taking equal number of sample size in all the sectors may be justified for the survey being undertaken by CDS at present. Each of the proposed sample size in CDS Inception Report is between 100 and 200 which is also supposed to be adequate as suggested by the foreign references mentioned above. Therefore considering all the factors taking almost equal sample sizes in each of the sectors appear to be justified.

Chapter-1.5

Our responses to the observations received from our discussants

1.5.1 Observations concerning the product boundaries of the study sectors

The SMEF had not spelt out the product boundaries of any of the study sectors. Indeed, it had not spelt out the product boundaries of any of the industries in which the study was going to be interested. It had cited the six target study sectors as (i) agro and food processing; (ii) designer goods industry; (iii) electricals and electronics; (iv) leather and leathergoods industry; (v) light engineering; and (vi) plastics industry. The expression "designer goods industry" or 'agro and food processing industry' are not necessarily available in a standard English dictionary. When designing the study, we took the initiative of writing in the Inception Report that by the composition of, say, the designer goods industry, we mainly had in mind manufacturing activities which center around the following substrates and/or materials: plain fabrics; dyed fabrics; knitted fabrics; woven materials; artificial jewelry; objects of aesthetics that use bamboo shoots, straw, dried plant stems, and other organic residue from the nature; cane and bamboo; clay; and in some cases light-weight metals. And of course we included the entire output of the handloom industry into our scoping of the designer goods industry. There is no doubt that some important segments of the textiles industry (BSIC 17) and apparel making (BSIC 18) are the two iconic manufacturing habitat for the growth of the designer goods industry. It appears to us that this characterization of the scope of the designer goods industry is quite a reasonable one.

This formulation necessarily leaves out a number of activities within the textiles sector, and certainly a few manufacturing industries in which design competency is a competitive differentiator of unmistakable potency. Examples include leathergoods, non-metallic minerals (floor tiles, ceramics, and the like). Examples may also include electricals goods---with the designer ladies bag, eye-wear, mobile phones and PDAs, Apple's two-in-one MacIntosh personal computers, and all varieties of designer goods being each a case in point. Re-classifying the output of each of these other design-dense industries as designer goods industry would be too radical a move to consider. In fact that such a reclassification would be so far removed from established statistical practice that, especially because the SME Foundation's own TORs meted out to the consultants are completely silent on the matter, it would almost immediately brook an almost irrefutable and scathing attack from the critics.

1.5.2 Criticisms based on the absence of a product-level granularity in the narrative

Often faced, as we were, with a multiplicity of distinct products within each study sector---indeed, a lot of times, within the same enterprise (as when a food processing plant makes both milk and chocolate drinks)---and because the concern with having a 'baseline' appeared to put the premium on the sector as a monolith, the establishment of equivalence across heterogeneous product-mix was more important than achieving product-level granularity in the ensuing narrative. The latter is rightfully the subject of future research, for which the data we generated will be available.

1.5.3 Criticisms based on the absence of a subsectoral customization in the narrative

Several discussants sought an analysis differentiated by the constituent subsectors of the overall sector. The reason why we didn't follow such a finely differentiated analytical approach are as follows:

Firstly, we interpreted the TOR as tasking us to perceive the sectors or the industrials as an aggregation. That is why we pointedly put forward in our Inception Report the viewpoint that we would largely talk about the study sectors or industries as 'monoliths'. The TOR had always mentioned these industrials as if the analytical focus were to be on one industry taken at a time. Never did the TOR exhort the consultants to present anything in a suitably disaggregated manner. [12]

Secondly, such a finely differentiated analysis would however be bedeviled by the fact that, as said already, outputs and inputs were quite heterogeneous across the firms in an industry, and the pecking order within an industry, whether based on the diversity of output or inputs, were not the same across the study industries.

Thirdly, the burden and the labour involved in any analysis that is disaggregated by size was presumed to be quite considerable. Because the SMEF had imposed on the consultants a calendar deadline that was 'inviolate', and because the consultants in any case had a challenging enough task simply generating, cleaning, processing, tabulating and analyzing the primary and the secondary data, there unfortunately was no time left in which we could *also* have carried out a sub-sectoral presentation of the results. As said already, this would have taken us well beyond responding to the TORs.[13] The presentation of the sub-sectoral results, like for product-specific results, is better seen to be as a direction of future research.

1.5.4 Criticisms based on the use of MiSmall versus MeLarge conjugates

The narrative in each of the seven presentation reports uniformly uses just four size-classes, namely, 'micro', 'small', 'medium', and 'large'. No where did, as critiqued by one discussant, we 'categorize all samples into six classes'. We accommodated a dual mode of aggregation of the raw-level, 'unit', data: once it is a four-part aggregation featuring the familiar four size-classes of micro, small, medium and large. At other times, perhaps for the more time-challenged policy executives who like to have research findings compared across pithier, handier, conjugates, we have provided a helpful and added dose of aggregation and abstraction. We have introduced two conjugates having the advantage of facilitating an analytical and policy focus across a 'small' *versus* 'non-small' divide. Conjugation leads to aggregation, and the latter to abstraction. Such a procedure does not amount to six classes. Such a procedure amounts to the use of a dual-mode aggregation, intended to serve better two classes of users and clients of data. Contrary to what some discussants have said in this connection, there is no possibility that such abstraction will ever create a problem in future for policy decision for the sectors currently under study. Quite the contrary, such a scheme

[12] If we nevertheless presented all our results using a four-part disaggregation in spite of the TOR not once exhorting us to invoke any disaggregation at all, that was because we reasoned that the SME Policy Strategies 2005 had addressed the SME Foundation to use a size-based classification to be employed when it comes to talking about enterprises in different categories. A disaggregation by size appears to be a natural extension of one's concern to dispense policy advice or advocacy. An *additional* disaggregation in terms of products or subsector didn't seem called for, even useful, after the disaggregation in terms of the size of firm.

[13] The CDS team would hand over all the raw data to the SMEF. Any future extension of the presentation of the research results is of course possible, including by the any member of the present team of CDS consultants.

for aggregation is an essential, indispensable, complement to using a relentless focus across a small-*versus*-nonsmall focus. That focus is legitimized by the SME Policy Strategies-2005, no less. To quote: "A *credit-distribution package* will need to be worked out by the Ministry of Industries. An innovative scheme---rather like a two-stage screening mechanism---that can really probe for the *bone fide* of the applicants as *entrepreneur materiale* will be deployed. Of the total resources available, no more then 20% may be earmarked for medium enterprises, while the remainder, 80%, will be earmarked for small enterprises." (SME Task Force, 2004, p. 7). Invoking the small enterprises in the above quotation is really about putting the spotlight on 'MiSmall' class of enterprises, while the medium harkens back to the 'MeLarge' class of enterprises.

1.5.5 Responding to other assorted criticism

Sometimes, no doubt inadvertently, the discussant has labeled a criticism without compelling merit. The following quotation is typical of this situation: "The report makes out some of the segments of agro and food processing industry. It is not understandable on what basis these segments are identified. Some of the important segments are dropped like spices processing, oil refinery (palm oil, coconut oil, mustard oil, etc), tobacco (bidi), molasses and suger, and etc". This critique misses the point: we stated categorically in our Technical Proposal (and also in the Inception Report) that the following subsectors would be covered under the agro and food processing sector study, and they have been meticulously covered, based on the Business Registry-2007:

1) Fruits and vegetable processing industry
2) Rice and wheat milling
3) Milk, dairy products, poultry and eggs
4) Fish processing
5) Bread / biscuit / confectionery manufacturing, breakfast foods(including cocoa processing and chocolate), malt extract, protein isolate, high protein food, etc.
6) Aerated waters / treated water, and selected kinds of soft drinks.

Volume-2

SMEF's Six Sector Studies---Baseline, Profile, Performance -A Synthesis

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A study for SME Foundation, Dhaka
By
Center for Development Studies, Dhaka

June 2010

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Executive Summary

Bangladesh's economy has put in impressive rates of overall growth and promising economic transformation during the last two or decades or so. Per capita growth has grown from some US $ 200 in the early 1990s to more than US $ 400 in 2007. The roll-out of a national grid of all-weather roads and a labyrinthine web of farm-to-market roads has grown increasingly dense, raising land prices in the countryside, and multiplying rural households' wealth. As the pressure on the major cities has grown relentlessly, and as cities became more and more of magnets, prices of assets, especially land, luxury apartments, and rents, have grown in spades. The spectre of mass unemployment in the rural areas has mostly been banished. The roll-out of micro-credit in rural areas has led to the emergence of unprecedented economic confidence among previously poor women, further improving consumer confidence across the country. Ownership of shares in publicly traded companies has multiplied, with hundred of thousand of firms having been witnessed varying degrees of capital appreciation. Urban job-holders have become used to having two jobs apiece. Consumer credit has put in a cautious appearance. The prominence of women in the workplace has visibly increased. Market size for all manners of hip and fashionable consumer goods---both durable and otherwise---has staged strong growth. In short, an important sub-text to the emerging narrative of Bangladesh's economic transformation during the last two decades has been about reasonably growth in final demand for manufactured goods. It is in this context that it becomes a matter of considerable professional interest to ask searching questions about the magnitude, composition, characteristics, factor intensities and productivities, profitability and growth dynamic, returns to investment and other diagnostics concerning small and medium enterprises in quantitatively important manufacturing industries of Bangladesh in a recent year. This is precisely the objective of the large and comprehensive sectors studies about six industries---(i) agro and food processing; (ii) designer goods; (iii) electricals and electronics; (iv) leather and leathergoods; (v) light engineering; and (plastics)---in Bangladesh. The following paragraphs are intended to provide an executive summary of the major findings that have emerged in the course of this study that ran its course between February and September, 2008.

Size-structure and average enterprise age of the six industries

Agro processing, leather and leathergoods and plastics are within spitting distance of each other when it comes to the percentage of micro and small enterprises (MiSmall firms)---at roughly 64-66% range. The designer goods industry is in a bracket by itself---of about 60%. Electricals and light engineering sectors in contrast harbour a much larger percentage of MiSmall firms, and the percentages are in the 84-85% range. The weighted average firm's age on the six-sector sample is 14 years. The representative firm across these six sectors was born in 1994.

Average size of enterprises

Across the sectors, average employment size remains pretty constant. Thus for the micro class of firms, average firm size is 5.9, 5.9, 6.3, 4.6, 6.5 and 8.6, respectively, for agro processing, leather, electricals, light engineering, designer goods and plastics industries. The corresponding numbers with respect to small firms are
23.6, 21.8, 23.9, 19.1, 35.7 and 21.0---values that are reassuringly close to one another. As well, the corresponding numbers with to medium firms are 70.6, 69.7, 65.8, 74.4, 71.9 and

75.8---values that are reassuringly close to one another. The Economic Census, 2001-2003, conducted by the BBS reported the average size of small firms during that census at 20 workers, and of the medium firms at 68 workers. The closeness of our own results versus the Economic Census is a major booster from our perspective: the findings to be reported in the following pages and volumes therefore inspire notable confidence by the readers.

Industries strongly identified with the business of exporting---namely, leather and leathergoods and designer goods industries---stand out in their 'headcounts'. Agro processing and plastics---with average firm size of 54 and 64 workers--- characterize middling sizes. The two industries with an engineering slant, electricals and light engineering, have the smallest average size on our sample.

Gender equality in employment

The largest relative prominence of women workers is found, quite expectedly, in the designer goods industry. Women workers account for 61% of all workers in the designer goods industry. The credit for the second position in this respect goes to the leather and leather goods industry, mainly courtesy to the leathergoods firms hiring women workers abundantly.

Start-up circumstances

With a roughly one-third: two-third ratio between equity and debt, agro-processing and plastics evince the most pronounced predisposition towards borrowing at start-up, while the other four industries---with more than ninety percent of capital raised in the form of equity---- preponderantly opt out of or are cut from debt contracts. However, both industries are subsequently found to load up on equity and retained earning as profits come in. During the study year, both industries are found to substantively increase their percentage of equity and retained earning on balance sheets. In contrast, leather and leathergoods industry metamorphoses from a lean user of debt to a heavily-indebted industry between the start-up scenario and the study year.

Gross value added per firm in the study sectors

Gross value added relative to gross value of output---at slightly above 60%--- in the designer goods industry is the highest of any industry on the sample. Next is the leather and leathergoods sector---at about a half. Third on this particular hierarchy is the agro and food processing---at about 47%. Plastics and light engineering are the least productive in terms of this metric, with the performance of the electricals/electronics being intermediate between the 'high' and the 'low' rollers.

A re-assuring comparison between the present survey and the Investment Climate Survey-2002

A comparison between the World Bank's Investment Climate Survey (ICS) 2002 for Bangladesh and the present survey returns some stunning similarities in results.

(1) Value added relative to gross value of output for the MiSmall class of establishments is found to be 32.2%. For the ICS-2002, this is found to be 34.4%. For large enterprises, value added relative to gross value of output reported by the ICS-2002 and our own survey is found to have been, respectively, 47.1% and 48.1%---once again very close to one another.

(2) Labor productivity (in thousand Taka worth of value added per worker employed) is found to be Tk. 375.45 thousands in 2002 as compared with Tk. 362.0 thousands in 2006/7. That is a striking similarity. Value added per worker is one of the most central empirical metrics when it comes to pro-poor development.

(3) Both surveys show that the MiSmall establishments register significantly higher capital productivity---by returning lower or much lower capital-output ratios on an average compared with medium or large firms.

At another level, there is a close correspondence between several results from the present survey, the ICS-2002 and the Economic Census of the BBS. For example, BBS reported an average employment size of 66.7 in 2001/2003 for medium enterprises, whereas the ICS and our data put that average at 68.4 and 70.2--- a statistically insignificant difference indeed (Chowdhury, 2007b; the present data).

The agro and food processing, and leather/leathergoods industries generate value added the size of Tk. 127 and 38 billion, respectively, while light engineering and electricals/electronics industries generate value added the size of Tk. 30 and 4.5 billion, respectively. The designer goods and plastics industries generated value added worth Tk. 29 and 11 billion, respectively.

At Tk. 321 thousand, plastics have the highest capital-labour ratio (CLR) of any industry on the sample. The leather and leathergoods industry registers the next highest average CLR---of Tk. 233 thousand. In the leather and leathergoods industry, verage CLR of large firms is significantly lower than for the smaller firms, and this is due to a concentration of individually cheap industrial sewing machine, of which such plants are full. With agro processing next in line, designer goods and light engineering industries are within spitting distance of each other in terms of the CLR. In character with their (highest-on-the-sample) CLR values, plastics and leather/leathergoods industries register the highest labour productivity (value added per worker) among any industries on the sample. However, labour productivity does not follow CLR lock-step. In particular, light engineering 'rocks the apple cart' big time: with the lowest average CLR values, light engineering registers the third-highest labour productivity.

In leather, design and plastics industries, MeLarge firms have an advantage in labour productivity over MiSmall firms. Elsewhere, it is the MiSmall firms that have the balance of advantage in labour productivity.

In four out of six industries, the MiSmall firms out-perform MeLarge firms in terms of the elasticities of output with respect to employment. MiSmall firms have therefore to be taken seriously as contenders for legitimate public assistance.

Overall, average capital-output ratio of the MiSmall class of firms is found to be 0.89. The corresponding average for the MeLarge firms is found to be 1.23. With the exception of designer goods and plastics, the COR is found to be higher for MeLarge firms *versus* MiSmall firms in each of the other four sectors. MiSmall firms have the advantage of leaner capital-output ratio in agro processing, leather, electricals and light engineering industries.

Estimating production functions of the Cobb-Douglas (CD) form, we find that in every case, employment elasticity of output is significantly higher compared with capital for every industry. This establishes the primacy of labour as the key factor of production. The null hypothesis that returns to scale are constant could not be rejected ---an important result.

Drivers of labour productivity in the study sectors

Agro processing:

Labour productivity is positively driven by bank loan, automation, experience of white-collar workers, and export orientation in the output mix are all significant and positive drivers of labour productivity. The only statistically significant negative coefficient owes to Dhaka's locational dummy.

Leather and leathergoods:

Labour productivity is negatively driven by bank loan and export orientation in the output mix. There is no statistically significant positive coefficient to write about.

Electricals and Electronics:

Labour productivity is significantly positively driven by fixed capital provisioning and the product price. There is no statistically significant negative coefficient to write about.

Light engineering:

Labour productivity is significantly positively driven by fixed capital provisioning and Chittagong locational dummy. There is no statistically significant negative coefficient to write about.

Plastics:

Labour productivity is significantly positively driven by automation, and to a certain extent by product price. Firm's age, workers' experience, Chittagong locational dummy and micro dummy variable each has a negative coefficient on the LP function.

Designer goods industry:

Labour productivity is significantly positively driven by Managing Director's educational attainment, fixed capital provisioning and product price. Firm's age variable has a negative coefficient on the LP function.

Estimating stochastic production functions, and firms' distance from it

Following reasonably rigorous procedures, we estimate firms' distance (which is a kind of measure of efficiency) from an estimated stochastic production frontier, and then explained this econometrically, with diagnostic insights in view. The following results were obtained for the various study sectors

Electrical and Electronics:

(1) Import intensity of the input-mix and location in Dhaka drive efficiency positively;

(2) An increase in product price fosters greater 'inefficiency', presumably by breeding complacency.

(3) Relative to firms of other size, micro firms are significantly less 'efficient'.

Light engineering:

Product price is found to promote greater 'efficiency'.

Designer goods industry:

(1) Having a bank loan and enhancing the formal education length of the owner positively drive the efficiency of the firm;

(2) Average product price fosters greater inefficiency, presumably by breeding complacency.

Leather and leathergoods:

(1) In this industry, having a bank loan and a higher intensity of imports in the use of inputs significantly increase distance from the production frontier;

(2) The educational attainment and firm capital-labour ratio positively drive efficiency in this industry.

Agro processing:

Location in Dhaka induces greater 'efficiency', while location in Chittagong drags efficiency.

Access-to-finance regime surrounding the study sectors

Light engineering is the most underbanked sector, with only 18% of the firms having had bank credit. Plastics are the most favourite bank client with the highest percentage of bank borrowers, at 43%. Electricals and designers goods industries each rate a 23-25% percentage range. Leather and agro processing are each in the 34-39% range. Taking all six sector in one sweep, some 23% of the firms have a bank loan.

In 26% of the cases, MiSmall firms report the 'privilege' of an exposure to bank loans, while the corresponding percentage for the MeLarge class of firms is 40%. Only 10% of the micro establishments report any exposure to bank loans. Micro enterprises account for a half of all manufacturing enterprises. What's more, performance-wise, the micro firms tend to be just as much 'bankable' as the rest of the pack in each of the sectors. The data suggest the squeezing of the micro firms out of the credit loop. Prime facie, this seem to be for no better reason than the fact that they are 'micro' and 'tiny', and are therefore not bank-credit-worthy. There needs to be some 'interventions' specifically aimed at mitigating the effects of this in the market for credit.

Average loan-size in the study sectors

Bank loan size ranges between a low of Tk. 1.51 million for the designer goods industry to a middling figure of Tk. 7.5 million for the agro processing industry to Tk. 16.5 million--- the highest number of any industry covered--- for the plastics industry. Both loan sizes and interest rates disperse significantly around these averages with regard to firm size variable. Compared with MiSmall firms, MeLarge firms have significantly larger bank loan contracts---Tk. 1.21 million *versus* Tk. 13.82 million[14], respectively. That difference is statistically highly significant: average bank loan for MeLarge firms is more than 11 times that for MiSmall firms. Because the average annual revenue or profits of the MeLarge firms is a much smaller multiple versus MiSmall firms, there is circumstantial evidence in this for believing that banks lending is slanted towards the MeLarge firms.

Average rates of interest

Average interest rates range between a low of 14.3% for the leather and leathergoods industry to a middling rate of some 16% for the designer goods industry to the highest number of any of the sectors covered of 19.7% for the light engineering industry. Leather industry is, as we have seen already, the one with the hoariest, 'blue-chip' track-record on the sample. MiSmall establishments are under-banked compared with MeLarge establishments.[15] As compared with MiSmall establishments who pay an average interest rate of 15.76%, MeLarge firms on average pay 15.82%. Overall, average rates of interest charged by banks is about 15.8%. For comparison, small and medium firms in China serviced debt owed to largely state-owned banks during 2007/2008 at between 7 percent, and those in India at 8%, over a comparable period (Chowdhury, 2007), whereas those in Viet Nam, too, serviced their bank loans at between 7%. According to IMF data, consumer prices in these four countries grew during 2007/2008, respectively, at 9.6% (for Bangladesh), 5.6% (China), 6.8% (India), 16.2% (Viet Nam). The upshot is that real rate of interest facing Bangladesh's SMEs---at more than 6%---is the highest among any of these three most important comparator Asian countries. Many factors---productivity growth, rate of return on capital, global interest rates, risk premia, credibility about inflation expectations, and monetary and fiscal policy--- all weigh into the determination of nominal and, ipso facto, real interest rates. Given that, is there any role for interest rate policies in all this? Opinions differ of course on whether interest rates in Bangladesh are 'too high' or 'too low'. Symptomatic of the viewpoint of those who believe that interest rates in Bangladesh are 'too low' is that apparently many private bankers feel that they can not attract savings deposits on the scale they would rather prefer, because of the de facto ceiling on the interest rates they can in fact pay their depositors. At the prevailing rates of interest, the argument goes, some demand for loans can not be met because banks have not been able to motivate the requisite additional deposits due to low rates they 'can' pay on their deposits. The prevailing interest rates are therefore 'too low'. As against this, interest rates in Bangladesh are among the highest in Asia (World Bank, 2003). Reasons why this is to runs the gamut from (i) less-than-full competition among private-sector banks; (ii) high 'administered' rates of interest meted out by the Ministry of Finance on the National Savings Certificates, which

[14] These averages are calculated based on all cases including where a loan contract was issued to the sample observation.

[15] We have put this conclusion a little euphemistically. It is quite correct to say that the degree and the provisioning of institutional credit by medium or large establishments would be understated to a greater degree compared with MiSmall establishments. For a larger proportion of the cases, the MeLarge establishments were characterized by non-response to questions concerning the fact and the extent of bank loans or loans from leasing companies.

‘lead to gold plating’ in deposits rates that other banks have to fork out to remain deposits-competitive; (iii) banks’ relatively high overhead costs, which have the same effect, etc. The consensus therefore is that high rates prevalent in Bangladesh are throttling growth rates of SMEs.

Non-institutional credit on the sample

With the exception of the plastics industry, there isn’t such a great dependence upon the non-institutional credit by firms on the sample.

Exposure to trade credit

The sectors that are squeezed out of the formal-credit market do the heavy-lifting of trade credit, whereas the sectors that were the poster-kid of bank-client relationships are conspicuous in this market by their absence. Light engineering takes the dubious ‘top credits’ when it comes to the largest average size of trade credit availed. Whereas plastics that had recorded the largest institutional credit on the sample steers well clear of trade credit. Trade credit is a kind of a ‘dumping ground’ for the ‘refuse’ of the private-sector banking system.

Weighted average cost of credit

The highest cost of credit---in terms of the weighted average interest rates prevailing ---confront the firms in the light engineering industry, followed by plastics industry, agro processing and designer goods industry, in that order.

Capacity utilization in the study sectors

Overall, weighted average rates of capacity utilization on this samples ranges between 61% and 69%. Weights used are the revenues reported. With the exception of agro processing, the MiSmall firms in each of the other sectors each report lower capacity utilization rates than do the MeLarge firms. The MiSmall firms overall are found to have financing cover for only 65% of their working capital requirements, while the MeLarge firms have financing cover for almost 74% of theirs. Entrepreneurs in the MiSmall category are clearly credit-constrained.

Marketing orientation as between exports and domestic markets

Electricals and light engineering industries—with 100% and 93% of output being aimed at domestic markets--- are virtually entirely focused domestically. Agro processing also quite substantially focused---some 86%--- on the domestic sales. Leather and plastics industries report the same relative focus on domestic sales---in the 54 – 55 percent range. For the leather and leathergoods industry, this fact highlights how important has the domestic market segment become as a source of demand. Especially footwear has have become important component of this industry.

Marketing margins in the study sectors

The marketing margins range between a low of 12% for the light engineering industry to a middling figure of a 13-37% range for the plastics/electricals/agro processing industries, to a high of 56% for the designer goods industry. The last finding accords well with what has already been presented, namely, that designer goods industry has the highest value-added-to-gross-output ratio on the present sample of industries.

Firms' demand for factor inputs: using Seemingly Unrelated Regression Estimators (SURE)

Firm's demand for labour everywhere takes a hit when workers' demand more wages. This effect is statistically significant---for designer and leather industries.[16] Most of the other explanatory variables ---product price, fixed capital, a dummy variable for automation, and firm's output---all turned out to be positive drivers of firm labour demand.[17]
The important role that wage rate plays in the determination of the firm demand for labour implies strongly that on the supply side, worker cost of living would in part drive prevailing wage rates, by shifting the supply conditions of labour. In order therefore to stimulate the demand of labour by the establishments in the industry, efforts have to be made in order to lower the reservation price of labour: the latter closely corresponds to the cost of living. Reservation price is about the minimum opportunity cost that is consistent with the worker being able to reproduce its labour-selling power and thus deciding to supply labour. Essentially, reservation price revolves around workers' cost-of-living. Clearly, there is a lot that public policy can do about workers' cost of living. Foremost among them is about leveraging the cost of food as a policy variable.

The demand for capital:

Firm capital demand function both rises and falls depending upon the interest rates: the regression coefficient runs the gamut from being statistically significant and positive to being statistically significant but negative, to being statistically indifferent from zero. If credit rationing prevails in the credit markets in Bangladesh, a positive interest-rate coefficient in a function like this is ultimately sensible. The credit market is supply constrained, and that in order to obtain more credit, or to obtain a larger-sized credit contract, you will need to up the ante---by promising to raise the interest rate that you agree to service. This is a typical result of the presence of rationing in the market. The credit market for the agro processing, in which interest rate has a significant negative coefficient, clears based on the interest rate. Whereas in the plastics sector, the credit market is subject to credit rationing.

Firm capital demand mostly rises with product price, also with automation dummy variable. Output---in this case capacity utilization--- is a strongly positive and statistically significant coefficient of capital demand.

The demand for material inputs

Firm material input demand takes a hit whenever the price of the former rises. The material input demand is mostly positively sloped in automation dummy (D_a), and the regression coefficients are mostly statistically significant. Automation has a penchant for spurring the demand for material inputs. Finally, capacity utilization is a strong positive driver of firm material input demand.

[16] Note that with SURE, it is z-statistics, rather than t-statistics, that is calculated in order to assess statistical significance of individual regression coefficients.
[17] In the present context, output largely corresponds to capacity utilization. That means that the higher is the capacity utilization, the greater is the demand for labour that will be generated by the enterprises.

The extent of and the drivers of the firms' growth achieved

How much of growth, especially in the level of employment provided, has occurred in the six study sectors? The rapidest grower of employment is the designer goods industry, followed---of all things!---by the light engineering (a quadrupling of average size over the life-cycle). Two traits of these two bring them top billings in terms of growth, namely, vibrant demand and relative shortage of skills. The next sector in terms of growth rates that are put on the table are plastics, electricals and agro-processing, in that order. Leather and leathergoods sectors are the 'laggards' of this set, registering the lowest extent of growth of any of the six sectors or industries considered.

What drive the extent of growth? The factor that most significantly and universally drove firm growth, very largely, negatively, turned out to be the AGE of firm: the evidence for a generational gap is writ-large in the numbers. Why do younger firms grow as if on steroids compared with older firms? In every industry considered, firms that were born after 1994 appear to be led by chief executives that are better educated, had positioned their budding enterprises better, had more of the collateral incubation effect that comes from a greater engrossment of families in the minutiae of industrial entrepreneurship, and were better 'connected'. It helped of course that, after 1994, the ascendancy of the Internet, and the 'fat pipe' of 'content' that it symbolized represented a bonanza of rich positive pecuniary externalities in many ways.

Chapter 2.1

2.1.1 Introduction to the Volume, and a map of what is to come next in this set of volume

The objective of this volume is to present a summary of the salient results that have emerged from the succeeding six constituent volumes. This is prepared with a view to facilitating the effort of the typical business executive who might otherwise be pressed for time and not be able to read them all up. As well as being a synopsis of the results and findings to have emerged from the following volumes, this also presents some materials that have not been included in them. It is called a synthesis. By juxtaposing the salient results and findings of the constituent volumes into a compact form, but also trying to get a better grip of what is going on in the lives of these industries, this volume is trying to be about both the trees as also about the forest.

This set of eight volumes is structured as follows. Volume 1 spells out several key analytical issues that are likely to fundamentally inform the weighing of the positives and negatives of the policy options that the formulators of policy might be influenced by. It is also in this volume that we present the sampling methodology which has governed the conduct of the large-scale sampling activities implemented during the course of this study.
The following is a bird'e-eye view of the contents of the succeeding volumes.

Vol No	Sector of focus	Authors	Volume title
3	Agro & Food processing	Dr. Burhan Uddin, Dr. Saleh Ahmed Dr. Naeem Chowdhuruy	Agro and food processing industry: baseline, profile, performance and plans for upgrading
4	Designer goods	Dr. Naeem Chowdhury	Designer goods industry: baseline, profile, performance and plans for upgrading
5	Electrical and electronics	Dr. K. S. Rabbani, Dr. Naeem Chowdhury	Electricals and electronics industry: baseline, profile, performance and plans for upgrading
6	Leather	Dr. Naeem Chowdhury	Leather and leathergoods industry: baseline, profile, performance and plans for upgrading
7	Light engineering	Dr. Kamal Uddin	Light-engineering industry: baseline, profile, performance and plans for upgrading
8	Plastics	Dr. M. U. Ahmed	Plastics industry: baseline, profile, performance and plans for upgrading

Source: SMEF survey of six sectors, 2006/07

Before proceeding any further, it is well to know that throughout this set of volumes, we have utilized the following convention regarding the presentation of our results. MiSmall is a category that conjugates 'micro' and 'small' firms. (These sizes are defined subsequently.) MeLarge is a category that conjugates 'medium' and 'large' firms.

2.1.2. The manufacturing pedigree of the six study sectors

The following table presents the Bangladesh Standard Industrial Classification (BSIC) 4-digit characterization of the firms we sampled in the six study sectors. For completeness and also because we shall soon refer to such data, we also present in the same breath the HS code numbers of this sectors of our interest.

Table 2.1
Study sectors in BSIC and Harmonic Systems classification

The six study sectors	BSIC 4-digit codes	HS 4-digit codes
Agro and Food processing	1511 to 1564, 1601 and 1610	0301 to 0399, 0401 to 0499, 1701 to 1799, 1801 to 1899, 1901 to 1999, 2001 and 2099, 2101 to 2199y
Designer goods industry	1721, 1722, 1723, 1812, 1813, 1716	5801 to 5899, 6001 to 6099, 6101 to 6199, 6201 and 6299
Electricals and electronics	3110, 3120, 3130, 3140, 3150, 3190, 3210, 3220, 3230	8501 to 8548
Leather & Footwear	1911, 1912, 1921, 1929	4101 to 4115, 4201 to 4206, 6401, 6402, 6403, 6404, 6405
Light engineering	2712 to 2732, 2811 to 2819, 2890, 2899, 2928 to 2930, 2911 to 2920, 2921 to 2926	8401 to 8413, 8414 to 8429
Plastics	2413, 2511 to 2518	3901 to 3909, 3910 to 3920, 3921 to 3926

Source: SMEF survey of six sectors, 2006/07 and NBR, First Schedule, 2008.

Before proceeding any further, we must quickly address the question of the definition of size of enterprise that is practiced in Bangladesh's policy-making exercises. Table 2.2 presents the definition of size of small and medium enterprises adopted by the Government of Bangladesh in 2004. Table 2.3 then presents a definition that has recently been adopted by Bangladesh Better Business Forum (BBBF).

2.1.3 Definition of Small & Medium Enterprises

A variety of definitions concerning small and medium enterprises exists in Bangladesh.

2.1.3.1 BBS definition:

BBS uses a definition of size based on 'employment size'. Establishments employing between 1 and 9 workers are called 'micro'; establishments employing between 10 and 49 workers are called 'small'; those employing between 50 and 99 workers are called 'medium'; and, finally, those employing between 100 or more workers are called 'large'. It is this definition that was used both in the BBS' Economic Census of 2001/2003, whence came the Business Registry –2005/6. It is also used in the updated BR of 2007, which, authorized by the RFP from ADB, our team is using.

2.1.3.2 Ministry of Industries definition:

The erstwhile Small and Medium Enterprise Task Force (SMETF) enunciated a second definition of size. This was subsequently adopted in the issuance of the Cabinet-approved

SME Policy Strategies 2005---the muse for all SME policies of the Government of Bangladesh.

Table 2.2: Definition proposed in SME Policy Strategies-2005

Enterprise	Sector	Asset size	No. of employees
Small	Trade	No position taken	Less than 25
	Manufacturing	Total fixed asset excluding land & building of up to Tk. Tk. 15 Million	No position taken
Medium	Trade	No position taken	more than 25
	Manufacturing	Total fixed asset excluding land & building of between Tk. 15 Million -Tk. 10 Million	No position taken

2.1.3.3 The definition formulated by the Bangladesh Better Business Forum (BBBF)

That said, the BBBF has recently issued another definition of small and medium enterprises in various realms of production. This is presented below:

Table 2.3: Definition mooted by the BBBF, in 2008

Enterprise	Sector	Asset size	No. of employees
Small	Service	Total fixed asset excluding land & building Tk. 50000-Tk. 5 Million	Less than 25
	Trade	Total asset worth Tk. 50000-Tk. 5 Million excluding the value of fixed asset	Less than 25
	Manufacturing	Total fixed asset excluding land & building Tk. 50000-Tk. 5 Million	Less than 25
Medium	Service	Total fixed asset excluding land & building Tk. 5 Million -Tk. 10 Million	Less than 50
	Trade	Total asset worth Tk. 5 Million -Tk. 10 Million excluding the value of fixed asset	Less than 50
	Manufacturing	Total fixed asset excluding land & building Tk. 15 Million -Tk. 20 Million	Less than 150

Because the BBS definition has already shaped results from many empirical exercise before, in this implementation, we are using the BBS 'informal' definition. We shall define an enterprise with between 1 and 9 workers as a micro establishment; between 10 and 49, small; between 50 and 99, medium; and 100 and above, large.

Chapter 2.2

2.2.1 A sector-specific samples in a broad light

Throughout this set of volume, we use the following convention while presenting the results. Firms with 'headcount' of between 1 and 9 are described are micro; between 10 and 49 workers, small; between 50 and 99, medium; and 100 or more workers, large. This is consistent with Bangladesh Bureau of Statistics (BBS) practice in the Economic Census, 2001/2003, and in subsequent Business Registry (BR) produced by the BBS of small, medium and large firms as of 2007.As well, we utilize the epithet of 'MiSmall' to describe the conjugate of micro and small firms, ie firms with between 1 and 49 workers, and 'MeLarge' to describe the conjugate of medium and large firms, ie firms with between 50 and more workers. The presentation of results in the tables that literally dot this and the succeeding volumes is enhanced by the interleaving of results relating to 'MiSmall' and 'MeLarge' class of firms.

2.2.1.1 The relative prominence of MiSmall class of firms

Table 2.4 profiles the six sectors in terms of the relative distribution of the firms across the four study size classes of micro, small, medium and large. While the data can in principle be sliced and diced in many alternative ways, one is particularly after our heart. We want to see how the percentages of the firms shape up on a 'MiSmall' *versus* 'MeLarge' divide across the six sectors. We note that agro processing, leather and leathergoods and plastics are within spitting distance of each other when it comes to the percentage of MiSmall class of firms in them---at roughly 64-66% range. The designer goods industry is a loner---in a bracket by itself---of about 60%. Electricals and light engineering sectors in contrast harbour a much larger percentage of MiSmall firms, and the percentages are in the 84-85% range.

2.2.1.2 Average firm-size, gender balance, length of schooling and work experience

Table 2.5 profiles the six sectors in terms of the average firm size across the four study size classes of micro, small, medium and large. The two industries clearly identified with the business of exporting---namely, leather and leathergoods and designer goods industries---stand out in terms of the average firm size based on 'headcount'. Agro processing and plastics---with average firm size of 54 and 64 workers--- characterize the middle-of-the-road sizes. The two industries with an engineering disposition, have the smallest average size on our sample.

Table 2.6 profiles the six sectors in terms of the 'gender balance' in employment across the four study size classes of micro, small, medium and large. The largest relative prominence of women workers is found, quite expectedly, in the designer goods industry. Women workers account for 61% of all workers in the designer goods industry. The credit for the second position in this respect goes to the leather and leather goods industry, mainly courtesy to the leathergoods firms hiring women workers abundantly.

Table 2.7 profiles the six sectors in terms of the length of the experience of the average worker across the four study size classes of micro, small, medium and large. Plastics, leather and light engineering industries score pretty similarly in terms of this metric, with agro processing not far off from this trio. Electricals and electronics industry however seems to be working with workers with 'rookie-grade' experience.

Also, the weighted average age of the enterprise for the entire sample comprising six industries is found to be 14 years. What is the intuition there? For starters, the country had elected, for the first time in more than a decade, a democratically-elected government, in 1991. The new government was a business-friendly government. Import liberalization was proceeding apace. For the first time in the history of the country, private commercial import of what were previously 'taboo' commodities for the purpose---such as rice and wheat---had been legalized in 1993 and 1994, respectively. Especially with policies that are preferential to the liberalization of imports of all kinds, the 'investment' or 'business' climate became one of the most enabling in and around 1994 that it had ever been before. Small wonder, the birth of new enterprises during this period of hope and optimism was thick and fast.

Table 2.8 is about statistical distribution of the samples within industries across firm size classes. It is also about the average length of the formal schooling on the part of the Managing Directors of the sample firms. First about the average age of the firms. Leather and leathergoods industry boasts the hoariest past, with about 21 years of average track record. Light engineering, with 18 years, and designer goods industry, with some 14 years of average experience have an intermediate seniority. Agro-processing, electrical and electronics and plastics each rate a track record about 12 years long. Now we take up average educational attainments of the MDs. With the exception of leather and light-engineering---two industries which spawned in the 'old' part of the city---there is a fair amount of closeness between the average age of the firm and the average length of the MDs' education in the industry---on average, both the age of the firm and length of the MDs' education hover around a 11-12 years range. Leather and light engineering are in contrast distinguished by an egregious hiatus between the typical hoariness of the average firm, and the meagerness of the educational attainment of it's the MDs in them.

2.2.1.3 Economic circumstances of start-up mobilization: employment, number of machines

Table 2.9 profiles the number of employees and machines at start -up, and no. of products across the six sectors. The leather and leathergoods industry has an upward size skewness in the startup year due to the presence of some very large establishments in the footwear and leathergoods segments of the industry. Other than that, 'headcount' at startup ranges between the low of 9.15 of the light engineering industry to the high of 26 of the agro processing segment. Electricals and desiger goods industry both rate a 17.4 workers at startup, while plastic, only marginally higher, at 21. The main point is that the average values regarding head-count at start up has a tendency to be strung around relatively narrow band.

Table 2.10 profiles the amount of equity and debt at start-up by firms across the six sectors. In this table, leather, agro processing and plastics segments define one end of the spectrum with a fairly substantial amount of start-up equity being ploughed into the business at the time of start-up. Overall, for these three sectors, the mobilization of equity at start-up on an average ranged between Tk. 9.7 million in the case of plastics and agro processing, and Tk.45 million. Leather sector is clearly exceptional among these six study sectors when it comes to the mobilization of equity or retained earnings to itself. In contrast, the other three sectors are fairly moderate in terms of their demand for own-account equity, ranging between a low of Tk. 655 thousand for light engineering industry and a modest local peak of Tk. 3086 thousand only for the designer goods industry. Even a casual visual examination of the results about start-up debt is sufficient to demonstrate clearly to one that with the exception of agro processing and plastics, the debt: equity ratio typical of the other four sectors features fairly little of debt in the mix.

Table 2.4:
No & percentages of firms across the four size classes in the six study sectors

	Agro processing		**Leather & Footwear**		**Electrical & Electronics**		**Light Engineering**		**Designer goods**		**Plastics**	
Firm size classes	No of firms	% of total	No of firms	% of total	No of firms	% of total	No of firms	% of total	No of firms	% of total	No of firms	% of total
Micro	11	7.9	16	11.5	25	18.1	38	25.3	6	4.3	23	16.5
Small	82	59	73	52.5	86	62.3	87	58	70	50	69	49.6
Medium	34	24.5	30	21.6	15	10.9	17	11.3	47	33.6	27	19.4
Large	12	8.6	20	14.4	12	8.7	8	5.3	17	12.1	20	14.4
MiSmall	93	66.9	89	64	111	80.4	125	83.3	76	59.5	92	66.2
MeLarge	46	33.1	50	36	27	19.6	25	16.7	64	45.7	47	33.8
All	139	100	139	100	138	100	150	100	140	100	139	100

Source: SMEF survey of six sectors, 2006/07

Table 2.5:
Employment per firm across the four size classes in the six study sectors

Firm size classes	**Agro processing**	**Leather & Footwear**	**Electrical & Electronics**	**Light Engineering**	**Designer goods**	**Plastics**
Micro	5.9	5.9	6.3	4.6	6.5	5.6
Small	23.6	21.8	23.9	19.1	35.7	21.0
Medium	70.6	69.7	65.8	74.4	71.9	75.8
Large	254.2	620.8	170.3	196.9	666.7	261.2
MiSmall	21.5	19	20	14.7	33.4	17.7
MeLarge	118.5	290.1	109	113.6	229.9	156.4
All	53.6	116.5	38.7	31.2	123.2	63.6

Source: SMEF survey of six sectors, 2006/07

Table 2.6: Average no of male & female worker across the four size classes in the six study sectors

	Agro processing		Leather & Footwear		Electrical & Electronics		Light Engineering		Designer goods		Plastics	
Firm size classes	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Micro	5.7	0.2	5.87	0	6.21	0.04	4.53	0	6.17	0.33	5.7	0.2
Small	21.7	1.9	21.65	0.19	20.8	3.11	16.05	3.02	22.69	13.02	20.4	0.75
Medium	57.5	13.1	60.57	9.1	54.18	11.59	64.35	10	49.53	22.36	71.5	3.4
Large	194.3	59.8	437.1	183.7	132.83	37.5	153	43.88	191.76	474.88	211.7	50.6
MiSmall	19.8	1.7	18.82	0.15	17.59	2.43	12.54	2.1	21.38	12.02	16.7	0.6
MeLarge	93.2	25.3	211.18	78.94	86.72	22.31	92.72	20.84	87.31	142.56	131.2	23.1
All	44.1	9.5	88.01	28.49	32.12	6.61	25.91	5.23	51.52	71.7	55.4	8.2

Source: SMEF survey of six sectors, 2006/07

Table 2.7: Average years of worker experience across the four size classes in the six study sectors

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	4.7	12.7	5.26	7.6	10.3	6.5
Small	5.6	7.7	6.49	6.8	4.4	7.3
Medium	7.2	4.4	6.65	7	4.1	8.6
Large	7.3	5.4	5.68	6.4	8.8	10.0
MiSmall	5.5	8.6	6.21	7.1	4.9	7.1
MeLarge	7.2	4.8	6.22	6.8	5.5	9.3
All	6.1	7.2	6.21	7	5.2	8.0

Source: SMEF survey of six sectors, 2006/07

Table 2.8: Age of firm & Entrepreneur years of schooling across the four size classes in the six study sectors

	Agro processing		Leather & Footwear		Electrical & Electronics		Light Engineering		Designer goods		Plastics	
Firm size classes	**Age of firm**	**Entrepreneur years of schooling**	**Age of firm**	**Entrepreneur years of schooling**	**Age of firm**	**Entrepreneur years of schooling**	**Age of firm**	**Entrepreneur years of schooling**	**Age of firm**	**Entrepreneur years of schooling**	**Age of firm**	**Entrepreneur years of schooling**
Micro	6.63	12.91	25.44	5.83	8.32	9.72	16.32	6.95	18	5.25	11.4	10.4
Small	11.41	11.99	23.94	9.22	12.59	11.44	19.34	5.33	13.28	11.22	11.1	13.6
Medium	13.68	13.29	14.77	11.94	13.6	11.87	23.71	8.34	11.83	13.25	12.4	14.3
Large	16.42	14.42	17.64	13.95	13.54	11.92	20.88	2.14	23.94	10.25	11.5	16
MiSmall	10.84	12.45	24.26	8.51	11.63	11.05	18.42	5.83	13.77	10.6	11.2	12.6
MeLarge	14.34	13.85	15.97	12.77	13.57	11.89	22.8	6.96	14.9	12.49	10.6	15.3
All	12.22	13.15	21.1	10.14	12.02	11.22	19.15	6.01	14.28	11.45	11.6	13.6

Source: SMEF survey of six sectors, 2006/07

Table 2.9: The number of employees and machines at start -up, and no of products across the six sectors

	Agro processing			Leather & Footwear			Electrical & Electronics		
Firm size classes	**Emp.**	**Machines**	**Products**	**Emp.**	**Machines**	**Products**	**Emp.**	**Machines**	**Products**
Micro	5.34	2.38	2.4	15.8	4.1	1.05	6.88	1.92	1.63
Small	19.49	3.21	2.3	20.3	6	1.01	15.09	5.82	1.79
Medium	14.45	2.91	2.3	43.3	26.2	1.02	20.93	24.07	1.46
Large	65.0	5.25	2.3	348.4	87.4	1	49.23	12.85	1.54
MiSmall	12.41	2.74	2.4	19.3	5.6	1	13.24	4.96	1.75
MeLarge	39.72	4.08	2.3	172.4	50	1	34.07	18.67	1.5
All	26.07	3.41	2.3	76.6	21.4	1.01	17.44	6.96	1.71

	Light Engineering			Designer goods			Plastics		
Firm size classes	**Emp.**	**Machines**	**Products**	**Emp.**	**Machines**	**Products**	**Emp.**	**Machines**	**Products**
Micro	1.97	1.95	1.55	3.5	2.25	2.75	4.6	2.3	2.2
Small	6	3.27	1.57	10.27	1.8	3.43	19.8	5.3	2.3
Medium	14.53	4.59	1.88	18.11	3	3.7	52.1	8.6	1.7
Large	66	23.13	1.63	30.43	6.88	4.76	136.1	33.1	1.7
MiSmall	4.78	2.82	1.57	9.57	1.84	3.36	11.1	3.6	2.3
MeLarge	31	10.52	1.8	21.24	4.03	3.98	99.4	22.4	1.7
All	9.15	4.11	1.61	17.44	2.84	3.64	21.3	5.8	2

Source: SMEF survey of six sectors, 2006/07

Table 2.10 (a): Equity / Retained earning and debt at the start-up (Tk. 000s)

	Agro processing		**Leather & Footwear**		**Electrical & Electronics**	
Firm size classes	**Equity/Retained earning**	**All debt**	**Equity/Retained earning**	**All debt**	**Equity/Retained earning**	**All debt**
Micro	429.78	145.83	4493.8	72	281.68	28
Small	3150.65	1351.67	10545.3	1543	1460.93	146.49
Medium	2181.86	944.96	111570	492	2457.87	141.33
Large	33375	15000	108039	5866	2260.46	316.67
MiSmall	1790.22	716.66	9457.4	1279	1209.05	119.85
MeLarge	17778.43	7972.49	110157.6	2639	2366.21	219.26
All	9784.33	4360.62	45680.5	1768	1466.38	139.3

	Light Engineering		**Designer goods**		**Plastics**	
Firm size classes	**Equity/Retained earning**	**All debt**	**Equity/Retained earning**	**All debt**	**Equity/Retained earning**	**All debt**
Micro	144	57.78	1585.8	28.0	1295	1429
Small	851.34	62.34	2692.6	146.5	10443	2640
Medium	912.94	376.48	4223.0	141.3	13106	6750
Large	394.8	350	2195.3	316.67	35400	16406
MiSmall	636.34	60.96	2577.6	119.85	5237	2473
MeLarge	747.2	52	3708.1	219.26	25646	13937
All	654.81	112.14	3086.3	139.3	7586	12263

Source: SMEF survey of six sectors, 2006/07

Table 2.10 (b):
Equity-debt ratio at start-up across the six study sectors (Equity versus Debt percentage)

	Agro processing		Leather & Footwear		Electrical & Electronics	
Firm size classes	**Equity**	**Debt**	**Equity**	**Debt**	**Equity**	**Debt**
Micro	75	25	98	2	91	9
Small	70	30	87	13	91	9
Medium	70	30	100	0	95	5
Large	69	31	95	5	88	12
MiSmall	71	29	88	12	91	9
MeLarge	69	31	98	2	92	8
All	69	31	96	4	91	9

	Light Engineering		Designer goods		Plastics	
Firm size classes	**Equity**	**Debt**	**Equity**	**Debt**	**Equity**	**Debt**
Micro	71	29	98	2	48	52
Small	93	7	95	5	80	20
Medium	71	29	97	3	66	34
Large	53	47	87	13	68	32
MiSmall	91	9	96	4	68	32
MeLarge	68	32	94	6	65	35
All	85	15	96	4	67	33

Source: SMEF survey of six sectors, 2006/07

Table 2.10 (c):
Equity-debt ratio in 2006/2007 across the six study sectors (equity versus debt percentage)

	Agro processing		Leather & Footwear		Electrical & Electronics	
Firm size classes	**Equity**	**Debt**	**Equity**	**Debt**	**Equity**	**Debt**
Micro	95.0	5.0	96.0	4.0	97.6	2.4
Small	80.0	20.0	87.0	13.0	85.9	14.1
Medium	97.0	3.0	50.0	50.0	84.6	15.4
Large	89.0	11.0	41.0	59.0	76.2	23.8
MiSmall	80.0	20.0	87.0	13.0	88.6	11.4
MeLarge	92.0	8.0	43.0	57.0	81.1	18.9
All	91.0	9.0	48.0	52.0	87.1	12.9

	Light Engineering		Designer goods		Plastics	
Firm size classes	Equity	Debt	Equity	Debt	Equity	Debt
Micro	89.3	10.3	92.5	7.5	90.5	9.5
Small	85.9	14.1	93.8	6.2	89.4	10.6
Medium	67.3	32.7	93.2	6.8	81.6	18.4
Large	99.8	.2	99.0	1.0	69.4	30.6
MiSmall	86.2	13.8	93.8	6.2	89.7	10.3
MeLarge	91.4	8.6	95.5	4.5	76.3	23.7
All	89.2	10.8	95.2	4.8	85.2	14.8

Source: SMEF survey of six sectors, 2006/07

2.2.1.4 Harnessing of different business models and degrees of specialization across firms

Table 2.11 is about the relative prominence of different models --- of business organizations and functional specialization---observed among the firms that compose the study industries. In particular, we single out two modes of doing business, namely, being own-account producers (OAPs) *versus* contract manufacturers or custom millers (CMs). The former takes responsibility for all life-cycle stages of production, running the gamut from conceiving the product, buying and sourcing raw materials and other inputs, organizes and quality-assures the production, sets prices, leads the marketing efforts and finally takes the risk that all businesses are about. The CMs on the other hand are much more focused, concentrating on a relatively limited number of stages of production. Note that the numbers across the columns in the table are row percentages, and are likely, although not always, to add up to one hundred. (This is because there is also an 'other' category not covered in the table in the interest of conserving space.) The major finding is that our study sectors constitute a mosaic, with all combinations in it. For instance, while agro processing comprises overwhelmingly, and electricals and plastics comprises largely of OAPs, design and light engineering occupy a middle ground with approximately a half comprising of OAPs. Leather is alone in having its percentage of OAPs at well less than fifty percent.

Table-2.11:
Proportion of establishment that are in own-account production *versus* contract manufacturing

Firm Sizes	Agro		Leather		Design	
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	7.9	0	1.44	9.35	5	0.71
Small	56.8	2.2	15.83	35.97	21.4	25
Medium	24.5	0	12.23	9.35	10.71	22.14
Large	8.6	0	8.63	5.76	10	2.14
MiSmall	64.8	2.2	17.27	45.32	26.43	25.71
MeLarge	33.1	0	20.86	15.11	20.71	24.29
All	97.8	2.2	38.13	60.43	47.14	50

Table continued

Firm Sizes	Electrical		Plastics		Light. Eng.	
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	12.31	1.44	64	24	16.67	8.67
Small	48.55	2.89	75	20	24	32.67
Medium	9.42	0.72	77	11.5	7.33	4
Large	7.97	0	90	10	2	3.33
MiSmall	60.86	4.34	72	21.5	40.67	41.34
MeLarge	17.39	0.72	82.5	11	9.33	7.33
All	78.26	5.07	76.5	16.4	50.0	48.7

Source: SMEF survey of six sectors, 2006/07

2.2.1.5 Gross value of output differentiated by different underlying business models of firms

Table-2.12 is about gross value of output differentiated by the various business models and types of specialization across the study sectors. We find the following results. First, for the OAPs, light engineering and electricals report average gross value of outputs that are strikingly similar. Design goods industry is not far behind these two. That said, plastics and agro processing both report average revenues well above those of these three. However, the leather and leathergoods sector is, at least for this collection of industries, just 'off-the-charts'. Why is that? This is because of the inclusion in the leather and leathergoods industry sample of firms some of Bangladesh's largest private tanners, and footwear manufacturers, and manufacturer of large leathergoods. The second major finding is that in electricals and designer goods industries, CMs actually pull in larger volumes of revenue compared with OAPs, whereas in light engineering, they level off with the OAPs in terms of revenues. In the other industries---leather, agro and plastics--- they are smaller or much smaller *versus* the OAPs, even though, to be sure, they are as an individual group, often quite large. This is true for example in the case of leather and leathergoods industry, where the CMs' average revenue is the second largest in the entire table, and second only to the OAPs in the same industry.

Table 2.12

Gross value of output per firm (Tk.000s)

Firm Sizes	Agro		Leather		Design	
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	1064.97	0	1700	4100	4707	7500
Small	7081.33	2447.45	27100	6400	5694	8540
Medium	9649.92	0	159100	78100	20605	20685
Large	129243.3	0	716000	607100	51328	465000
MiSmall	6346	2447.45	25000	5900	5507	8511
MeLarge	40848.19	0	389500	279600	35437	59889
All	18015.86	2447.45	224500	74300	18658	33466

Table continued

Firm Sizes	Electrical		Plastics		Light. Eng.	
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	3153.43	190.75	1920	2150	2110.309	652.95
Small	8588.85	20213.3	7620	8360	5522.58	8283.7
Medium	6203.54	8830	47870	15390	11133.09	25180
Large	26697.7	0	102734	47690	108652	18648
MiSmall	7488.83	13539.1	6410	6500	4124.11	6683.7
MeLarge	15596.7	8830	73920	28090	32030	22211
All	9252.64	12866.4	31210	10860	9333.206	9023.4

Source: SMEF survey of six sectors, 2006/07

Table 2.13 presents average gross value of output per firm across our sample industries. Electricals and light engineering have the lowest average gross value of output, while leather/leathergoods and plastics are the largest output plays of the set.

Table-2.13:
Gross Value of output per establishment (Tk. thousand)

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
	All	All	All	All	All	All
Micro	1064.97	3700	4324	2349.34	1840	1611.7
Small	6911.48	12600	7339	10343.8	7700	7003.4
Medium	9649.92	124000	20589	6390.06	44140	16091
Large	129243.3	672400	73912	27284.6	97230	52399
MiSmall	6220.24	11000	7101	8543.26	6370	5364.36
MeLarge	40848.19	343400	34132	15676.5	66730	27709.5
All	17679.85	130600	19352	9938.9	26693	9088.55

Source: SMEF survey of six sectors, 2006/07

2.2.1.6 Gross value added per firm in the study sectors

Table 2.14 and 2.15 present gross value added as a percent of gross value of output: the latter table presenting the information after lumping OAPs and CMs. In lay terms, these percentages correspond to how much in each taka worth of sales is available as the gross value added that has been generated. By gross value added, we mean the difference between gross value of output and the cost of all material goods and services (including such regulars as rentals, cost of marketing, and utilities, etc) that have been consumed by way of production. Only payments of wages and salaries, interest payments, payment of any taxes to the government are excluded from the subtraction. We find that the value added relative to gross value of output---at a tad above 60%--- is the highest in the designer goods industry. Next in line in this respect is the leather and leathergoods sector---at about a half. Third on this particular hierarchy is the agro and food processing---at about 47%. Plastics and light engineering are the least productive on this sample of industries in terms of this metric, with the performance of the electricals/electronics being intermediate between the 'high' and the 'low' rollers.

Table-2.14:
Gross value added relative to Value of gross output, per establishment, across three types of establishments

Firm Sizes	Agro		Leather		Design	
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	40.6	0	26.98	52.43	74.27	81.56
Small	44.9	29.9	23.42	21.01	49.29	65.4
Medium	52.2	0	40.78	64.4	48.87	65
Large	51	0	55.13	60.46	58.45	62.9
MiSmall	44.3	29.9	23.44	22.98	53.31	65.8
MeLarge	51.9	0	50.85	61.11	55.57	63.57
All	46.9	29.9	48.02	55.6	55.19	63.86

Firm Sizes	Electrical	Plastics	Light. Eng.			
	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing	Own-account production	Contract manufacturing
Micro	40.91	53.65	32.7	32.4	65.31	35.25
Small	38.27	46	30.4	36	58.47	28.93
Medium	30.07	39.2	29.4	25	31.47	54.69
Large	31.59	0	33.2	52.2	37.86	20.18
MiSmall	38.48	46.03	30.9	34.8	59.79	29.04
MeLarge	31.25	39.2	31.2	35.9	33.73	33.09
All	35.28	45.26	31	35	39.61	30.42

Source: SMEF survey of six sectors, 2006/07

Table-2.15:
Gross value added relative to Value of gross output, per establishment, across three types of establishments

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
	All	All	All	All	All	All
Micro	40.4	47.33	74.1	38.82	32	58.4
Small	44.3	22.59	59.4	36.79	32.4	34.8
Medium	52.2	45.32	46.8	29.61	30.4	36.74
Large	51	56.95	60	34.61	35	31.03
MiSmall	43.8	23.33	62.1	37.25	32.3	36.14
MeLarge	51.9	53.95	61.7	31.83	32.4	32.92
All	46.5	50.38	62.9	36.19	32	33.89

Source: SMEF survey of six sectors, 2006/07

2.2.1.7 The Accuracy of Results from the surveys conducted for six sector studies

The objective of this subsection is to show some results relating to micro, small, medium and large establishments based on data generated by two large-scale sample surveys of the SME sector carried out in Bangladesh during the last six years or so. The first source is the World Bank's Investment Climate Survey 2002, results from which are presented in Table 2.16. The second source is the present surveys associated with six sectors, commissioned by the SME Foundation in 2008, comparable results from which are presented in Table 2.17. The point is to examine the extent to which findings from these two large-scale surveys of manufacturing and related firms, selected from two different 'list-frames', strike the same chord or different ones.

Several similarities between the two sets of results are notable, as follows:
(1) Value added as a percentage of sales for the MiSmall class of establishments is found to be 32.2%. For the ICS-2002, this is found to be 34.4%. Considering that Bangladesh economy has become even more outward-oriented during the six intervening years since 2002, thereby increasing competitive pressure on the domestic manufacturers. That assessment is consistent with the take of value added's relative share in sales having fallen between 2002 and 2007. In contrast, for the large enterprises, value added relative to sales is found to have risen between 2002 and 2007---from 47.1% to 48.1: but that is still a spitting difference between the two ratios. The percentages yielded by the two surveys are strikingly similar. The point is that both survey samples seem to have been drawn from the same universe.
(2) Labor productivity (in thousand Taka worth of value added per worker employed) is found to be Tk. 375.45 thousands in 2002 as compared with Tk. 362.0 thousands in 2006/7. That is a striking similarity. Value added per worker is one of the most central empirical metrics when it comes to pro-poor development.

(3) Both surveys show that the MiSmall establishments register significantly higher capital productivity---by returning lower or much lower capital-output ratios on an average compared with medium or large firms.

It is reassuring that the more recent 2006/2007 survey, which has a somewhat smaller sample size than the ICS-2002, yields results that are often very similar compared with the latter. There is a close correspondence between several results from the ICS-2002 survey, and the Economic Census of the BBS. For example, BBS reported an average employment size of 66.7 in 2001/2003 for medium enterprises, whereas the ICS data put that average at 68.4--- a statistically insignificant difference indeed (Chowdhury, 2007b). The BBS reported an average employment size of 389 in 2001/2003 for large enterprises, whereas the ICS data put that average at 415--- a difference of 4 or 5 percent, which is small. At a further remove, it is reassuring that many important results from the ICS-2002 and the present survey are fairly, if not always strikingly, close. We might therefore conclude that the quality of data in the 2006/2007 surveys of the six sectors conducted by the CDS team and commissioned by the SMEF appears to be representative of the same 'universe' as the ICS-2002.

Table-2.16:
Economic characteristics of micro, small, medium and large firms, 2002
(Unless otherwise indicated, financial values are in Tk. 000s)

Particulars	Micro	Small	MiSmall	Medium	Large
Sample size	34	195	229	127	621
Total sales	22177	28012.2	27145	75000.2	289013
Direct material cost	13033	18631.5	17800	51393.7	152994
Value added	9144	9380.6	9345	23606.4	136019
No. of workers	5.47	28.27	24.89	68.4	415.2
Labour productivity	1671.6	168.8	375.45	345.12	327.6
Capital employed	11879.8	25078	23118.6	120930	250283
Capital-output ratio (Tk.)	1.29	2.67	2.47	5.122	1.84

Source: Investment Climate Survey (ICS) data, 2002

Note: Sample size of the source is 977 establishments interviewed by Bangladesh Enterprise Institute (BEI) in 2002.

Table 2.17:
Economic characteristics of micro, small, medium and large firms, 2002
(Unless otherwise indicated, financial values are in Tk. 000s)

	Micro	Small	Medium	Large	MiSmall	MeLarge	All
Sample size	121	465	170	89	586	259	845
Total sales	4978.5	25837.4	88239.8	443107.8	21530.3	210216.8	79438.4
Direct material cost	2794.6	17636.4	51870.7	229761.1	14571.8	113033.0	44825.1
Value added	2183.8	8201.0	36369.1	213346.7	6958.5	97183.8	34613.3
No. of workers	5.5	22.8	68.6	406.4	19.2	184.9	86.9
Labour productivity	398.1	359.9	530.3	525.0	362.1	525.7	398.4
Capital employed	2513.6	6734.93	87261.3	159274	10061.3	112007	45806.4
Capital-output ratio (Tk.)	1.64	0.70	1.56	0.71	0.89	1.23	1.05

Source: SMEF survey of six sectors, 2006/07

Table 2.18 (a) is about producing an economy-wide 'baseline', based on gross value of output, for each of these industries. We simply 'gross up' or 'blow up' to the level of the relevant universe based on the estimates of gross value of output we have had from our sample surveys. From the Business Registry-2007, we knew the overall number of firms in the various size-class categories of 'small', 'medium' and 'large' as of 2007. The BR does not have any information about micro firms as of 2007. We extrapolated their numbers as of 2007 based on the corresponding information as of 2002 per the Economic Census. We limited our definition of the micro class of firm for this purpose to those with headcounts of between 7 and 9 only. We obtain the gross value of output of the four classes of firms in each of the sectors simply by multiplying the economy-wide number of the firms by the average gross output per firm yielded by our surveys. The resulting values of gross value of output thus obtained are presented in Table 2.18 (a) below.

Table:2.18 (a): Gross value of output in Bangladesh in 2006/2007 (Taka billion)

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	32.1	12.3	3.6	25.7	7.0	7.7
Small	102.5	28.4	6.1	22.8	5.7	12.8
Medium	116.5	27.4	0.6	5.2	15.2	5.5
Large	16.0	23.6	2.0	16.4	22.1	7.2
All	267.0	91.6	12.2	70.0	50.0	33.3

Source: SMEF survey of six sectors, 2006/07

Table 2.18(b) reports an economy-wide 'baseline', this time based on value added, for each of these six industries. For grossing up, we follow the same procedure as for gross value of output, which we just finished describing. In particular, we extrapolated the numbers of micro establishments as of 2007---which are omitted from the BR-2007---based on the corresponding information as of 2002 per the Economic Census. We limited our definition of the micro class of firm for this purpose to those with headcounts of between 7 and 9 only. The resulting values of gross value added thus obtained are presented in Table 2.18 (b) below.

Table:2.18 (b): Gross value added in Bangladesh in 2006/2007 (Taka billion)

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	12.97	5.81	1.38	15.0	5.2	2.46
Small	45.4	6.41	2.23	7.92	3.4	4.15
Medium	60.8	12.4	0.18	1.91	7.1	1.68
Large	8.14	13.44	0.68	5.08	13.28	2.53
All	127.3	38.06	4.47	29.91	28.98	10.82

Source: SMEF survey of six sectors, 2006/07

Chapter 2.3

Technology platforms

2.3.1 Number of machines, replacement cost per machine and total valuation of machinery in use

Table 2.19 now reports on the state of the adoption of technology in the study sectors. Between Table 2.19 and 2.22, we present the average number of machines per firm, average replacement cost per type of machines, and average total replacement cost of machinery in use in the study industries. Table 2.19 shows the total number of machines that study industries use per firm. Leather and leathergoods is the industry that uses the largest number of machines per firm, followed by designer goods industry, light engineering industry and plastics goods industry, in that order. Agro processing and electricals/electronics industries are the numerically the most 'least demanding' in terms of putting standalone numbers of machines to work.

Table 2.19:
Average number of machines in use across the six study sectors, 2007

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	2.1	6.15	3.8	7.0	6.13	2.7
Small	4.2	9.93	7.8	13.2	8.44	6.7
Medium	6.6	21.95	11.2	17.18	19.17	16
Large	24.4	87.82	29.3	29.63	59.29	41
MiSmall	4.0	9.83	6.8	11.2	8.2	5.7
MeLarge	10.8	49.2	19.3	21.16	29.83	27
All	6.9	23.3	9.3	12.86	18.09	12.78

Source: SMEF survey of six sectors, 2006/07

Table 2.20:
Unit replacement cost per machine type (Tk. 000s)

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	69.8	775	115.4	73	431.6	393
Small	115.5	934	161.1	181.3	498.8	948
Medium	176.6	975	289.6	243	538.3	3373
Large	391.0	1084	554.4	211.9	443.5	4169
MiSmall	122.8	920	166.7	151.3	497.4	881
MeLarge	232.5	1020	477	231.9	521.9	3531
All	159.1	969	246.9	175	508.4	2099

Source: SMEF survey of six sectors, 2006/07

Table 2.20 reports on the unit replacement cost of machines on our sample. Once again, the plastics, which took 'top billing' in terms of the number of machines, registered the

highest unit replacement cost per type of machines. Leather and leather goods industry comes second in line now, with Tk. 969 thousand per machine owned, followed by designer goods industry. Agro processing, electricals and electronics, and light engineering bring up the rear in terms of unit replacement costs per machine type.
Table 2.21 reports on the total replacement cost per firm of machines on our sample. The leather and leathergoods industry registers the highest total replacement cost of machines installed. Plastics comes second in line now, followed by designer goods industry. These three industries are at a cut above the rest of the pack in terms of total replacement cost of machinery installed. Agro processing, electricals and electronics, and light engineering in that order bring up the rear in terms of overall replacement costs per firm. Electricals and electronics and light engineering are the equivalent of the 'salts of the earth' on this sample, making to with very little in the way of investment in core machinery. We shall see later that even so the firms in these two industries generate a quite healthy stream of gross value added from its relatively meager stock of fixed capital.

Table:2.21:
Total replacement cost of core machinery per firm (Tk. 000s)

Firm size classes	Agro processing	Leather & Footwear	Electrical & Electronics	Light Engineering	Designer goods	Plastics
Micro	146.9	3296	438.52	512.92	2645.7	4550
Small	485.2	8007	1256.58	2361.1	4209.9	11653
Medium	1166.0	35607	3243.52	4173.9	10319.2	23555
Large	9540.4	41755	16216.2	6277.5	26295.1	38451
MiSmall	491.3	7774	1133.56	1694.6	4078.7	10507
MeLarge	2511.0	38681	9206.12	4907.0	15568.3	31965
All	1097.8	25525	2296.17	2250.5	9196.9	23852.1

Source: SMEF survey of six sectors, 2006/07

Table 2.22 reports on the ownership of industrial land per firm on our sample. Several firms in each industry are found to own the land which sites the plant sampled. And yet a large percentage rented or leased the land they used. The Leather and leathergoods industry registers the highest percentage of firms that own the land on which they are sited. Agro processing comes second in line, with designer goods industry being third in order of ownership percentage. Electrical, light engineering and plastics are all industries that are mostly located mostly in the 'old' part of the city of Dhaka. The proportions of cases involving ownership of land are the smallest in these three industries.

Table :2.22: Ownership and leasing of industrial land on the sample

	Agro processing		Leather & Footwear		Electrical & Electronics		Light Engineering		Designer goods		Plastics	
Firm size classes	**Own land**	**Rent land**	**Own land**	**Rent land**	**Own land**	**Rent land**	**Own land**	**Rent land**	**Own land**	**Rent land**	**Own land**	**Rent land**
Micro	45.4	45.4	75	25	8	92	15.79	84.21	55.56	33.33	22	74
Small	41.5	48.8	58.9	39.72	29	62	24.14	73.56	39.68	53.97	26	67
Medium	50	38.2	76.66	30.43	33	47	29.41	52.94	33.33	60	46	31
Large	58.3	8.3	95	0	16	42	62.5	0	50	50	65	5
MiSmall	41.9	48.38	61.79	37.07	24	69	21.6	76.8	41.67	51.39	25	68
MeLarge	52.2	30.4	84	14	25	45	40	36	36.84	57.89	54	20
All	45.3	42.4	69.78	28.77	24	65	24.67	70	39.53	54.26	22	74

Source: SMEF survey of six sectors, 2006/07

Table 2.23 reports on the average size of area used, measured in *decimals*, of industrial land per firm on our sample. Here, no distinction is made of whether the land is owned or simply rented. The agro processing industry registers the highest amount of land used---1.19 acres--- of any industry on the sample. Leather and leathergoods industry, with an average of 37 decimals, comes next in line. Then comes the electricals and electronics industry, with an average of 24 decimals. Designer goods and plastics industries are 'tightly coupled' in their estimate of the amount of land used by them---of 17 decimals. Like it is parsimonious in terms of the number of machines, the light engineering once again is found to the 'salt-of-the-earth' in terms of the use of land too---of only 11 decimals.

Table: 2.23: Average land use per firm

	Agro processing	**Leather & Footwear**	**Electrical & Electronics**	**Light Engineering**	**Designer goods**	**Plastics**
Firm size classes	**Land**	**Land**	**Land**	**Land**	**Land**	**Land**
Micro	35.1	12.69	5.1	0.97	5.0	3.4
Small	37.7	21.7	23.6	6.25	6.5	7.1
Medium	32.7	36.98	30.5	27.4	16.6	19.5
Large	997.3	123.04	40.7	76.1	81.0	66.5
MiSmall	37.3	20.082	31.9	4.63	6.32	6.2
MeLarge	284.3	69.255	34.7	42.98	30.2	40
All	119.63	37.3	24.1	11.07	17.8	17.4

Source: SMEF survey of six sectors, 2006/07

Table 2.24 reports on the average value of land used per firm on our sample. Here, only the value of the land that is owned is taken into account. The agro processing industry registers the highest value of land used per firm---of Tk. 154 million--- of any industry on the sample. Leather and leathergoods industry, with an average of Tk. 50 million, comes next in line. Then comes the plastics industry, with an average of Tk. 31 million.

Table :2.24: Average land value per firm (Million)

Firm size classes	**Agro processing**	**Leather & Footwear**	**Electrical & Electronics**	**Light Engineering**	**Designer goods**	**Plastics**
Micro	49.7	20.27	2.625	2.45833	1.05	1.77
Small	49.4	35.59	11.997	9.125	2.37	12.13
Medium	69.9	37.8	9.451	22.875	6.14	18.48
Large	712.8	121.83	12.079	84	16.56	82.24
MiSmall	49.45	32.15	11.445	7.58654	2	9.74
MeLarge	311	74.43	10.601	43.25	10.11	49.39
All	154.1	50.89	11.175	18.84868	6.05	31.92

Source: SMEF survey of six sectors, 2006/07

Table 2.25 reports on the average capital-labour ratio (CLR) per firm on our sample. CLR is calculated by dividing the employment size into the replacement cost of machinery of the firm. Plastics have the highest CLR of any industry on the sample. The leather and leathergoods industry registers the next highest average CLR---of Tk. 233 thousand--- on the sample. One 'spoiler' needs to be explained here. Average CLR of the large firms in this industry is found to be significantly lower than for the smaller firms, and this is due to a concentration of individually cheap industrial sewing machine, of which such plants are choke-a-block. With agro processing next in line, designer goods and light engineering industries are within spitting distance of each other in terms of the CLR.

Table-2.25:
Capital-labour ratio across the study sectors (Tk. 000s)

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	53.5	283.5	603.5	38.58	229	69.97
Small	80.12	248.8	93.7	27.99	243	75.99
Medium	160.51	289.1	284.6	30.37	438	63.12
Large	217.28	52.7	988.5	22.31	542	77.36
MiSmall	76.98	255	82.2	23.81	239	74.16
MeLarge	175.32	194.5	223.2	22.98	482	67.68
All	109.28	233.3	70.9	28.93	321	73.08

Source: SMEF survey of six sectors, 2006/07

Table 2.26 reports on the average labour productivity (LP) per firm on the sample. Here, LP is calculated by dividing the employment size into the physical volume of the firm. For this purpose, heterogeneous output has been first expressed in 'equivalent units'. These estimates are not, *inter se*, comparable, as the underlying units that measure the output of the dominant revenue earning niche within each of the sample industries happen to differ from one industry to another. (The estimates within a given industry are however comparable.) This is one situation where we shall expand upon the comparative productivity across a MiSmall *versus* MeLarge divide. In three of the industries under study, the MeLarge class of firms have an advantage in LP over the MiSmall firms. These industries are leather, design and plastics. In the other industries, it is the MiSmall firms that hold the balance of advantage in terms of LP.

Table-2.26:
Labour productivity per worker

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	830.0	3081.89	78.6	1635	6812	2000
Small	967.6	3543.86	138	1076	7853	4110
Medium	396	6045.96	164.8	457	10636	2490
Large	784.7	3502.24	57.6	587	8501	2350
MiSmall	951.0	3481.43	133.3	1202	7593	3470
MeLarge	497.4	5028.47	136.3	515.4	9728	2450
All	801.0	4105.24	134.7	1067.7	8315	3300

Source: SMEF survey of six sectors, 2006/07

Table 2.27 reports on the average machine productivitry (MP) per firm on the sample. Here, MP is calculated by dividing the number of machines into the physical volume of the firm. For this purpose, heterogeneous output has been first expressed in 'equivalent units'. These estimates are not, *inter se*, comparable, as the underlying units that measure the output of the dominant revenue earning niche within each of the sample industries happen to differ from one industry to another. (The estimates within a given industry are however comparable.) This is also one situation where we shall expand upon the comparative productivity across a MiSmall *versus* MeLarge divide. In four of the industries under study, the MeLarge class of firms have an advantage in LP over the MiSmall firms. These industries are leather, design, plastics and light engineering. In the other two industries, it is the MiSmall firms that hold the balance of advantage of productivity per machine.

Table-2.27:

Machine productivity per machine

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	3172.6	6415.75	79.4	7177	23282	1080
Small	10841.8	5644.17	1134.2	4631	33803	10740
Medium	5873.9	5830.59	1406.1	2612	57654	13640
Large	25929.3	6989.49	1177.7	3790.5	91078	15200
MiSmall	10125.1	5729.91	1050.9	5205.1	31173	7800
MeLarge	11105.7	6307.78	1345.4	3135.7	71877	14140
All	10470.2	5953.17	1185.6	4800	44936	8860

Source: SMEF survey of six sectors, 2006/07

Table 2.28 reports on the elasticities of physical output with respect to employment size and number of machines in use per firm on the sample. Estimates of elasticities are unit-neutral. These estimates are obtained by multiplying estimates of LP or MP, as the case may be, by the inverse of the ratio of the average (at arithmetic mean level) to the corresponding output. For this purpose, heterogeneous output has been first expressed in 'equivalent units'. These estimates are , *inter se*, perfectly comparable across sectors. The estimates within a given industry are also comparable.

Table-2.28:

Elasticities with respect to labour and machines

Firm Sizes	Electrical	Plastics	Light .Eng.	Agro	Leather	Design
	Labour elasticity	Labour elasticity	Labour elasticity	Labour elasticity	Labour elasticity	Labour elasticity
Micro	4.65	1.16	-0.275	1.487	0.009	1.72
Small	1.18	1.32	1.051	-1.57	1.078	0.72
Medium	2.9	2.03	2.524	0.703	3.068	1.44
Large	0.46	0.25	-0.024	2.32	0.216	0.50
MiSmall	1.25	1.24	1.192	-0.952	1.075	0.84
MeLarge	0.7	0.44	0.325	2.879	0.35	.97
All	0.59	0.66	0.523	0.724	0.48	0.86

Source: SMEF survey of six sectors, 2006/07

Table 2.29 reports on the capital-output ratio about the study sectors across the firm-size classes. Overall, the weighted average capital-output ratio of the MiSmall class of firms is found to be 0.89. The corresponding average for the MeLarge firms is found to be 1.23. With the exception of designer goods and plastics, the COR is found to be higher for MeLarge firms *versus* MiSmall firms in each of the other four sectors. This is a significant finding. For MiSmall to out-produce MeLarge firms when it comes to using Bangladesh's scarce capital is important. MiSmall firms have this advantage in agro processing, leather, electricals and light engineering industries.

Table 2.29 :
Capital-output ratio across the sample industries

Size classes	Capital-output ratio						
	Agro	**Leather**	**Design**	**Electrical**	**Plastic**	**Light Eng.**	**All sectors**
Micro	10.8	0.76	0.85	0.92	0.93	0.58	1.64
Small	0.48	1.67	2.09	0.44	0.87	0.74	.070
Medium	3.39	3.38	1.42	1.14	0.7	0.7	1.56
Large	0.42	0.81	0.87	1.17	0.83	1.36	0.71
MiSmall	1.7	1.5	1.96	0.55	0.89	0.70	0.89
MeLarge	2.6	2.5	1.28	1.15	0.75	0.91	1.23
All	1.99	1.53	1.32	0.77	0.84	0.79	1.05

Source: SMEF survey of six sectors, 2006/07

Having discussed CLR and COR, the next stage in our presentation of results would feature results obtained from fitting production functions of the Cobb-Douglas type to the data. The results from doing so are presented in Table 2.30. The dependent variable in every case is natural log of the gross value of output. The arguments of the function are natural log of number of workers employed, natural log of capital employed, and natural log of homogeneous-unit inputs used by firms. Each of the equations presented in that table returns arguments of the CD production function that are statistically significant, and all have the intuitive signs. In every case, the elasticity of the output with respect to labour is significantly higher compared with capital. This establishes the primacy of labour as the key factor of production. Separately, we carried out tests in terms of constancy of the returns to scale. In none of the cases, the null hypothesis that returns to scale are constant could not be rejected. That means that the estimated exponents of the CD production function sum to unity---an important result. Accepting the CD as the most appropriate functional form for each of the study sector has a corollary---namely, that the elasticity of substitution is also fixed.

2.3.2 Estimating production functions using Cobb-Douglas functional forms

$$\ln Q_i = \beta_0 + \sum_j \beta_j \ln X_{j,i} + \varepsilon_i \qquad \text{...(1)}$$

Table 2.30: Coefficients of production functions (of various kinds), 2006/2007

	Agro processing		Leather & Footwear		Electrical & Electronics		Light Engineering		Designer goods		Plastics	
Explanatory variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
Const.	3.631*	6.154	.54*	6.59	4.7*	12.3	6.495*	21.926	2.78*	6.12	4.3*	26.676
Ln(L)	.618*	6.859	.55*	5.2	0.554*	5.34	0.465*	5.691	0.81*	9.42	0.172*	4.45
Ln(K)	0.073	1.249	.38*	5.4	0.45*	7.1	-2.23E-02	-0.471	0.31*	5.75	0.065*	2.2
Ln(I)	.313*	7.002	.17*	4.57	0.038	1.37	0.489*	12.949	-0.01*	-0.43	0.756*	35.03
R^2	0.54		0.66		0.60		0.80		0.60		0.97	
F-statistic	53.1		82.8		65.9		192.0		69.1		145.0	

Source: SMEF survey of six sectors, 2006/07

Having discussed results from the production function regressions, we shall now plumb results from multivariate regressions that sought to explain labour-productivity among enterprises. The point of this present exercise is to see if we can identify several diagnostic variables that affect, one way or the other, gross value added per workers across the firms on the sample in the study sectors. A glossary of the independent variables may be useful at this stage. Education relates to the education of the Managing Director. Bank loan, cluster, automation, OAP, micro, Dhaka, Chittagong are all dummy variables, taking either 1 or 0 as values. Capital relates to fixed capital per worker. Results will be discussed sector-wise, starting with agro processing, and mainly based on regression coefficients that are statistically significant at least at 10 error probability level (using * and ** signifying significance at 5% and 10% levels, respectively):

Agro processing:

Labour productivity (LP) is positively driven by bank loan, automation, experience of white-collar workers, and export orientation in the output mix are all significant and positive drivers of labour productivity. The only statistically significant negative coefficient owes to Dhaka's locational dummy.

Leather and leathergoods:

Labour productivity is negatively driven by bank loan and export orientation in the output mix. There is no statistically significant positive coefficient to write about.

Electricals and Electronics:

Labour productivity is significantly positively driven by fixed capital provisioning and the product price. There is no statistically significant negative coefficient to write about.

Light engineering:

Labour productivity is significantly positively driven by fixed capital provisioning and Chittagong locational dummy. There is no statistically significant negative coefficient to write about.

Plastics:

Labour productivity is significantly positively driven by automation, and to a certain extent by product price. Firm's age, workers' experience, Chittagong locational dummy and micro dummy variable each has a negative coefficient on the LP function.

Designer goods industry:

Labour productivity is significantly positively driven by Managing Director's educational attainment, fixed capital provisioning and product price. Firm's age variable has a negative coefficient on the LP function.

Stochastic production frontier for isolating inter-firm 'efficiency' differences

The production functions point up a summary picture which holds true for the sample in question as a whole. This same is true when it comes to estimates of the total factor productivity function---another set of summary results. These results appeal well when one is interested in sample-wide insights. If however one, as is quite likely, is interested in intra-sample insights and results, estimates of production function don't really cut it. One is in this uncomfortable position whenever, as now, diagnostic results and diagnostic insights are warranted. Here, one is interested in getting estimates of inter-firm 'scores' or 'ratings' even as one uses data on firms' output and inputs in an effort to see how the two stack up.

It is here that we, like many researchers before us, invoke the stochastic frontier function (SFF), which was first independently by both a Dutch team of econometricians, and also by Aigner, Lovell and Schmidt (1977). Subsequently, important work in this tradition was done by Kumbhakar (1982). The specification of the SFF is as follows:

$$\ln Q_{j,t} = \beta_0 + \sum_i \beta_i \ln X_{j,i,t} + \frac{1}{2} \sum_i \sum_k \beta_{i,k} \ln X_{j,i,t} \ln X_{j,k,t} - u_{j,t} + v_{j,t}$$

where $Q_{j,t}$ is the output of the establishment j in period t and $X_{j,i,t}$ and $X_{j,k,t}$ are the variable and fixed establishment inputs (i,k) to the production process. As noted above, the error term is separated into two components, where $v_{j,t}$ is the stochastic error term and $u_{j,t}$ is an estimate of technical inefficiency.

Using sample observations concerning measures of both output and input(s), and using Maximum Likelihood Estimators, we estimate coefficients of the corresponding coefficients that maximize the likelihood of observing the combinations of the output and inputs we have on our hands. Using estimates of the variances of both normally-distributed error and the half-normal error using values of sample observations, we estimate the stochastic frontier (Table 2.31). We then estimate the value of the efficiency, which we measure by value added, 'predicted' by the labour-capital combination for each sample observation. Ultimately, we then calculate for each firm its distance from the 'estimated frontier'.

The formulation is such that it is practicable to calculate the productivity deficit of each sample observation from the 'stochastic frontier' for the industry in question. This is how we plan to conduct our diagnostic analysis on the distances from the stochastic frontier production function.

Table 2.31 is about maximum likelihood estimate (MLS) estimates of a stochastic frontier production function, for the six study sectors.

Explanatory variable	**Agro & food processing**		**Leather & Footwear**		**Electrical& electronics**		**Light engineering**	
	Coeff	**t statistic**	**Coeff**	**t statistic**	**Coeff**	**t statistic**	**Coeff**	**t statistic**
Const	-120.246	-0.406	2.548	1.5	-0.757	-0.6	-7.98	-0.37
Age	1.021	0.265	0.173	0.983				
Education	-4.634	-1.013	0.585	1.605	0.214	1.538		
Workers experience	-7.617	-0.995			0.269	0.984	9.697	0.475
White collar workers experience	16.236*	2.169						
Cluster	-89.179	-1.222						
Bank loan	296.192*	3.869	-1.045*	-3.036	-0.299	-1.007	435.374	1.504
Automation	218.157*	2.788	2.378	1.617	-0.325	-1.259		
Fixed capital	-0.002	-0.251	-0.0931	-1.012	0.413*	4.424	0.815**	1.732
% of output exported	3.065**	1.636	-0.093*	-3.117				
OAP	286.173	1.223	0.535	1.622				
Micro	182.374	1.029	0.386	0.704	0.648	1.173	354.489	1.392
Price	0.14	0.375			0.456*	3.495	3.52E-03	0.702
Dhaka	-253.0*	-3.374						
Chittagong	219.2	-1.328			-0.75*	-2.129	533.7*	1.994
R- squarred	0.336		0.458		0.328		0.075	

Source: SMEF survey of six sectors, 2006/07

Table 2.31 (contd.): Explaining labor productivity measured using gross value added per worker

Explanatory variable	Plastics		Designer goods	
	Co-eff	**t statistic**	**Co-eff**	**t statistic**
Const	3.62	1.445	6.231*	8.46
Age	-.017**	-1.701	-0.30*	-2.97
Education	-.001	-.056	0.18*	2.38
Workers experience	-.072*	-2.078		
White collar experience				
Cluster	-.095	-.494		
Bank loan	.232	1.180		
Automation	.394*	2.154	-0.20	-1.06
Fixed capital	.000	.625	0.23*	4.48
% of output exported	.335	1.549		
OAP	-.038	-.182		
Micro	-.655**	-1.696		
Price	.023	1.546	0.21*	2.45
Dhaka	-.407	-1.266		
Chittagong	-.285**	-1.760		
R- squared		.361		0.32

Source: SMEF survey of six sectors, 2006/07

Table: 2.32: Estimates of the coefficients of the stochastic frontier production function, using MLEs

Coefficient	Agro & food processing		Leather & Footwear		Electrical& electronics	
	Half-Normal model		**Half-Normal model**		**Half-Normal model**	
	Estimate	**Z –statistic**	**Estimate**	**Z –statistic**	**Estimate**	**Z –statistic**
const.	.983*	10.37	5.51*	1.5	4.83	3.03
β_L	-0.024	-0.47	.656*	6.95	0.53	4.72
β_K	5.15*	5.93	.365*	5.58	0.483	7.11
σ^2	1.01		1.107		0.989	
σ_u	0.515		0.038		0.071	
σ_v	1.019		1.1		0.992	
λ	0.015		0.034		0.071	

Coefficient	Light engineering Half-Normal model		Designer goods Half-Normal model		Plastic Half-Normal model	
	Estimate	Z –statistic	Estimate	Z –statistic	Estimate	Z –statistic
const.	4.7381	2.7	3.9*	10.22	21.33	
β_L	0.9191	9.98	0.834*	4.67	0.89	10.19
β_K	0.088	1.27	0.181*	4.47	0.14	3.45
σ^2	1.1093		1.003		0.92	
σ_u	0.0107		0.02		0.02	
σ_v	1.109		1.007		0.84	
λ			0.2		0.02	

Source: SMEF survey of six sectors, 2006/07

2.3.3 Explaining the distance from the stochastic frontier production function

Following the lead of the analytical model developed in Annex-II and using estimates from Table 2.31 of the standard errors of the two components of the error term---one distributed as a normal variate and the other distributed as a truncated, half-normal variable, we estimate the 'distance' of the value added registered by each sample observation (which is a kind of measure of efficiency) from an estimated stochastic production frontier. We then regressed this distance on a number of behavioural or strategic choice variables, such as opting for (or obtaining a) bank loan, fixed capital provisioning per workers, average product price, etc. The explanatory variables on which distance from the frontier is regressed include the following:

EDUC= Number of years of schooling of the Managing Director's formal schooling (natural log of years);

PER_EXP = % of the firm's output that is exported;

CHT_DUM = A dummy variable that takes the value of unity for Chittagong and zero everywhere else;

DHK_DUM = A dummy variable that takes the value of unity for Dhaka and zero everywhere else;

AV_P_PR = Average product price (natural log of Taka);

B_LOAN = Bank loan;

AGE = Number of years since the establishment of the firm;

Like when we were discussing results about labour productivity, here also results will be presented separately for different sectors.

Agro processing:

Location in Dhaka induces greater 'efficiency', while location in Chittagong drags efficiency. None of the other variables is found to be significant in one way or the other.

Electrical and Electronics:

The following table presents the results obtained from the regression analysis:

(1) An increase in the import intensity of the input-mix is found to increase 'efficiency'

(2) Location in Dhaka boosts ‘efficiency’ significantly;

(3) An increase in product price fosters greater ‘efficiency’, presumably by breeding complacency.
(4) Relative to firms in other size-classes, micro firms are significantly less ‘efficient’.

Light engineering:

Alone among the explanatory variables, product price is found to promote greater ‘efficiency’. None of the other variables was found to be significant.

Plastics:

Designer goods industry:

The following table presents the results obtained from the regression analysis:

(1) Having a bank loan reduces distance from the production frontier. This suggests that bank loans induces greater efficiency in this industry compared with firms that are more internally financed;

(2) Enhancing the formal education length of the Managing Director is found to have a positive effect on the efficiency of the firm;

(3) Average product price fosters greater inefficiency, presumably by breeding complacency.

The point of presenting these results is that one can harness relatively advanced methods and still demonstrate results with diagnostic values in formulating policy stances. Certainly, in this implementation, we would be spending a lot of time trying out various models of policy diagnostics on the data that we shall generate for the SMEF and the MOI.

Leather and leathergoods:

The following table presents the results obtained from the regression analysis:

(1) Having a bank loan significantly increases distance from the production frontier: bank loans cause a loss in efficiency in this industry compared with firms that are more internally financed;

(2) A high intensity of imports in the use of inputs is found to significantly increase distance from the production frontier. Because value added is used in evaluating output in the underlying stochastic frontier production function, and because there is a connection between value added and intensive use of imported material, [18] a higher import intensity in the input-mix causes a loss in efficiency in this industry compared with firms that are better adjusted to the use of domestically produced inputs.

(3) Now we take up the factors that reduces the distance from the frontier. We find that capital-labour ratio is one such variable. The higher is the amount of capital that a worker has to work with, the smaller is the distance from the frontier. The coefficient of capital-labour ratio in the distance function is highly significant.

(4) The educational attainment of the Managing Director too has a negative coefficient on the distance function.

[18] The cost of raw material is subtracted from the gross value of output in order to arrive at value added.

Table 2.33: Explaining the distance from estimated stochastic production frontiers using multivariate regressions

	Agro & food processing		Leather & Footwear		Electrical& electronics		Light engineering		Designer goods		Plastic	
	coefficient	**T-stat**	**coefficient**	**T-stat**	**coefficient**	**T-stat**	**coefficient**	**T-stat**	**coefficient**	**T-stat**	**coefficient**	**T-stat**
Constant	1.015	1.562	3.653*	2.422	.232	.293	0.526	0.749	1.797	6.993	-9.237	-1.395
Education	.098	.501	-.456	-1.442			-0.209	1.014	-.025*	-1.989	-.066	-.400
Age	-.024	-.299					-0.153	-1.163	-.005	-.532	-.202	-2.887
% of output export	-.002	-.795	.0050	1.440								
worker experience							-7.60	-0.947	-.003**	-1.743		
cluster							0.234	1.210			-.046	-.320
Bank loan	-.009	-.487	.0735*	2.373	.009	.343	-0.266	-1.116	.0001**	-1.720	.092*	.565
Automation											-.232	-1.727
Micro	-.053	-.146	-.736	-.931	1.375*	3.411					.112	.399
Small	-.076	-.265	.195	.398	.550	1.642					.257	1.185
Medium	-.244	-.870	-.488	-1.003	.623	1.531					.079	.362
Dhaka	-.233**	-1.711	.216	.533	-.824*	-3.278			.071	.344	.179	.684
Chittagong	.426**	1.705					-0.300	-1.232	-.160	-.609	.061	.464
Dm(Other dist.)												
Product price	-.049	-.428	-.069	-.480	-.162**	-1.709	-0.107**	-1.831	4.035E-06*	7.906	2.031	1.595
Capital/labor	-.032	-.723	-.486*	-4.015			5.32	0.760				
Input Import			.0151*	2.975	-.004**	-1.891						
R^2		.20		.37		.41		0.09		0.47		.569

Source: SMEF survey of six sectors, 2006/07

Chapter 2.4

Access-to-finance regime

Before we could present an analysis of the access to finance on the part of SMEs, we need a framework of discussion as to what we shall mean by access to finance regime? The regime typically involves the following narrative variables, namely, (1) size structure of loans; (2) structure of interest rates.[19] . We recognize two categories of loan---namely, institutional, non-institutional and trade credit.[20] The issue remains that the coverage of the data relating to institutional and non-institutional loans is better compared with trade credit. That is why we also present weighted average using two alternative bases. One of these bases only takes into account institutional and non-institutional loans. Trade credit is missing from the other. We present information concerning loan sizes with respect to three borrower situations, namely, institutional loans; non-institutional loans and trade-credit.

2.4.1 Structure of loan sizes

Table 2.34:
Percentages of firms that have at least one bank or leasing-company loan

Firm size	Agro	Leather	Electrical	Designer	Light eng	Plastics
Micro	0	12.5	8	16.7	7.87	17
Small	35.36	45.20	24.42	22.9	18.39	33
Medium	35.29	40	20	29.8	47.06	67
Large	50.00	40	41.67	23.5	0	75
MiSmall	31.18	39.3	20.73	22.4	15.2	29
MeLarge	39.13	40	29.62	28.1	32	70
All firms	33.81	39.5	22.47	25.0	18	43

Source: SMEF survey of six sectors, 2006/07

Table 2.33 presents results concerning several indicator variables cited above, namely, the proportion of establishments with access to institutional loans. Average loan size and average interest rates, respectively, are presented in Tables 2.34 and 2.35. For each category of loans types, we also present information about interest rate structures. Light engineering industry is the most underbanked in the entire sample of industries, with only 18% of the firms having been lend by the banks or leasing companies. On the other hand, plastics have the highest percentage of bank borrowers, at 43%. Electricals and designers goods

[19] One could also argue that (1) structure of outstanding loans with respect to the value of fixed collaterals; (2) the age-structure of arrearages ought also to be included in the definition of finance regime. We agree completely. We made an effort to also collect data on outstanding loan values and their age structure. It is in the area of access to finance that the degree of cooperation of our respondents with the survey was the most lackadaisical, if not outright adversarial. In a very large proportion of cases, the respondents simply refused to discuss the issue of 'outstanding loans' and 'age '

[20] Trade credit is also recognized in our data. For three of our sectors, respondents cooperated more than in others as far as interest rates on trade credits are concerned. For the sectors where the data were the most inclusive, trade credit averaged roughly at 33.3% annually. It is this average that we have used for the other three sectors where data was not available.

industries each register a percentage that is close to each other, in the 23-25% range. Leather and agro processing are each a picture of moderation, in the 34-39% range. Overall, we find that only about 30% of the firms in these six sectors taken as a lump have a bank loan.

Also the six sectors as a lump, we find that MiSmall firms report an average of some 26% of bank borrowers in its ranks of firms, while the corresponding percentage for the MeLarge class of firms is 40%. In the class of micro establishments, which accounts for some 50% of the firms taking the six as a lump, only 10% of the firms report any credit contract with the private financing industry. And yet, the micro firms tend to be just as much 'bankable' as do the rest of the pack in each of the sectors. This is a prime example of squeezing a certain segment of the firms out of the credit loop for no better reason than the fact that they are 'micro' and 'tiny', and are therefore not up to the snuff for the bankers. There needs to be some 'interventions' specifically aimed at mitigating the effects of this in the market for credit.

Table 2.35:
Full-sample average institutional loan size in the six study sectors

Firm size classes	**Agro & food processing**	**Leather & Footwear**	**Electrical& electronics**	**Light engineering**	**Designer goods**	**Plastic**
Micro	0	28.9	23.6	144.74	55.5	750
Small	628.7	4317.51	1575.58	705.75	100.9	1975
Medium	6924	13686.67	2333.33	3129.41	283.6	16253
Large	93233.5	52169.92	14666.6	0	94.84	43367
MiSmall	552.8	3097.07	1226.03	535.2	96.8	1794
MeLarge	15144	29079.98	7814.81	2128	228.5	28577
All	7531.1	12342.79	2515.14	800.67	151.57	16525

Source: SMEF survey of six sectors, 2006/07

2.4.2 Loan sizes' structure of bank loans

The average bank loan size on this sample ranges between a low of Tk. 1.51 million for the designer goods industry to a middling figure of Tk. 7.5 million for the agro processing industry to the highest number of any of the sectors covered of Tk. 16.5 million for the plastics industry. There is a very significant dispersion of both loan sizes and interest rates around these average with regard to firm size variable. The table clearly shows that as compared with MiSmall establishments, medium and large establishments (represented by MeLarge establishments) have significantly larger bank loan contracts---Tk. 1.21 million *versus* Tk. 13.82 million[21]. That difference is statistically highly significant: after all, the average provisioning of bank loan for the MeLarge is more than 11 times that for MiSmall establishments.

[21] These averages are calculated based on all cases including where a loan contract was issued to the sample observation.

Table 2.36 reports on average interest rates that sample firms pay. These average rates range between a low of Tk. 14.3% for the leather and leathergoods industry to a middling rate of some 16% for the designer goods industry to the highest number of any of the sectors covered of 19.7% for the light engineering industry. Leather industry is, as we have seen already, the one with the hoariest, 'blue-chip' track-record on the sample. It is intuitive that in a bankers' world in which lenders swear by the length of track record and credit-worthiness based on immoveable collaterals, leather tanning industry would axiomatically become the 'darling' of the 'finance types'. On the other hand, light engineering industry is, as we have seen already, the one with the infamy of being least-educated, most 'grubby' industry on the sample. It is not surprising at all that in a bankers' world in which lenders swear by the social networking of its prospective borrowers, light engineering industry would axiomatically become the 'poor relation' of the 'finance types'. The evidence is therefore clear that MiSmall establishments are under-banked compared with MeLarge establishments.[22]

There is not a great difference in interest rates with regard to firm size. As compared with MiSmall establishments who pay an average interest rate of 15.76%, MeLarge firms on average pay 15.82% (Table 2.36).

Table 2.37 reports on the average amounts of non-institutional loans that are availed by the industries on the sample. With the exception of the plastics industry, there isn't such a great dependence upon the non-institutional credit by firms on the sample. Table 2.38 reports on the average interest rates that firms in the sample industries pay on the non-institutional loans they take.

Table 2.39 reports about the average volume of trade credits that firms in the sample industries take. The averages presented in this table look as if they are merely the other side of the coin to that reported in Table 2.34. Sectors that are squeezed out of the formal-credit market do the heavy-lifting of trade credit, whereas the sectors that were the poster-kid of model borrower behaviour are conspicuous in this market by their absence. Thus we find that light engineering takes the dubious 'top credits' when it comes to the largest average size of trade credit availed. Whereas plastics that had recorded the largest institutional credit on the sample avoids trade credit as if it were a pestilence. Electricals, which were the third-lowest beneficiary of institutional credit according to Table 2.34, is now found to be second-highest beneficiary of trade credits. It is therefore quite correct to say that trade credit is a kind of a mopping ground for the 'refuse' of the private-sector banking system.

Table 2.40 presents the weighted average interest rates prevailing in the sample sectors. These rates are weighted in the sense that they take into account the prevailed observed rates of interest in each of three markets, viz institutional, non-institutional and trade credits markets. The table shows that the highest cost of credit confronts the firms in the light engineering industry, followed by plastics industry, agro processing and designer goods industry, in that order.
The prominence of credit on the books of account of SMEs is important not for academic reason. It is for an entirely practical reason. And the reason is that the amount of credit is a major determinant of the per-worker output in the industry, even after controlling for

[22] We have put this conclusion a little euphemistically. It is quite correct to say that the degree and the provisioning of institutional credit by medium or large establishments would be understated to a greater degree compared with MiSmall establishments. For a larger proportion of the cases, the MeLarge establishments were characterized by non-response to questions concerning the fact and the extent of bank loans or loans from leasing companies.

several relevant variables. It is therefore important to profile both the MiSmall and MeLarge establishments in terms of the affordability of their access to credit relative to “requirements” they have.

With this particular end in view, we decide that it is appropriate to use average rates of capacity utilization evinced by the various sectors on the sample as an indirect indicator of the extent to which firms were ‘squeezed out’ of the working capital ‘requirements’ they had. Table 2.41 presents the weighted average rates of capacity utilization. For each sector, the weighting was done at the ‘unit’, ‘raw data’ for the firms’ level. Weights used are the revenues reported for each three main lines of products for which our questgionnaire had solicited the capacity utilization data during the interviews. Overall, weighted average rates of capacity utilization on this samples ranges between 61% and 69%. With the exception of agro processing, the MiSmall firms in each of the other sectors each report lower capacity utilization rates than do the MeLarge firms. The MiSmall firms overall are found to have financing cover for only 65% of their working capital requirements, while the MeLarge firms have financing cover for almost 74% of theirs.

Entrepreneurs in the MiSmall category are clearly credit-constrained. This is the bottomline of the access-to-finance picture.

Table 2.36
Average interest rate for bank loan

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	0	15	14	20.33	17	17
Small	15	14.47	15.2	19.88	15.1	15.3
Medium	18	15.11	14.33	19.78	14.63	13
Large	16	12.08	14.2	0	19	11
MiSmall	15	14.5	15.1	19.95	15.91	14.1
MeLarge	16.5	13.84	14.1	19.78	15.93	14.8
All	17.83	14.24	14.93	19.76	15.92	14.3

Source: SMEF survey of six sectors, 2006/07

Table2.37
Average non institutional loan size taking all firms

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	54.5	23.43	36	2.63	55.5	733
Small	29.5	111.06	72.09	18.51	100.9	1513
Medium	0	24.33	0	17.65	283.6	3650
Large	0	18	0	0	94.84	9000
MiSmall	32.4	90.62	63.96	13.68	96.8	1300
MeLarge	0	21.8	0	12	228.5	4541
All	21.8	61.01	51.44	13.4	151.57	2444

Source: SMEF survey of six sectors, 2006/07

Table2.38
Average interest rate for non institutional loan

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	0	0	16	10	0	17.0
Small	15	2.36	6	0	30	15.3
Medium	18	3.8	0	0	0	13.0
Large	16	1.25	0	0	20	11.0
MiSmall	15	2.1	12	1.67	30	14.1
MeLarge	16.5	2.8	0	0	20	14.8
All	17.8	2.45	12	1.42	26.7	14.3

Source: SMEF survey of six sectors, 2006/07

Table-2.39
Average trade credit size taking all firms

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	0	0	175.2	159.6	1580	47.53
Small	77.2	400.1	152.4	980.49	5521	1235.5
Medium	234.9	867.1	333.37	1291.33	11722	5237.9
Large	571.7	597.9	1036.3	8032.18	32032	0
MiSmall	68	269.2	154.1	795.6	4956	874.34
MeLarge	295.4	820.4	520.1	4287.26	9874	3561.8
All	140.3	451.5	325.5	1478.76	7811	1586.7

Source: SMEF survey of six sectors, 2006/07

Table2.40
Weighted average interest rate

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	0	10	15	21.13	17	28.72
Small	15	17	12	18.95	16	24.98
Medium	18	16	14	17.67	15	15.02
Large	16	13	14	0	19	19.08
MiSmall	15	17	15	19.27	16	25.94
MeLarge	16.5	15	14	17.67	16	18
All	17.8	15	15	18.83	16	18.75

Source: SMEF survey of six sectors, 2006/07

Table 2.41
Weighted average capacity utilization

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	69	50.5	59	68.63	51	65.95
Small	62.6	65.8	61.1	67.65	64	65.16
Medium	61.3	72.7	60.3	71.73	68	68.38
Large	65.8	76.3	65.7	72.72	73	81.14
MiSmall	63.4	63.9	60.9	67.98	62	65.36
MeLarge	62.5	74	62.7	72.37	69	73.81
All	63.1	68.1	61.1	68.77	65	68.22

Source: SMEF survey of six sectors, 2006/07

2.4.3 Comprehensive understanding of the marketing chain

Marketing is the business of connecting consumers with manufacturers. This involves transporting a commodity between places, storing it between periods and changing its form to make it fit for human consumption. In all economies, this is a vital function to perform efficiently, ie. At least possible resource costs. Economies, and markets, differ in terms of how well the marketing function is performed. Marketing is efficiently performed when the marketing agents charge keen rates for the use of their resources---time, money, skills, vehicles or fixtures, assets, godowns and risk-bearing---and earn competitive profites. The consumer pays a price that is deemed closely related to the resource costs of supplying to him the commodity in the quantity and at the place and time desired. The manufacturer receives a price that keenly compensates him for the use of the resources up to that stage of production. Understanding how competitively a market performs involves looking at the costs of and normal returns to marketing. On the cost side, we look at the cost of production, and at the cost of spatial arbitrage and at the cost of marketing. Finally, we present the combined margins found from the traders' survey.

Table 2.42 presents the percentages of sales that is obtained by the firms in the sample sectors from their domestic sales. Electricals and light engineering industries are entirely focused on domestic markets. Agro processing also quite substantially focused on the domestic sales and domestic pocket-books. Significantly, leather and plastics industries report what appears to be virtually the same relative focus on domestic sales---in the 54 – 55 percent range. For the leather and leathergoods industry, this fact highlights relatively how important has the domestic market segment become as a source of demand. This means that footwear, and designer leathergoods have become important component in this industry.

Table 2.42: % revenue from domestic sales

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	100	15.38	100	100	16.67	100
Small	94.76	50.22	100	100	40.31	58
Medium	86.18	54.48	100	100	53.14	62
Large	86	90	100	100	39.25	37
MiSmall	95.38	44.56	100	100	38.31	61
MeLarge	86.13	68.97	100	100	49.37	47
All	93.32	53.83	100	100	43.33	55

Source: SMEF survey of six sectors, 2006/07

Table 2.43 : % revenue from export

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	0	84.61	0	0	83.33	0
Small	5.24	49.77	0	0	59.69	39
Medium	13.82	45.51	0	0	46.86	38
Large	14	10	0	0	60.75	57
MiSmall	4.62	55.43	0	0	61.69	36
MeLarge	13.87	31.02	0	0	50.63	49
All	6.68	46.16	0	0	56.67	45

Source: SMEF survey of six sectors, 2006/07

2.5 Marketing margins in the sample industries

Marketing margin for the establishments as a whole is defined as follows:

$$Mi = \frac{(Pr - Pm)}{Pm} * 100$$

Where M happens to be the sector-specific market margin, Pr is the average price at the retail level, Pm is the *ex-factory* price. Table 2.43 reports on the average marketing margins among the sectors on our sample.

The marketing margins on this sample ranges between a low of 12.1% for the light engineering industry to a middling figure of a 13-37% range for the plastics / electricals / agro processing industries, to the highest number of any of the sectors covered of 56% for the designer goods industry.

It was not possible to determine the marketing margins for micro, small, medium and large firms separately. This was largely because the traders were not able to tell products from say small firms apart from medium or large firms.

Table 2.44:
Marketing margins in various study sectors

	Marketing margin (%)
Agro	23.1
Leather	20.7
Design	56.5
Electrical	17.1
Light engineering	12.1
Plastics	37
All	25.2

Source: SMEF survey of six sectors, 2006/07

2.6 The drivers of unit costs of production

Unit costs are defined as the total cost of production divided by the rate of the establishment's output. The following budget line items have been added up while getting at total cost of production:
Cost of raw materials;
Cost of other materials (such as fuel, lubricants, dyes and chemicals, packing materials)
Spares parts, and cost of preparing moulds etc.
Repair and maintenance, etc
Financing costs
Office supplies
Communication, storage, and transportations
Wages and salaries
All kinds of utility expenses
Advertizement expenses
Marketing outlay
Rentals of various kinds
Commercial expenses arising in connection with foreign trade
Miscellaneous expenses

Table 2.44 presents average cost of production (ie cost per unit of output) across the study sectors. The average cost of production generally rises in a monotonic fashion across the four size classes of the establishments in this industry.

Table-2.45:
Overall cost of production per unit of output

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	148.6	577.3	1150.7	3809.5	122.2	1696
Small	466.8	621.6	1574.3	15040	123.6	1766.47
Medium	153	736.8	1923.2	17354	125	1583.11
Large	808.2	695.5	2152.5	64436	127	2601.02
MiSmall	447.3	615.8	1545.7	12510.8	123.2	1745.05
MeLarge	250.1	720.3	1981.4	38279.4	126	1902.97
All	275.5	657.2	1746.1	17552.5	124	2747.89

Source: SMEF survey of six sectors, 2006/07

Table 2.45 presents the average percentages that outlays on all kind of raw materials, office supplies, parts and components, and assorted materials cost in the total across the six study sectors. The first thing we note is that designer goods industry comes through with the lowest percentage share of materials in the total. This is why it is this designer goods industry that also, earlier analysis, came through with the highest average percentage share that gross value added has relative to the gross value of output. While agro processing rates a 69% average materials-cost percentage share in the total, electricals and plastics are similarly situated on 75-78% range. The highest percentages in the table are reported by leather and light engineering industry. The percentage here reported for leather and leathergoods industry has also been corroborated by international evidence (UNCTAD, 2006).

Table-2.46
Materials cost as percentage of total cost

Firm Sizes	Agro	Leather	Design	Electrical	Plastics	Light. Eng.
Micro	72.9	83.7	40.87	71.7	76.7	76.89
Small	71.8	91	53.05	77	76.4	90.52
Medium	64.1	91.6	54.07	68.7	83.6	82.51
Large	62.5	86.9	53.53	78.4	74.4	81.13
MiSmall	71.9	90.9	52.68	75.8	76.5	89.99
MeLarge	63.6	88.2	53.7	73	79.7	80.28
All	69.2	88.8	53.54	75.2	77.5	85.99

Source: SMEF survey of six sectors, 2006/07

Table 2.46 presents the coefficient of the cubic cost function. For the agro processing industry, the functional form is a linear one. For four others, viz leather, electricals, designer and light engineering, the unit data have been transformed logarithmically before the regressions were run. These forms are therefore log-log. For the plastics industry, the functional form is a semi-log. (The coefficients of the best-fitting cost surfaces have been reported, based on the values of r-squarred that we got.)

The following findings need to be highlighted. Firstly, we find that the underlying cost surface behaves mostly like a whip-saw in the log-log space. The coefficient of the log-linear segment is positive and highly significant. This means that as scale of output rises early on, firms' cost increases significantly, as, for instance, machines fail to be 'run in', or workers fail to smoothly negotiate and run up the "learning curve". As a result of both factors, raw material wastage tends to increase at small volumes of output. However, at larger scales of production, the log-square term takes over, and is negative and highly significant too. Over the relevant range of output, this happens because machines and workers both adjust better, and are better 'run-in', thus keeping total costs in a check. The log-cubic term then is positive again, with its coefficient highly significant. Dummies for micro, small and medium establishments are each highly significant and, in this total-cost version, negative (relative to large firms). Because the large establishments provide the control in the specification of these three dummies, the implication is that relative to large establishments, costs of micro, small and medium establishments are, given their quality quotients, significantly lower.

Table 2.47:

Determinants of logarithmic cost function in the study industres

	Agro & food processing		Leather & Footwear		Electrical& electronics		Light engineering		Designer goods		Plastic	
	Regression coefficient	**t-statistics**	**Regression coefficient**	**t-statistics**	**Regression coefficient**	**t-statistics**	**Regression coefficient**	**t-statistics**	**Regression coefficient**	**t-statistics**	**Regression coefficient**	**t-statistics**
Constant	69233.411*	3.691	10.437*	31.901	7.393*	12.934	9.397*	28.200	19.88*	11.82	301.556*	6.807
Physical output(Q)	.692*	36.905	6.815*	9.267	6.878*	9.153	1.855*	10.445	-3.57*	-4.86	-24.757*	-4.465
Physical output$(Q)^2$			-4.232*	-6.769	-5.352*	-5.182	-3.13*	-7.502	.37*	3.49		
Physical output$(Q)^3$	.211*	4.243	7.327*	5.705	1.279*	4.055	1.319*	6.230	-.01*	-2.84	.032*	2.5
Wage rate	17.595	.098					3.047*	3.545			.032	1.306
Input cost	-21.705	-.272					-1.65	-0.117			.808*	16.407
Dm(Micro)	.00002*	-35.854	-2.549*	-6.215	-1.449*	-5.100	-2.972*	-8.623	-1.45*	-3.69	-42.978*	-6.3
Dm(Small)	-65964.3*	-2.917	-1.429*	-4.854	-.474**	-1.947	-1.518*	-4.863	-.94*	-4.12	-25.633*	-4.806
Dm(Medium)	-63974.3*	-3.742	-.934*	-3.194	-.247	-.849	-1.214*	-3.376	-.65*	-3.09	-15.328*	-3.273
Dm(Dhaka)	-51957.8*	-2.805	-.406	-.897	1.102*	2.200	-0.222	-1.120	.11	.75	4.936	1.103
Dm(Chittagong)	-23355.714	-2.524	.374	1.300	.881**	1.663	-7.47	-0.326	-.10	-.48	2.365	.509
R^2	.931		.745		.765		0.798		0.492		.689	

Source: SMEF survey of six sectors, 2006/07

The state and the relevance of the information and communications technology infrastructure that is harnessed by the sample observations is therefore of some interest to us. Table 2.47 presents information about the percentage of cases of establishments owning and using at least one personal computer across the sample sectors. The percentage is the smallest for the light engineering, and courses with middling values for sectors such as leather and plastics (respectively 47% and 50%) to high values for the designer goods industry.

Table 2.48:
Percentage of firms with at least one PC

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	2.16	0	36	2.63	40	4.3
Small	23.74	32.8	48.8	12.64	65.2	34.8
Medium	15.11	76.6	73.3	41.18	83	92.6
Large	76.26	90	83.3	37.5	71.4	100
MiSmall	18.71	26.9	45.9	9.6	62	27.2
MeLarge	23.74	82	77.7	40	80.3	95.7
All	20.4	46.7	52.1	14.67	70	50.4

Source: SMEF survey of six sectors, 2006/07

Table 2.48 is about management hierarchy. Taxonomically, 'flat' versus 'hierarchical' management structures are really the two polar divides that come to mind. The two terms are not necessarily unambiguously defined in the literature. Lay people would understand by flat management structure a rather loose, informal, fluid structure in which canons regarding relationships between tasks and briefs, chain of command and accountability, even rewards and rebukes, are not formalized. Such informality is frequently the mantle of micro and small, at times even medium-sized, enterprises. Hierarchical management structures however set much larger store by codification and formalization, documentation and processes. Such processes are often written into business rules that get codified into the working of human resources software that get written so as to enforce such hierarchy in as much an impersonal manner as possible.

Respondents were asked to assess if their own management structures were flat in some 'general' manner. Their responses have been tabulated in Table 2.48 below. Several findings need a mention. First, while leather and leathergoods industry (with 50% of cases with flat management structure) and light engineering (with 98% of cases with flat management structure) represent the polar situations, the other four register in the 66-73% range for the prominence of flat-management structures.

Table 2.49
Percentage of firms with a flat structure management

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	100	62.5	100	100	100	96
Small	78	59.72	75.6	100	81.4	78
Medium	64.7	43.3	26.7	100	48.9	48
Large	33.3	15	41.7	75	76.5	15
MiSmall	80.6	60.23	18.1	100	82.8	82
MeLarge	56.5	32	33.3	92	56.2	34
All	72.7	50	71.7	98.67	70.7	66

Source: SMEF survey of six sectors, 2006/07

2.7 Towards the formulation of growth strategy

2.7.1 Understanding the factors determining the demand for primary factors and material inputs

The next topic is about growth strategy. But before we take growth strategy up, we have to remind ourselves that growth will need to be pro-poor. In a pro-poor scheme of things, we need to grasp, with some real accuracy, the process whereby the 'demand' for labour and capital drive themselves at the levels of the firms that comprise the world of manufacturing. After all, it is these drivers of factor demand in general, and of labour in particular that any growth strategy will need ultimately to be about. We therefore have invoked a full-information model so as to estimate a system of 'input demand functions'. The factors or inputs considered are labour, fixed capital and material inputs. The following is the structure of the model.

$$l_i = \partial_1 + \partial_2 * w_i + \partial_3 * A_i + \partial_4 * K_i + \partial_5 * Q_i + \partial_6 * N_i + \sum_{j=1}^{m} X_j + \in_i + \partial_7 * P_i$$

$$k_i = \alpha_1 + \alpha_2 * r_i + \alpha_3 * A_i + \alpha_4 * K_i + \alpha_5 * Q_i + \alpha_6 * N_i + \sum_{j=1}^{m} X_{i,j} + \mu_i + \alpha_7 * P_i$$

$$N_i = \beta_i + \beta_2 * p_i + \beta_3 * A_i + \beta_4 * K_i + \beta_5 * Q_i + \beta_6 * N_i + \beta_7 * P_i + \sum_{j=1}^{m} X_{i.j} + \omega_i$$

where the notations are relevant:

l = labour demand, measured by the employment size for each firm;
w = wage rate at which a given firm pays off its workers, staff and officers;
A = the state of mechanical automation in the firm;
Q= output level of the firm;
N = total level of material inputs used by the firm;

P = Product price charged by the firm;
k = Fixed capital in use by each firm;
r = Rate of interest on institutional loans paid on the firm's bank loans;
p = Weighted average price of the vector of the material inputs;

X = a set of shifter variables, often evaluated by dummy variables that alternatively take the values of 1 and 0s;

i, j, m are indices for firms and shifter variables, respectively.

$\in, \mu, and \omega$ are error processes for separate behavioural equation;

$\partial, \alpha, and \beta, are$ coefficients to be estimated by the model;

In order to estimate this system of equations, we employ Zellner's Seemingly Unrelated Regression Estimators (SURE). This estimator is the most appropriate when the disturbance terms are correlated across the equations comprising a system of equations. It is quite appropriate to say that it is in the determination of each of the labour demand, capital demand and material input demand that we are most interested.[23]

2.7.1.1 Labour demand (Table 2.49):

We find that the labour demand function is everywhere negatively sloped in wage rate (lnW), which is what it should be. Two of the relevant regression coefficients---for the designer and leather industries---are statistically highly significant.[24] Labour demand function is positively sloped in product price (lnP)---again, in the designer and leather industries---where their coefficients are statistically significant. In the other equations, their coefficients are not statistically different from zero. We conclude that labour demand is positively sloped in product price, and this is intuitive. Labour demand is positively sloped in fixed capital (lnK) for three of the five sectors. These regression coefficients are statistically highly significant. Labour demand function is positively sloped in the dummy variable relating to automation (D_a) for four out of the five sectors for which we have been able to do the estimation. Two of these coefficients---for agro processing and leather sectors--- are statistically highly significant. That said, for the designer goods industry, the relevant regression coefficient is negative and highly significant. In the relevant sector Volume, we have argued that both signs of this particular coefficient are in theory plausible. The data will sometimes supports one, and sometimes the other, sign. Finally, output has a strong and positive coefficient in the labour demand function for four of the five sectors for which the equation could be fitted. In the present context, output largely corresponds to capacity utilization. That means that the higher is the capacity utilization, the greater is the demand for labour that will be generated by the enterprises.

The most significant aspect of this estimate of the labour demand equation is about the important role that wage rate plays in the determination of the firm demand for labour. On

[23] Despite our best efforts, a copy of STATA 9.0 that we were using could not estimate this system of equation for the electricals and electronics industry, even though it did quite well with data from the other sectors. We have no explanation for this 'freakish' happening. Electrical and electronics thus, sadly, draws a blank throughout Table 2.49.
[24] Note that with SURE, it is z-statistics, rather than t-statistics, that is calculated in order to assess statistical significance of individual regression coefficients.

the supply side, worker cost of living would in part drive prevailing wage rates, by shifting the supply conditions of labour. In order therefore to stimulate the demand of labour by the establishments in the industry, efforts have to be made in order to lower the reservation price of labour: the latter closely corresponds to the cost of living. Reservation price is about the minimum opportunity cost that is consistent with the worker being able to reproduce its labour-selling power and thus deciding to supply labour. Essentially, reservation price revolves around workers' cost-of-living. Clearly, there is a lot that public policy can do about workers' cost of living. Foremost among them is about leveraging the cost of food as a policy variable.

Secondly, the amount of labour that entrepreneurs demand is a positive function of the average product price they can charge. The higher the average product price, the more labour they tend to generate. Now product price is about the quality and the design of the product, its workmanship, the use of more expensive, more attractive and yet more user-friendly packaging material for the product. Ultimately, this is about the amount of industrial knowledge that goes into the product. Our results show that the higher is quotient of the application of knowledge embodied in the product, the larger is its knock-on effects on the demand for labour that it creates.

Thirdly, the amount of fixed capital that an enterprise has to work with also positively drives its need for worker. This implies that there is also a need, in the interest of spurring pro-poor growth, to increase the capital provisioning especially of MiSmall establishments. Such enhanced capital provisioning would energize their demand for labour, and would be good news for pro-poor growth.

Fourthly, the automation dummy has a positive and statistically highly significant coefficient. The higher is the index for automation, the higher is the demand for labour. There are times when entrepreneurs automate their business processes in such a manner that by simultaneously raising the rate of production also raises the demand for labour, especially in peripheral and support functions, such as packaging, storing, manning security arrangements. If this happens, automation can in principle have a positive coefficient on this particular function. Automation need not forever lead to contract the number of jobs offered by a firm. It depends upon on what kind of automation one is talking about, and how successful automation is in raising the output level of the firm in question.

Fifthly, output is a strongly positive and statistically significant coefficient of labour demand.

2.7.1.2 The demand for capital:

We find that the capital demand function is both negatively sloped and positively sloped in interest rates (lnI): the regression coefficient runs the gamut from being statistically significant and positive to being statistically significant but negative, to being statistically indifferent from zero. If credit rationing prevails in the credit markets in Bangladesh, a positive interest-rate coefficient in a function like this is ultimately sensible. This is saying in effect that the credit market is supply constrained, and that in order to obtain more credit, or to obtain a larger-sized credit contract, you will need to up the ante---by promising to raise the interest rate that you agree to service. This is a typical result of the presence of rationing in the market. If the credit market actually clears based on the interest rate, a negative interest-rate coefficient in a function like this is what we expect to find. On this basis, the credit market for the agro processing, in which interest rate has a significant negative coefficient, clears based on the interest rate. Whereas in the plastics sector, the credit market is subject to credit rationing.

Capital demand function is mostly positively sloped in product price (lnP). In the designer goods industry, this coefficient is statistically significant. We conclude that labour demand is positively sloped in product price.

Capital demand is also mostly positively sloped in the dummy variable relating to automation (D_a). The regression coefficient are more often than not statistically highly significant. After all, firms need access to larger amounts of capital in order to move up the automation scale. And finally, output is a strongly positive and statistically significant coefficient of capital demand.

The upshot is that this estimate of the capital demand equation is quite intuitive. It says that in order to stimulate the demand of capital by the establishments in the industry, efforts have to be made in order to lower the prevailing interest rate so that access to capital becomes more and more affordable. Clearly, there is a lot that public policy can do about interest rates. Foremost among them is about empowering public-private partnerships (PPP) such as the Small and Medium Enterprise Foundation (SMEF) credit wholesaling programmes, for instance.

2.7.1.3 Material input demand:

We find that the material input demand function is mostly negatively and statistically significantly sloped in own price, which is what it should be. We also find that the material input demand function is mostly positively sloped in automation dummy (D_a), and the regression coefficients are mostly statistically. Automation has a penchant for spurring the demand for material inputs. Finally, output has a strong and positive coefficient in the material input demand function.

In overall terms, these estimates of the demand equations for labour, capital and material inputs is reasonably an intuitive set of results. They say that in order to stimulate the demand of inputs by the establishments in the industry, efforts have to be made in order to lower prices of raw materials. What implications does that have for policy making? It says that macroeconomic stability must be maintained, so that the inflation rate can capped at an appropriate level. This is needed in order for an environment of price stability to be in force. Policies that work on keeping as low as possible the reservation price of labour also implicated in this particular content. As said already, reservation price of labour is about the minimum opportunity cost that is consistent with the worker being able to reproduce its labour-selling power and thus deciding to supply labour. Essentially, reservation price revolves around workers' cost-of-living. To reiterate, clearly, there is a lot that public policy can do about workers' cost of living. Foremost among them is about leveraging the cost of food as a policy variable.

Table 2.50
Towards the drivers of a growth strategy for the sample sectors of interest

	Agro & food processing		**Leather & Footwear**		**Electrical& electronics**		**Light engineering**		**Designer goods**		**Plastic**	
Explanatory variables	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics
Labor demand equation												
Constant term	3.237*	11.24			No estimate		3.327*	7.03	1.46*	2.9	3.65*	2.18
Wage Rate	-.00012	-.00	-0.0056*	-1.96			-0.005	-0.68	-0.213*	-2.54	-.002	-1.09
Product price	-.00060	-49	0.0008214*	3.4			-0.00002	-0.90	0.196*	2.09	-.0002	-0.02
Fixed Capital	3.4e-06	-49	0.0000202*	3.06			0.00002	0.95	0.108*	2.82	0.0001*	3.57
Automation	.687*	2.0	3.44*	10.75			0.176	0.48	-.425*	-2.19	0.19	1.36
Chittagong	.589	.94	0.3059	0.57			-0.346	-0.86	-.005	-0.03	-0.68*	-2.47
Dhaka	.469	1.4	-0.559*	-2.06			-0.753*	-2.07			-0.77*	-3.05
Output	-2.9	-.38	0.0008214*	3.4			0.0031*	2.14	0.295*	5.26	0.00001*	5.10
Capital demand equation												
Constant term	9.34*	8.59					9.56*	5.16	2.95*	2.96	7.80*	3.58
Interest rate	-.1408*	-2.08	0.0145	0.45			-0.0845	-0.87	.021	.96	0.04*	2.89
Product price	.0030	1.35	-0.000094	-0.18			-1.75E-06	-0.04	.402*	2.01	0.007	0.51
Input												
Output	-6.41^{0}	-.00	1.11*	2.77			-0.0030799	-1.33	0.393*	3.43	0.000*	6.79
Chittagong	1.25	1.14	0.379	0.31			-0.1389	-0.22	-0.232	-.60	-0.012	-0.03

	Agro & food processing		Leather & Footwear		Electrical& electronics		Light engineering		Designer goods		Plastic	
Explanatory variables	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics	Regression coefficient	z-statistics
Dhaka	-.800	-1.26	-0.58	-0.94			-0.594	-1.05			-0.89*	-2.64
Automation	.476	.73	8.309*	11.14			0.1295	0.23	1.941*	4.98		
Material input demand equation												
Constant term	10.278*	20.04					8.21*	8.01	3.37*	2.24	19.96*	5.70
Product Price											-0.02	-1.02
Input price	-.0124*	-2.14	-0.039*	-4.94			-0.02*	-5.83			-0.05*	-3.13
Output	1.13	.68	2.52E-06*	7.25			0.01*	4	0.28**	1.71	0.000*	8.95
Automation	2.346*	3.16	9.2567*	18.68			-0.4877	-0.70	-.51	-.88	0.51*	2.68
Chittagong	1.029	.83	-0.726	-0.69			-0.550	-0.66	.83	1.44	-0.32	-0.81
Dhaka	-1.96*	-2.72	-0.693	-1.3			-0.1516	-0.22			-1.05*	-2.86

Source: SMEF survey of six sectors, 2006/07

2.8 The achievement of growth on the sample: evidence and some patterns

We next turn to the formulating growth strategies for each of our sectors. For this purpose, we need to grasp the drivers of growth in the study sectors. We measured the extent of growth using four variables, namely, employment, equity, revenue and number of machines. Using the following formula, we calculate compound annual growth rate in each of these variables over the life-cycles of the firm for each of the firms on the sample. We then presented average compound annual growth rates across firm size classes. The formula is:

$R_i = \exp((\ln(E_t) - \ln(E_0))/n) - 1$, where R is the growth rate, E_t is headcount, for example, in the study year of 2006/2007, E_0 is headcount in start-up year, n is the number of years of firm's life since start-up, exp is code for exponentiation, and 'i' is an index at firm-level.

We helped ourselves and generated data relating to the extent of growth (both positive or negative) registered by the firms from the perspective of employment growth, equity growth, revenue growth and growth measured for the number of machines. We have been therefore been able to calculate the average annual compound growth rate from each of these four perspectives across the size classes. These average growth rates are presented in Tables 2.50 through 2.53. The results are self-explanatory.

Table 2.51: Employment growth rate

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	2.2	-0.668	8.9	7.57	10.92	6.6
Small	12.4	9.16	16	12.17	23.33	12.7
Medium	10.5	12.5	14.9	11.61	27.48	14.4
Large	18.1	8.38	29	15.19	31.77	15.6
MiSmall	11.2	7.39	14.4	10.77	18.79	11.1
MeLarge	12.5	10.82	21.1	12.75	27.48	14.9
All	11.6	8.6	15.7	11.1	22.79	12.4

Source: SMEF survey of six sectors, 2006/07

Table 2.52: Equity growth rate

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	11.4	10.72	27.8	22.42	26.87	10.8
Small	25.1	10.39	25.9	29.14	28.43	13.3
Medium	13.8	9.83	18.8	15.62	33.25	12.6
Large	25.3	9.02	22.7	66.62	36.88	14.2
MiSmall	23.4	10.45	26.4	27.09	28.19	12.7
MeLarge	16.8	9.5	20.9	31.94	33.25	13.2
All	21.2	10.13	25.26	27.9	28.36	12.9

Source: SMEF survey of six sectors, 2006/07

Table 2.53: Revenue growth rate

Firm size classes	Agro & food processing	Leather& Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	15.1	7.9	27.9	21.43	22.33	7.8
Small	41.9	22.17	27.6	26.59	29.26	8.3
Medium	17.4	25.1	29.28	19.33	29.85	13.8
Large	37.3	24.98	25.9	44.74	32.43	14.6
MiSmall	38.7	19.82	27.6	25.02	28.21	8.2
MeLarge	21.5	25.1	27.8	27.46	32.22	14.1
All	33.4	21.8	27.7	25.43	30.04	10.2

Source: SMEF survey of six sectors, 2006/07

Table 2.54: Machine growth rate

Firm size classes	Agro & food processing	Leather& Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	0	0.99	3.9	7.53	12.18	1.2
Small	11.9	4.2	11.1	12.79	14.88	8.8
Medium	12.3	4.5	10.2	7.53	15.11	14
Large	13.7	8.98	10.7	9.75	18.11	9.3
MiSmall	11.2	3.86	9.5	11.19	14.47	6.9
MeLarge	12.8	6.13	10.4	8.24	15.11	12
All	9.3	4.78	9.7	10.7	14.76	8.6

Source: SMEF survey of six sectors, 2006/07

2.8.1 Explaining inter-firm growth rate in the study sectors

Table 2.54 seeks to establish if stylized patterns of causal influences emerge from the regression coefficients of the employment-growth function, or if the coefficients form more of a 'mosaic'. Grasping the drivers of growth rates of firms in their employment size is naturally of great importance to the policy-makers. And, indeed, one significant pattern does indeed emerge from Table 2.54. It is that AGE of the firm everywhere has a negative coefficient. In three of the sectors, the coefficient in question also happens to be statistically significant. Apart from this, there is really no other systematic pattern in the results. The r-squarred returned tends frequently to be of a middling nature, ranging between 0.21 on the low side to as high as 0.8.

We believe that the results are telling us a very important thing. Firms that are relatively young and have entered into manufacturing more recently are doing so with greater entrepreneurial preparation, more detailed and competent analyses surrounding product positioning, more astute selection of the technology platform issues, and generally greater mastery of management and information-technology issues. That is why this new generation of entrepreneurs are showing up significantly faster growth rates in their employment size compared with 'older' and therefore perhaps more 'hidebound' firms. The new crop of entrepreneurs both possess larger quotients of 'knowledge' compared with their older comparators. This perspective really highlights the importance of knowledge, and management of knowledge, as a systematic competitive differentiator in today's turbo-charged environment of globalization, the use of ICTs, including the Internet and computer-aided design, and more hands-on networking with 'power players' and incumbents. The SME Foundation would certainly need to pay a lot of attention to building their capacity building programmes so that knowledge and knowledge-management could make a difference.

Table 2.55:
Explaining annual compound growth rates of the firms in the study industries

	Employment growth rate per year is the dependent variable					
	Design	**Leather**	**Agro**	**Electrical & electronics**	**Plastic**	**Light engineering**
Constant	2.52*	.484*	0.914*	.549	.220	.367
Automation	-1.44*					-2.96E-3
Dhaka	0.54*		0.028		.046	1.748E-2
product price	0.000			.015	.032	2.38E-3
Age	-0.04*	-.104*	-0.375*	-.187	-.088	-9.97E-2
Education	-0.02	-0.026	0.052**		-.033	8.459E-3
Fixed capital	-0.001				.004	-8.38E-3
Cluster		0.007	0.020		.001	1.58E-2
PER_EXP		-2.6E-05			.004	
INP_IMP		0.0002				
bank loan		0.032	-0.014	.045	.016	-6.66E-3
Micro		-0.101		-.203	-.095	6.17E-2
Small		-0.048		-.078	-.50	-2.66E-3
Medium		-0.033		-.070	-.010	3.299E-2
Chittagong		0.010			.011	1.685E-2
R^2	.21		0.802	.486	.571	.440

Source: SMEF survey of six sectors, 2006/07

2.8.2 Relating measures of performance based on dichotomous division of the samples in study sectors

Tables 2.55 through 2.62 compares and contrasts the effects on a variety of performance measures (such as value added per production workers, or the ratio of value added to gross value of output, for example) based on a two-way division of the samples of firms in each study sectors. For instance, in a particular run, sample observations in each of the industries are split into 'bank loanee' and 'others'. From this particular exercise, large firms have all been omitted. The inclusion of large firms typically drive the average values quite precipitously, one way or the other: its exclusion from the sample has a neutralizing effect on the resulting average values reported. One important implication of this is that these average results would not, necessarily, be equal to or comparable with the nominally corresponding values reported elsewhere in other volumes. The spilt achieved, we then calculate and present average values of a large number of performance-showing variables.
We leave the reader to take liberty interpreting these tables for himself or herself. This way, this research will likely become more interactive.

Table2.56: Performance comparison, across sectors, of the bank-loanees *versus* firms that don't have a bank loan
(All values are averages, in Tk. 000s unless stated to the contrary)

	Agro & food processing		**Designer goods**		**Leather & Footwear**		**Electrical& Electronics**		**Light engineering**		**Plastic**	
Variables	**Bank loanees**	**Others**	**Bank loanees**	**Others**	**Bank loanees**	**Others**	**Bank loanees**	**Others**	**Bank loanees**	**Others**	**Bank loanees**	**Others**
Revenue/ Production worker (Tk.)	1711	919	405	336	1692.6	5307	1525.72	1192.25	2919.15	1168.14	1692.6	1088.5
Revenue / All worker (Tk)	1190	577	343	289	2318.4	4327.2	936.6	925.73	1378.96	922.07	2318.4	1590.2
GVA/ Production worker (Tk)	570	285	279	183	465.4	2022.1	720	477.13	1373.72	391.43	465.4	360.8
GVA / All worker (Tk.)	431	200	244	166	646.5	1626.9	464.2	373.7	654.05	390.44	646.5	517.8
GVA / Revenue (%)	48.3	45.3	56	61	29	34	36	36	43.4	46.3	29.0	34.0
Gross profit/ Total capital employed (%)	10.8	9	26.9	7.3	16	34	18	34	29	35	16	35
Net Profit/ Total capital employed (%)	8.4	6.8	26.4	6.88	11	29	12	33	26	24	11	29
Employment/ Firm (No.)	42.06	31.9	36	41	46.6	36.54	32.57	24.18	34	18.9	46.6	18.6

Source: SMEF survey of six sectors, 2006/07

Table 2.56 presents comparative performance across a 'bank loanee *versus* others' define. The table basically shows that, with the exception of leather industry, on many measures examined, bank loanees have the balance of advantage compared with firms without bank loans. And again, on certain other measures, the opposite is true. Thus for instance, the bank loanees register higher revenue and gross value added per worker, across the column, with the exception, as pointed just now, of the leather sector. In spite of this, the firms that banks choose not to lend to register higher value added as a percent of gross value of output in at least four of the sector. In one of the sector, there is tie between bank loanees and others. In only one sector, namely, agro and food processing, the bank loanees edge 'others' out. When it comes to gross profits as a percent of of total capital employed, the comparator group of firms clearly gives the bank loanees among the MiSmall and medium firms a run for their money, registering significantly higher profitability rate. The two comparator classes share the credits when it comes to the ratio net profits as a percent of total capital employed. Bank loanees typically report significantly higher employment per firm compared with non-bank loanees.

How to summarize this evidence? Even though the bank loanees 'out-produce' the comparators who are typically financed by own equity and retained earnings, it is highly significant that this latter group of the probably so-called 'unbankable' firms are actually often more profitable and generate, at least in gross terms, higher gross profitability relative to total capital employed than do the bank loanees. Is such a result possible? Of course, it is.

Table 2.57 presents comparative performance across a 'cluster-based-*versus*-others' divide. on virtually every measure examined, non-cluster firms compare more advantageously with cluster-based firm. We find that when it comes to gross value added relative to gross value of output, in five out of six sectors, it is the non-cluster firms who 'out-yield' the cluster-based firms. The only sector in which this is not true is agro and food processing. Why is agro and food processing the lone exception. Perhaps this is because there are some middle-sized fish-processing firms in the export-processing zones in Chittagong that tip the scales in favour of the cluster-based firms. As far as the rest of the micro, small and medium firms are concerned, location in a cluster does not make any difference. In four of the sectors, cluster-based firms report higher average ratios of both gross profits to total capital employed, and net profits to total capital employed. Only in two of the sectors, the opposite happens to be the case. That is to say, when it comes to the returns to investment (ROI), locations in a cluster does make a difference. The intuition overall is that while firms not located in cluster appear to extract a larger average amount of value added from their sales, much of that advantage seems to dissipate when we stack up their profits against their total capital employed. Still, the question stays with us: from the perspective of the pro-poor growth, which deserves greater intellectual support --- a larger value-added payoff from a lump of gross value of output, or a higher ROI? The property relations or the character of the capitalist institutions in Bangladesh are such that profits are distributed vastly more unequally than is value added. Value added touches more lives, and has a denser effect on the ground. Profits tend to be concentrated in its effects. However, this can not be the last word. This can not be the last word, because we are starkly reminded that there is another facet of choice to be made---this time, between the short and the long run. Maximizing the ratio of value added to gross value of output regardless of the ROI can only be the legitimate strategy only in a world where there is not long-term. If we are, as we must be, prepared to factor in the long run, maximizing the ROI while of necessity giving a bit of short shrift to the value added quotient in the gross value of output may achieve that goal more predictably. We would only say that the jury is still out whether having the cluster for one's base is or is not more 'desirable' from the viewpoint of the growth characteristics of the SME sectors. We can only say so much because we don't know the planners' rate of time preference. We seek guidance from the SME Foundation about what time-preference assumptions we need to factor into our own analysis.

Table 2.58 presents comparative performance across a 'university-trained-*versus*-others' divide. The evidence is mixed when performance is measured on the basis of value added per workers, or revenue generated per worker. While in three of the sectors—namely, leather, light engineering and plastics---university trained Managing Directors are trumping firms that are led by Managing Directors of CEO who is not an university-trained material, the opposite is the case for the other three sectors, namely, agro processing, designer goods and electricals and electronics. This situation is the equivalent of a draw. Similarly, the situation is also mixed when it comes to the three ratio involving value added, gross profits and net profits.

Table 2.59 presents comparative performance across a 'post-1995-*versus*-pre-1995' divide. For four of the sectors---viz agro processing, designer goods industry, leather and leather goods industry and plastics industry---it is clear that younger firms perform better compared with older firms. In contrast, in electricals and light engineering industries, the opposite is mostly the case, with the older firms on average being both more productive and profitable compared with the younger firms.

Table 2.60 presents comparative performance across a 'automated-versus others' divide. For three of the sectors---viz agro processing, designer goods industry, light engineering and plastics industries--- firms with what their entrepreneurs termed to be automated or relatively automated technology setup performed worse almost across the entire range of comparator metrics compared with relatively less automated firms. In electricals and leather and footwear industries, there were really no predictable patterns in the results. For example, while in the electronics and industrial industries, relatively automated firms trumped the relatively less automated firms in terms of generating both revenue and value added per workers, the relativity reversed itself when it came to the two profitability metrics. There is therefore a lack of consistency in performance across the metrics in this sector, and the same is true with the leather and leathergoods industry. The picture that emerges in these two industries is therefore fuzzy. Overall, it can therefore be said that when we confine only to micro, small and medium firms in abstraction from large firms, automation does not really deliver on its promises.

Table 2.57: Performance comparison, across sectors, of the cluster-based firms *versus* those that aren't based in clusters
(All values are averages, in Tk. 000s unless stated to the contrary**)**

	Agro & food processing		**Designer goods**		**Leather & Footwear**		**Electrical& Electronics**		**Light engineering**		**Plastic**	
Variables	**Cluster-based**	**Others**	**Cluster-based**	**Others**	**Cluster-based**	**Others**	**Cluster-based**	**Others**	**Cluster-based**	**Others**	**Cluster-based**	**Others**
Revenue/ Production worker (Tk.)	556.49	1438	366	330	3320.23	3279.05	1041.28	1315.47	1658.14	1278.48	1316.3	1397.8
Revenue / All worker (Tk)	462.04	883.73	328	263	2640.14	2704.3	732.63	976.33	851.88	1272.71	1850.2	1994.1
GVA / Production worker (Tk)	241.65	426.1	230	168	976.79	1664.11	526.05	527.56	577.17	601.89	362.8	494.2
GVA / All worker (Tk.)	199.5	293.7	197	164	775.89	1369.36	332.49	407.21	300.56	675.66	514.1	695
GVA / Revenue (%)	47.19	45	59	63	28.1	33	35	36	42	51.2	30	35
Gross profit/ Total capital employed (%)	10	9	8.1	3.0	15.5	21	15	25	22	16	30	21
Net Profit/ Total capital employed (%)	1.48	.11	8	3	10	16.2	12	23	33	15	24	16
Employment/ Firm (No.)	36.6	33.6	40	40	30.1	44.2	29.6	25	22.5	20.5	28.9	33.5

Source : SMEF survey of six sectors, 2006/07

Table 2.58: Performance comparison of the university -trained MD's *versus* others across sectors
(All values are averages, in Tk. 000s unless stated to the contrary)

	Agro & food processing		**Designer goods**		**Leather & Footwear**		**Electrical& Electronics**		**Light engineering**		**Plastic**	
Variables	**University trained**	**Others**	**University trained**	**Others**	**University trained**	**Others**	**University trained**	**Others**	**University trained**	**Others**	**University trained**	**Others**
Revenue/ Production worker (Tk.)	1014	1258	277	473	3396.21	3269.67	1038.08	1417.75	2476.76	1330.32	1565.5	1099.6
Revenue / All worker (Tk)	548	931	236	410	2765.6	2580.9	747.35	1054.91	985.71	1013.21	2217.5	1546.6
GVA/ Production worker (Tk)	318	408	196	219	1321.2	908.5	407.58	611.36	954.6895	515.38	425.6	382.1
GVA / All worker (Tk.)	201	322	177	193	1090.15	707.4	319.68	443.47	435.91	441.42	600.8	540.4
GVA / Revenue (%)	46.9	45.3	62	57	33.6	26	39	33	43	46	29	35
Gross profit/ Total capital employed (%)	9.2	9.8	23.7	12.12	31	48	32	28	31	18.1	18	38
Net Profit/ Total capital employed (%)	6.2	4.6	23.1	12.08	20	44	21.2	26	19	7.5	12	32
Employment/ Firm (No.)	38.83	30.48	44	34	40.74	26.69	30.34	22.79	31.5	19.98	39	21

Source: SMEF survey of six sectors, 2006/07

Table 2.59: Performance comparison of before 1996 firm *versus* after 1996 across sectors
(All values are averages, in Tk. 000s unless stated to the contrary)

	Agro & food processing		**Designer goods**		**Leather & Footwear**		**Electrical& Electronics**		**Light engineering**		**Plastic**	
Variables	**Young**	**Old**	**Young**	**Old**	**Young**	**Old**	**Young**	**Old**	**Young**	**Old**	**Young**	**Old**
Revenue/ Production worker (Tk.)	1385	989	393	328	3813.3	2253.9	1131.8	1471	2351.18	2199.2	1527.8	1086.5
Revenue / All worker (Tk)	981	601	329	285	3061	1766.6	891.21	987.73	667.37	1129.33	2178.8	1506.1
GVA/ Production worker (Tk)	416	336	212	200	1134	894.8	439.52	669.83	687.0814	862.2271	440.1	356
GVA / All worker (Tk.)	322	231	164	194	901.5	726.6	351.52	458.79	265.35	495.2	626.8	496.1
GVA / Revenue (%)	44.5	47.5	56	63	29	27	37	34	44	46	30	34
Gross profit/ Total capital employed (%)	10.2	9.4	12.53	2.42	52	24.9	9.5	3.52	4.6	9.7	33	19
Net Profit/ Total capital employed (%)	7.3	9.2	12.49	2.35	21.3	19.2	1.22	1.56	1.4	9.3	28	13
Employment/ Firm (No.)	29.78	36.52	34	43	28.53	38.68	23.55	29.75	28.33	32.19	30.5	30.3

Source: SMEF survey of six sectors, 2006/07

Table 2.60 presents comparative performance across 'before 1996 firm *versus* after 1996' define. The table basically shows that on virtually every measure examine, young industries are more advantageously compare with others.

	Agro & food processing		**Designer goods**		**Leather & Footwear**		**Electrical & Electronics**		**Light engineering**		**Plastic**	
Variables	Manual	Automated	Manual	Automated	Manual	Automated	Manual	Automated	Manual	Automated	Manual	Automated
Revenue / Production worker (Tk.)	1063	1157	450	306	2467.4	3476.5	922.4	1499.04	1004.06	3787.27	1013.7	1386.2
Revenue / All worker (Tk)	883	697	391	261	1975.5	2775.4	653.7	1120.6	854.32	1698.67	1333.6	1971.2
GVA / Production worker (Tk)	448	336	232	192	991.7	1070.18	368.67	638.7	400.1151	1413.75	276.4	421.9
GVA / All worker (Tk.)	361	231	189	180	824.7	849.7	286.4	466.8	395.91	639.81	369.1	598.9
GVA / Revenue (%)	47.8	45.6	53	63	31	28	39	33	46	48	33	31
Gross profit / Total capital employed (%)	10.5	9.2	14.36	2.24	15.59	6.3	25.5	6.9	7.3	7.5	10	30
Net Profit / Total capital employed (%)	8.2	7.2	14.32	2.18	7.8	3.6	18.8	4.5	6.6	7.1	5	25
Employment / Firm (No.)	42.17	32.29	32	44	43.68	29.5	19.38	30.5	18.96	34.31	17.6	32.1

Source: SMEF survey of six sectors, 2006/07

2.9 Gross and net profits as a percentage of total capital employed

Table 2.61 reports on gross profits as a percent of total capital employed. Table 2.62 then reports on the returns on investment---the much-anticipated ROI which are beholden to not just the finance types but to everyone who deeply cares about industrialization. ROI is defined as net profits as a percentage of total capital employed. The latter is defined as replacement cost at current prices of each of three types of fixed capital and working capital including net receivables. The lowest average sector-wide returns on investment are reported for agro & food processing and light engineering, in the 11-16% range, whereas the highest is found in the designer goods industry, at about 30%. In every case, gross profit as percentage of total capital employed is higher compared with net profit as percentage of total capital employed, and this is what it should be. With the exception of light engineering, everywhere the ROI is significantly higher on average for the MeLarge firms *versus* the MiSmall firms. This is not unexpected: after all, the MeLarge firms are better capitalized, have a far more secure and enabling bank line of credit, are better networked, both socially and economically, and are 'better organized' as a coherent force.

Table 2.61:
Gross profit as a percentage of total investment

Firm size classes	**Agro & food processing**	**Leather & Footwear**	**Electrical& electronics**	**Light engineering**	**Designer goods**	**Plastic**
Micro	11.1	20.19	17.9	62.75	-30.76	24.8
Small	16.1	22.83	24.8	34.50	28.37	26.9
Medium	17	26.62	28.9	16.99	36.03	38.3
Large	10.1	38.62	35.4	11.76	48.65	41.7
MiSmall	15.6	22.36	23.3	36.59	24.2	26.5
MeLarge	15.4	31.42	31.8	13.36	38.96	39.7
All	15.6	30.26	24.9	20.91	30.71	28

Source: SMEF survey of six sectors, 2006/07

Table 2.62
Net profit as a percentage of total investment

Firm size classes	**Agro & food processing**	**Leather & Footwear**	**Electrical& electronics**	**Light engineering**	**Designer goods**	**Plastic**
Micro	8.6	17.25	16.4	58.40	-27.18	20.58
Small	10	19.51	22.6	30.16	30.43	20.93
Medium	15.9	22.75	25.2	11.15	32.67	32.47
Large	7.9	33.0	33.1	6.21	39.97	36.59
MiSmall	9.8	19.10	21.2	32.25	27.34	20.86
MeLarge	14.1	26.85	28.7	7.72	34.36	34.17
All	11.3	25.86	22.7	15.70	30.39	22.57

Source: SMEF survey of six sectors, 2006/07

Table 2.63 presents the percentage distribution in each of the six sectors of responses obtained with respect to a number of 'interventions' that respondents thought highly of. The question we had asked in the questionnaire was as follows: "Which of the following possible interventions would you like to recommend for implementation by the Government of Bangladesh". In answering, the respondents were open to fingering more than one interventions. That is why the percentages that we report across the rows of the tables, are not column percentages. They may not add up to 100.0. As well, it would be almost impossible to use the same scheme (of intervention labels) to arrange *each of the comparator* sectors in, say, descending order with respect to the percentages reported. This is because the structure, and therefore the *inter se* ranking, of the preferences, are empirically different among the constituent sectors under study.

Certain interesting patterns emerge from the data. First, the two oft-repeated recommendations mooted by the respondents in several industries happen to be the 'usual suspects' ---namely, that VAT administration has to be made more symmetrical and that import duties on imported parts and components must be reduced so that the user cost of inputs could be lower. The second 'sticking point' on the sample of suggestions is about the scandalous 'now-you-see-it-now-you-don't' situation with the power availability in Bangladesh. Shielding from the high rate of interest is also found to be on a lot of peoples' minds in the interviews.

Impact of the Regulatory Regime

The survey instrument asked the following question: "Among the following regulatory compliance 'intrusions', which do you consider the most limiting from the perspectives of the growth rate of your firm?" The respondents were at liberty to opt for as many as three options. Table 2.64 to 2.73 presents these responses.

ercentage of cases across size classes where VAT is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	45.5	56.2	72	47.37	50	30.4
Small	63.4	64.4	76.7	70.11	32.86	43.5
Medium	76.5	76.7	53.3	64.71	34.04	51.9
Large	41.7	85	83.3	62.50	11.76	40.0
MiSmall	61.3	62.9	75.7	63.2	34.2	40.2
MeLarge	67.4	80	66.7	64	28.13	46.8
All	63.3	69.1	73.9	63.33	31.43	42.4

Source: SMEF survey of six sectors, 2006/07

Table 2.65: Percentage of cases across size classes where income tax is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	72.7	75	52	52.63	50	13.0
Small	75.6	78.1	65.1	74.71	37.14	20.3
Medium	91.2	83.3	53.3	88.23	51.06	33.3
Large	66.7	70	75	50	29.41	30.0
MiSmall	75.3	77.5	62.2	68	76.32	18.5
MeLarge	84.8	78	63	76	45.31	31.9
All	78.4	77.6	62.3	69.33	41.43	23.0

Source: SMEF survey of six sectors, 2006/07

Table 2.66: Percentage of cases where issuance of trade license is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	27.3	68.8	40	23.68	50	34.8
Small	57.3	71.2	54.7	57.47	28.57	20.3
Medium	61.8	83.3	33.3	52.94	40.43	14.8
Large	33.3	80	66.7	50	23.53	10.0
MiSmall	53.8	70.8	51.4	47.2	30.2	23.9
MeLarge	54.3	82	48.1	52	35.94	12.8
All	54	74.8	50.7	48	32.86	20.1

Source: SMEF survey of six sectors, 2006/07

Table 2.67: Percentage of cases where issuance of TIN is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	45.5	68.8	28	7.89	50	0
Small	52.4	69.9	40.7	31.03	15.71	7.2
Medium	58.8	70	20	29.41	21.28	7.4
Large	41.7	75	41.7	25	11.76	10.0
MiSmall	51.6	69.7	37.8	24	34.21	5.4
MeLarge	54.3	72	29.6	28	18.75	8.5
All	52.5	70.5	36.2	24.67	27.14	6.5

Source: SMEF survey of six sectors, 2006/07

Table 2.68: Percentage of cases where complying with environmental compliance is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	36.4	75	12	13.16	0	56.5
Small	45.1	63	26.7	34.48	1.43	59.4
Medium	55.9	60	26.7	47.06	4.26	81.5
Large	16.7	75	41.7	37	5.88	45.0
MiSmall	44.1	65.2	23.4	28	1.31	58.7
MeLarge	45.7	66	33.3	44	4.69	66.0
All	44.6	65.6	25.4	30.67	2.86	61.2

Source: SMEF survey of six sectors, 2006/07

Table2.69: Percentage of cases where satisfying the BSTI is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	54.5	12.5	36	7.89	0	0
Small	59.8	24.6	50	8.05	0	0
Medium	76.5	40	46.7	17.65	6.38	0
Large	50	65	50	0	5.88	0
MiSmall	59.1	22.4	46.8	8	0	0
MeLarge	69.6	50	48.1	12	6.25	0
All	62.6	32.3	47.1	8.67	2.86	0

Source: SMEF survey of six sectors, 2006/07

Table2.70: Percentage of cases where satisfying the Chief Boiler Inspector is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	27.3	12.5	0	0	0	0
Small	35.4	30.1	5.8	0	0	0
Medium	50	50	6.7	0	0	0
Large	16.7	50	8.3	0	5.88	0
MiSmall	34.4	27	4.5	0	0	0
MeLarge	41.3	50	7.4	0	1.56	0
All	36.7	35.2	5.1	0	0.71	0

Source: SMEF survey of six sectors, 2006/07

Table2.71: Percentage of cases where satisfying the CIFE is fingered as the most significant blight

Firm size classes	Agro & food processing	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic
Micro	27.3	6.25	0	0	0	0
Small	25.6	23.2	3.5	0	0	0
Medium	38.2	43.3	6.7	0	0	0
Large	8.3	50	8.3	0	5.88	0
MiSmall	25.8	20.2	2.7	0	0	0
MeLarge	30.4	46	7.4	0	1.56	0
All	27.3	29.5	3.6	0	0.71	0

Source: SMEF survey of six sectors, 2006/07

The following three tables are about three aspect of the border-taxation policy as applied to the six study sectors---viz traits of the regime of customs duties applicable on the six study sectors, average customs duty, supplementary duties, VAT, and AIT applicable to the six study sectors, and finally calculated total tax incidence (TTI) for each of these six sectors. For the moment, we shall only suffice to highlight the fact that the TTI for our six study sector ranges, at the low end of values, 118% for light engineering to a middling value of some 134% for electricals and electronics industry to 164% for leather and leathergoods to more than 172% for agro and food processing industry.

Table 2.72: Import duties that are leviable on 2-digit HS lines in the six study sectors

2-digit HS Code	No. of tariff lines	Characteristics				
		Average	Standard deviation	Minimum	Maximum	Range
03, 04, 17, 18, 19, 20, 21	9	25	0	25	25	0.0
39	25	13	7.8	7	25	18.0
41	14	5.1	3.2	0	7	7.0
42	6	13.5	10	0	25	25.0
60	6	25	0	25	25	0.0
61	16	24.2	2.4	15.3	25	9.7
62	16	23.1	6.2	0	25	25.0
64	6	25	0	25	25	0.0
68	14	18.8	7.6	5.3	25	19.7
84	87	5.2	4.3	0	22.4	22.4
85	47	13.4	7.5	0	25	25.0

Source: SMEF survey of six sectors, 2006/07

Table 2.73: Import, Supplementary duties, VAT and AIT on 2-digit HS lines

Num of digit	Count	Average CD	Average SD	Average VAT	AverageAIT
3,4,17,18, 19,20,21	227	0.204	0.195	0.173	0.025
39	298	0.141	0.044	0.165	0.027
41,42	87	0.1	0	0.136	0.007
60,61,62	436	0.221	0.105	0.183	0.027
64	56	0.214	0.105	0.176	0.026
84	899	0.068	0.015	0.066	0.011
85	576	0.135	0.033	0.141	0.022

Source: SMEF survey of six sectors, 2006/07

Table 2.74: Total Tax Incidence (TTI) on 2-digit HS lines

	Tax incidence up to				
		CD stage	**SD stage**	**VAT stage**	**AIT stage**
3, 4, 17, 18, 19, 20,21	1.01	1.21	1.45	1.7	1.73
39	1.01	1.15	1.2	1.4	1.43
41,42	1.01	1.11	1.11	1.26	1.27
60,61,62	1.01	1.23	1.36	1.61	1.64
64	1.01	1.23	1.35	1.59	1.62
84	1.01	1.08	1.09	1.17	1.18
85	1.01	1.15	1.18	1.35	1.37

Source: SMEF survey of six sectors, 2006/07

Recommended actions of a cross-cutting nature

The centrality of ‘pro-poorness’ in the SMEF focuses

Reducing and eventually eliminating poverty, at any rate in its most visible and demonstrable forms, must be the ultimate reason for the existence of every publicly-funded transformational initiative, SMEF included. This must be imbued in to the reigning policy mindset, including in the SMEF.

The centrality of a ‘MiSmall’ focus: the subtext for SMEs development

Getting to know better, and relaxing the binding constraints, of the MiSmall firms in manufacturing must be the core focus of the SMEF in the days to come. Only then will it be possible to facilitate putting in place modalities and milestones of a pro-poor growth process that is legitimately preferential to the MiSmall firms.

Pro-poorness as a developmental mindset, without apology

The ‘culture’ of SME development has for long given impatient, short shrift to inputs from the science of ‘development economics’. The ascendant mindset was that what SMEs sector in developing countries needed most were innovative financial products and processes, including in managing and pooling risks. There was a concomitant neglect of distributional, informational-asymmetry, social access and relationship issues. Finance had trumped technological know-how, and distributional issues as the life-blood for efficient and inclusive development. The tsunami of recent months in the world’s ‘richest’ credit markets have demonstrated the murderous opportunism, gross inequalities, and institutionalized rapacity that private markets can dump on others in the absence of an appropriate degree of regulation. Unreconstructed private markets are unlikely to deliver propoor development of SMEs. Proactive, well-informed, and well-targeted interventions will be needed as never before.

SMEF’S Sectoral Implementation Task Force (SITFORC)

SMEF patently needs a Board sub-committee to take the lead in shaping, in a predictable and virtually continuous manner, the translation of policy research and institutional R & D---of the kind embodied in these six sector studies--- into concrete interventions that empower the entrepreneurs, infrastructures, and institutions commensurately with SMEF’s mandate. Towards this end, incremental tactical and implementational roll-out, framed by coherent and critically responsive ‘long-term roadmap’, must occur in the SMEF. As well, as a part of the same process, there must be virtually continuous match-making between scholarly and analytically-sound visions, and practically-minded engagement with policy, planning and funding processes prevalent in the economy. With all these considerations in mind, we propose that a Sectoral Implementation Task Force (SITFORC) be formed at the SMEF. It ought to be tasked with designing, advocating and detailing the specifics of the tactical roll-out of projects and schemes, initially for these six sectors, in the interest of sustainable and inclusive development. Conception, design and ‘selling’ of interventions and development projects, however avowedly pro-poor, is a highly creative process, and requires brains of high caliber and, increasingly, personalities with high visibility and social networking access. The convenors of the SMEF Working Groups could become ex-officio members of this Task Force. This Task Force is going to require a good deal of staff support and expert resources retained, even perhaps a regular budgetary allocation, so that it can commission additional, knock-on, due diligence. The Task Force will have a jurisdiction that cuts across the eleven 'booster' industries that have been mooted by SME Policy Strategies-2005 and beyond.

The Commissioning of a high-end Design and Testing Laboratory

A high-grade capability in 'product design' and 'product quality' are unrivalled sources of competitive differentiation in this age of globalizing competition. Capabilities in terms of design and testing are in question here. Like technologies are convergent, so also there are convergence in the production processes. Raw materials, substrates, and receptacles within which design and testing savoir-faire (know-how) needs to be upgraded and enhanced overlap and evolve in synergy. For instance, leather, fabrics, and shells have, despite their outward dissimilarities, certain commonalities at the more fundamental levels that brings synergies to the fore. With the size and average incomes of the middle class growing quite rapidly, the demand for designer goods based on metallic substrates and attracting fancy prices and gross margins is growing apace. **The SMEF could well do with taking an up-close look at how to take Bangladesh's design and testing capabilities and infrastructures to, say, Indian best-practice.** The SMEF should conceive of and roll-out a high-grade Design and Testing Laboratory (DesiTest), the equipments and facilities would need to be customized by needs assessment, especially of designer goods, leathergoods and light engineering sectors. A concept note about DesiTest has already been submitted to the SMEF in connection with the drafting of the Annual Work-plan. That Concept Note could become the keystone of the DesiTest.

Catching the wave with the next blockbusters

Billionnaire business people put to use a penchant for catching the wave with the 'next blockbuster demand'. It has been said about Steve Jobs, Apple's world-famous innovator, that he uncannily discovers and latches on to not just 'new products' but 'milestone categories'. Spotting the next blockbuster demand in the making requires keen power of observation, accurate analysis, good listening skills and, above all, means to retain the services of 'futurists' who are also connoisseurs of technology. It is said that Apple's iPOD was the brainchild of a consultant, with Apple buying the former off. The rest, from the perspective of Apple's pocket-book, has been history. There is a need for the SMEF to capitalize such a 'super-hot halo' of creativity and demand-discovery. The SMEF could choose to habitually react to the private-sector pioneers of 'demand innovation'. The alternative would be for the SMEF to develop a capacity for seeing the emergence of the next wave of the blockbuster 'product' or 'technology' platform. This would really put the SMEF's 'money' where the collective 'mouths' of its core constituencies are.

Actions from the six sector studies

ACTION PLAN FOR AGRO AND FOOD POCESSING (AFP) SECTOR

Framing and adopting policy for AFP industry development and adequate functioning

(1) Formulate and finalize a national policy for AFP industry. Such a policy must seek to i) create an enabling environment to ensure level playing field for AFP enterprises of all sizes, ii) reduce custom duty rates on basic raw materials and intermediate imports used by export oriented AFP industries, iii) improve Bank's performance in AFP industrial lending, iv) rationalize tax structure to provide support to small & cottage AFP industries by raising the ceiling of exemption limits as regards taxation, and by lowering the VAT rates and v) develop separate credit policy for AFP SMEs.
(2) Constitute a committee to formulate a National AFP Policy.
(3) The SMEF ought to work and coordinate with the Ministry of Agriculture, Ministry of Industries in this regard.

Access to Finance

(4) Enhance easy access to finance for AFP industry of SMEs

Technology upgrading

(5) Design, develop and disseminate appropriate technologies to enhance competitive efficiency through appropriate technology intervention.Marketing for AFP products

(6) Enhance access to market and the objectives is to enhance AFP products access to domestic and international markets".
Towards this end, diversify AFP products and identify new AFP products;

Build display-centers for AFP products,
organize AFP products fairsess to domestic,
participate in international fairs/exhibitions with AFP products,
improve quality of products,

provide incentive to build awareness about the advantages of AFP products and their quality assurance mechanism through generic advertisement and publicity;
Initiate market promotion campaign for new products mix and brand name support.

(7) Develop guidelines for agricultural marketing, market research and market information system for processed products", with a view to strengthening the marketing system, ensuring adequately remunerative price of products and locating new and promising markets for processed products.

The activities will be i) A committee formed with experts ii) Marketing guidelines developed and iii) Marketing research areas selected and the expected out puts of i) Guidelines approved, ii) marketing research conducted and iii) new markets identified. The MoI, SMEF, MD, FBCCI, Universities, R&D institutions may take up responsibilities.

Capacity building and skill development training for technicians and workers of AFP industries

(8) Review existing institutional programmes and facilities extending towards AFP human resource capacity development, with a view to increasing human resource capacity of the AFP industries to improve their skills.

(9) Prepare list of experts, review present curriculum, syllabus and examine standard of materials of various skill training and revise, ii) conduct training need assessment to remove mismatch between supply and market demand, iii) organize meeting with all relevant institutions and exchange information among agencies, iv) organize market oriented training of trainers course for AFP SMEs. v) provide training on management development of private entrepreneurs and vi) support in-factory skill up-gradation and training activities through providing fiscal and other incentives.

Infrastructure and institutional facilities for AFP industry

(10) Adopt policy to ensure utility (electricity, water and gas) services AFP industry, with a view to ensuring an un-interrupted power and adequate water and gas supply, ii) improve production system and iii) minimize labourer wastage. The activities will be to i) exclude AFP industry from load shading and gas shortage, ii) power supply in main grid in AFP industry area increased and iii) minimize labourer wastage.

(11) Commission additional, knock-on studies with a view to developing schemes for strengthening of backward linkages of AFP industries in the following areas:

- The strengthening of traditional fish processing technologies.
- Development schemes for modernization of meat, poultry, milk and egg processing.
- Establishment of post-harvest infrastructure and cool chain facilities for agro and food processing.
- Promotion of the establishment of ice-plant in rural areas.
- Setting up feed mills to produce quality feed (fish, poultry and animal).
- Development of baby and weaning food processing industry in the country.
- Modernization of rice milling.
- Strengthening of capacities of SMEF to render better services.

Handling, grading and transportation of raw materials

(12) Development of the handling and transportation guidelines for agro & food processed products
(13) Formulation, dissemination and enforcement of grade and standards.
(14) Improvement of transportation of frozen foods to expand export.

Quality and standards of AFP products

(15) Quality and standards of AFP products, with a view to improving the quality and standards of AFP products". This involves a number of subsequent actions, in the areas of i) strengthening capacity of industries to conform with the increasingly stringent quality standards in the global market by strengthening quality control measures and related institution, ii) Strengthening institutional/ national capacity in relation to Standard, Metrology, Testing and Quality (SMTQ), iii) Enhancing Quality Management System (QMS) complying international standards, iv) Enhancing product certification system by BSTI and make it easier for SME entrepreneurs, v) Ensuring compliance of quality assurance and environmental friendliness in the industries vi) Developing programme on capacity building in the area of food hygiene and safety through implementing GMP, GHP and HACCP etc. vii) Introducing financial grants for ISO, 9000 and 14000 and HACCP certification for SMEs.

Business support services for AFP entrepreneur

(16) Extending Business Development Services for local and international trade, with a view to strengthening business development support services for AFP entrepreneurs. This would involve organizing larger numbers of better-conceived national and international trade fairs, ii) enhancing activities of Advisory Service Centers of SMEF, iii) Advocating the creation of insurance facilities, iv) advocacy for reducing customs and excise duties, and v) introduction of awards and incentives for exceptional performance in AFP industry sector.

Coordination and monitoring

(17) Develop institutional mechanism for coordination and monitoring.

Public –private partnership

(18) Enhance and harmonize the service delivery activities of both public and private sectors in promoting AFP industries

Environment compliance

(19) Gradually raise awareness about the issue of the nexus between the environment and growth.

ACTION PLAN FOR DESIGNER GOODS INDUSTRY

Short-run Action(s)

(20) The SME Foundation ought to catalogue the overseas markets for products that the designer goods industry could produce profitably in terms of the categories used by the International Standard Industrial Classification (ISIC)-2005. The SMEF ought then to disseminate, in collaboration with relevant trade bodies such as WEAB, BWCCI, CWCCI, Bangladesh Handicrafts Exporters Association and NASCIB, the size of the addressable overseas market for the products that belong to those categories.

(21) Need exists for the SME Foundation to organize, in collaboration with relevant trade bodies such as WEAB, BWCCI, CWCCI, Bangladesh Handicrafts Exporters Association, more frequent participation by Bangladeshi designers and fashion goods in international product exhibitions, beginning with India.

(22) The SMEF should constitute a Panel of Advisors with say five recognized design-industry leaders to regularly proffer advice and strategic insights so as to spur the development of the designer goods industry. The members of this panel should have a decent monthly 'retainership'. The Panel should meet once monthly. The Panel should be tasked to author a definite Master Plan for the design and inclusive development of a highly innovative and productive designer goods industry.

(23) In the short term, SME Foundation ought sponsor one of the former NIFT alumni, preferably one speaking Bengali and hailing from West Bengal to come and spend quality time (preferably a month) lecturing under the aegis of the SME Foundation. This kind of professional collaboration is a pre-requisite to the spawning of institutional good-will.

(24) Concrete training programmes should be conceived, scoped out, rationalized, designed and implemented, where carefully selected trainers are brought from India, Thailand, Indonesia with expertize of design and production work on fabrics, *batiks,* shells, respectively. Funding for such proactive programmes ought to be aggressively sought from the bilateral donors. Additional funding for them ought also to be sought from the Annual Development Plan (ADP). The SME Foundation would need to strengthen its capacity for project appraisal, as also for the preparation of investment, management and business plan(s) preparatory to the authorship of aggressive proposals that compellingly champion the cause of such public-investment proposals.

(25) The MiSmall establishments in the designer goods industry ought to be given a waiver from paying the 15% VAT on assessed production value. Instead, these MiSmall firms ought to be assessed for VAT collection at a truncated 1.5% of turnover.

Medium term actions

(26) Over the medium term, an Institute of Design Excellence be created in Dhaka under the aegis of the SME Foundation. The ground for the creation of InDESI will be paved by greater network between the SMEF's TESS Wing personnel, and one of India's most famous icons of high-fashion education. SMEF ought to do its due diligence while working towards the selection of such an international 'mentor', institutionally.

(27) A sector development programme of the designer goods industry must contain provision for selective upgrading of the equipment range in use, especially in the hubs of handloom weaving in areas such as Tangail, Kumarkhali and the like.

(28) The SME Foundation should take the lead in creating the vision for and a business plan for an Institute of Creativity and Design. The Institute might be affiliated with the Dhaka University's faculty of Fine Arts. Rather than only aim at design competencies in the context of textiles and clothing alone, this will work more broadly.

(29) The SME Foundation should take the lead in financially sponsoring a small band, say 12, of highly innovative young designers, selected from across a number of substrate specializations. The value of annual scholarship would be Tk. 250000 a year. The selected candidates would enrol for part-time studies and upgrading in this programmes. A large part of the pool of this money would be earmarked to pay for travel, board and lodge of one or two well-known alumni of NIFT for a period of two months. A second part of the pool would be earmarked for paying 'user fees' to the BGMEA's fashion laboratory and classroom facilities. The cost of hiring teaching faculties will also be paid out of that pool of money. The remainder of the money, some Tk. 125000 will be paid out to the alumni. For two months, these 12 designers would have the potentially quite valuable opportunity of being interned under the care of two of NIFT's better-known alumni.

(30) SME Foundation must form strategic or tactical partnership(s) with trade bodies that have done the most for 'empowering' women producers in the designer goods industry, viz BWCCI, CWCCI, WEAB, NASCIB and BanglaCraft. Opening 'cost' centers that are operationalized to provide tiny and micro, women-owned production businesses in the clusters access to markets in metropolitan areas would be the objective of these partnerships.

(31) The SMEF should prepare in-house a business plan, including an implementation programme, for the upgrading of the production capacities in key clusters in the country that feed into the success of the designers goods industry. Selective upstaging of the financial benefits of women artisans in MiSmall establishments in these clusters ---and therefore specific advancement of the cause of pro-poorness---should be organizing principle of the business plan and the implementation programme.

(32) Actions must be taken to enhance affordable supply of credit to the designer goods industry, especially to 'micro' and 'small' firms in the industry. Towards this end, the SME Foundation ought to try to 'fast-track' the onset of credit wholesaling in a targeted manner to firms in production clusters that have achieved critical supply mass in a national context.

(33) The SMEs in general and the firms in the MiSmall class of firm need to be proactively mainstreamed into being more abundant users of information and communications technologies. The SME Foundation would certainly like to become even more involved in harnessing the ICTs for the management and dissemination of knowledge and knowledge-based public-goods inputs for advancing the common good of the producers and players of the designer goods industry of Bangladesh.

ACTION PLAN FOR ELECTRICALS AND ELECTRONICS INDUSTRY

Fiscal Policies

(34) VAT and Corporate Income Tax have to be waived for small industrial enterprises (as defined by Industrial policy 2005) and initiated by Bangladeshi entrepreneurs so long they do not take any loans from formal banks. Industries based on investment from the remittances of non-resident Bangladeshis should also be waived of all taxes. However, industries based on foreign investment, whether in part or full, cannot get such facilities. When a micro or small industry enjoying such tax and VAT waiver takes a formal bank loan, or grows into a medium enterprise, this facility will no more be available.

(35) For small industrial enterprises (as defined by Industrial policy 2005) which have taken loans from formal banks, an **alternative simple option** to standard VAT, based on total turnover, should be given. This may be set at 3% on total turnover. The entrepreneur would choose the option whether to pay through the standard procedure, or through the simpler turn-over procedure.

(36) Total Tax Incidence (TTI) on the imported raw materials and components of the same product that are not made locally should be significantly less to allow a competitive edge to local production.

(37) A clause must be incorporated in the fiscal policy to the effect that if the above tax rationalisation is not done in certain cases, the importers should be able to import raw materials of the same product paying not more than 60% of the duty on the similar finished products. This means that if import duty and VAT are waived on a finished product, import duty on its raw materials and components should automatically stand waived, as well as the VAT on the production on the same products.

(38) Duty free import of electrical and electronic items under baggage rules should be abolished.

(39) The import of any 'technology-based' finished product at zero tax or VAT, however important that product is, should be not to allowed by law. If necessary, the Government, including by steering direct subsidies, can pay the duties back to certain organizations which it wants to provide with special support (such as computers and laboratory equipment to educational institutions)

(40) Drafting of the fiscal policies should not be finalized by a Government body (like NBR) alone. There should be separate committees for different sectors comprising of Civil servants from the Government, representatives of the manufacturing, trading and importing associations who will make the first draft. For the final document, representatives from these committees, again from different backgrounds, should do it through combined efforts.

Anti dumping measures

(41) "Dumping" by other countries should be prevented through individual case-to-case actions, buttressed by 'SMEF due diligence'. However, the Government trade bodies abroad should be more active in providing the required help since it may not be possible for local entrepreneurs to obtain necessary information and documentation to file such cases. Awareness-raising towards this effect including by SMEF would be quite useful.

Go slow in regional and international trade contracts (SAFTA, WTO, TRIPs, etc)

(42) Bangladesh should ask for some more time to get ourselves prepared so that we can play an active role in this new collaboration, rather than remaining as an onlooker and a consumer. The same should work out for international trade.

Deregulation of other mandatory policies

(43) Registration could be an optional requirement with some incentives. It should not be made obligatory.

(44) To eliminate harassment to the start-up or tiny enterprises, trade licence requirement should be waived for the very small enterprises, particularly for which tax and VAT waiver has been proposed in this body of recommendations.

(45) Counseling, campaigning and moral suasion persuasion, not draconian enformement of strict labour laws or regulations---as exemplified by "Child-labour laws"--- ought to be *modus operandi* when it comes to complying with the so-called 'universal charters' thrust down by the multilateralist institutions.

(45)Environmental clearance: This is another area which is very important, but again may lead to abuse if strict laws are adhered to. Again, counseling, campaigning and persuasion should be the tools, not strict laws or regulations.

PROMOTIONAL STEPS

Priority in utility services (Electricity, gas, etc.)

(46) Small manufacturing enterprises should get topmost priority in all utility services like electricity, gas, telephone, water & sewerage etc. and this should be communicated to all concerned.

Marketing of products

i) Co-operative marketing

(47) Small manufacturers' associations should be encouraged to organise co-operative marketing starting from local initiatives, then combining all of them into regional and countrywide initiative. The same can be done for export too. SME Foundation (SMEF) and / or BSCIC can provide necessary support.

ii) Exhibitions

(48) There should be timely exhibitions regionally, nationally and internationally. Again the Government may provide support direct to relevant manufacturers' associations, through BSCIC and SMEF.

iii) Government Procurement, no packaged tender

(49) A policy still exists which bounds a Government or Semi-Government organization to purchase a locally made product if it satisfies the minimum quality requirements, and if the price is less than about 20% of the lowest foreign bidder in a tender. If the policy has been scrapped, which is unlikely, it should be redone and a reminder should be sent to all concerned authorities together with advertisements in newspapers for its effective implementation. Legal actions should be taken if procurements are done otherwise.

(50) Tenders floated by the Government or Semi-Government bodies should be packaged in such a way that even a small firm may offer prices for individual items in a competitive way. Small manufacturing enterprises should be allowed to participate without VAT and tax-compliance documents, but VAT, which is ideally a tax on the consumer, may be taken from the purchasing organisation.

Research & Development (R & D) and Quality Control (QC) support

Setting up local R&D

(51) For new product and process development, and for Quality Control (QC) the Government and Semi-Government agencies should be put to work. Organisations like Bangladesh Industrial Technical Assistance Centre (BITAC), Atomic Energy Research Establishment and Atomic Energy Centre, Bangladesh Council of Scientific and Industrial Research (BCSIR), Universities and the Polytechnic Institutes should be motivated in taking up programmes to provide such technical assistance for the Small entreprises, particularly in the light engineering, electronics and electrical sector, may be in return for a reasonable fee. Appropriate polices should be taken up for this purpose.

R&D support through tax relief

(52) VAT and Tax relief should be also seen as covers for R&D expenditures:, almost all enterprises in the electrical and electronics industry have to perform continuous R&D of some sort.

Quality Control for imported products: role of BSTI

(53) Compliance mechanism should be initiated to ascertain that all products, especially of foreign manufacturers, should carry their full specifications on their (packaging) labels. If independent tests find out disagreement between that claimed and the actual performance, actions should be taken against marketing of such products. BSTI has a role here.

Business support facilities

54) In order to provide all types of assistance to entrepreneurs (with information on setting up, preparation of project proposals, sourcing of technology and machinery, raw materials, legal, etc.), business support facilities should be promoted in the private sector.

Procurement of quality raw materials

(55) Associations of small manufacturers should be encouraged to organise import of quality raw materials for their respective industry jointly. This may be done through the co-operatives mentioned before for marketing.

Training of human resource, short term, long term

Short term:

(56) To improve their quality of the goods made by technology innovators, the entrepreneurs should be provided with some training, and occasional refresher courses, either at home or abroad. The workers can get the training from the entrepreneurs in turn. SMEF should conceive of upgradation schemes to meet this requirement.

Medium term:

(57) Expert bodies formed through the Government can work to improve the curriculum of the institutes where diploma engineers receive their training. In electronics, manpower with degrees in engineering and Physics are also taking up entrepreneurship, and curriculum modification with the same view may be attempted.

Long term:

(58) The Government may revise teaching curriculum in the general education in the secondary level, slanting towards a vocational or 'trade-oriented' accent, and perhaps inducing school dropouts into small 'engineering' enterprises. Courses in the Universities should be adapted to the needs of technology-based industries.

Financial support

i) Venture capital: Science &Technology, and Industry Ministry may provide

(59) Science &Technology Ministry, and Industry Ministry may offer venture capitals to technology innovators having demonstrated capability in innovative technology having potential for commercialization.

Loans without collateral, with low interest rates

(60) Technical ability and relevant educational qualifications, entrepreneurial track record of growth, goodwill, etc. could be expressed into their monetary collaterals equivalents. SMEF ought to commission 'green-field, early-stage' assessment study in this area.

(61) The rates of interest should be kept low to support continued R&D expenditures for such technologically innovative industries.

(62) Of course, just giving 'orders' to banks to provide loans, as is being done now, do not work, since the banks have to earn profit at the end. At present necessary Government policy environment does not exist that can allow small industries to earn profit. Therefore, banks are not interested to give loans to small industries, which is the real experience in Bangladesh. Therefore policy environment favourable to local engineering based industries is the prime requirement as has been discussed before.

i) EEF availability

(63) Electrical and Electronics industries should be brought under the purview of Entrepreneur Equity Fund (EEF) of Bangladesh bank.

i i i) Cash incentives and duty drawback facilities to exports.

(64) These should be made available to Light Engineering and Electronics industries, and that should be available with minimum hassle.

Reorganising of Government bodies

i) Science &Technology Ministry, and Industry Ministry

(65) To promote indigenous R&D based small manufacturing enterprises, Science &Technology Ministry, and Industry Ministry should preferably merge together. Commerce ministry, of late, has been looking into the interests of medium and large industries. Therefore Industry ministry can turn its focus to small industries, and Science & Technology ministry should merge into one as well.

ii) Reconstitution of NBR, dispersal of authority

(66) All budget and tax policies that impinge upon the financial and business interests of SMEs in general and micro enterprises in particular should be regularly and rigorously appriased by a separate body, completely isolated from the NBR.

(67) The above body should have dedicated research resources with data archiving facilities and should have manpower with various specialities, particularly in appropriate branches of technology, fiscal economics, etc. Representatives of manufacturers' and traders' associations and subject experts from the civil society should be incorporated in this appraisal activities. Certainly, the SMEF could be considered to be a natural candidate for discharging such a mandate.

(68) All cases of tax evasion as filed by the NBR will be adjudged by an independent judiciary.

iii) Frequent changes in top Government positions should be stopped.

(69) Above the rank of a Joint Secretary, officals should not be transferred to other ministries as far as possible, in the interest of maximizing favourable synergies from personnel continuity.

ACTION PLAN FOR LEATHER AND LEATHER-GOODS INDUSTRY

Short-run

(70)An effort to network the merchants of Dhaka's old hides market at *posta* into the major salt producers of Chittagong and Cox's Bazar would appear to have priority.

(71)In an effort to improve the colour and suppleness especially of Bangladesh's cow hides, especially from the butt-side of the cow's hide, an effort involving the Bangladesh College of Leather Technology (BCLT) and Bangladesh Leather Exporters' Association need to be launched in order to improve the cultural practices. Especially, the feasibility of using bating and pickling ought to be appraised.

(72)The SME Foundation in collaboration with the Bangladesh Leather Exporters and Manufacturers Association should help upgrade the availability of mechanical drying capacities within the leather-tanning cluster.

(73) As a part of a sector development programme, the Bangladesh College of Leather Technology (BCLT) and the Bangladesh Leather Manufacturers and Exporters Association might capitalize an R & D 'laboratory' under collaboration of the Technology and Enterprise Support Services (TESS). The specific objective of this intervention would be about creating an embryonic capability within the cluster of Hazaribagh with respect to establishing the core of what might be called 'enzymatic skill taskforce' in the BCLT. The tasks for such a 'laboratory' would need to be defined at more of an abstract, conceptual, level. It will need to be implemented more as an experiment. The two sponsors (the BCLT and BLMEA) will need to enter into an MOU. In addition, they will need to enter into arrangements with one of the several medium-sized tanneries that currently make a living by leasing their standing facilities. The production-oriented aspects of the project could well take place at this rented-in facility.

(74) A common facilities center, fitted out with machines cited in the foregoing could, if the authorities so desired, be set up in the new cluster being planned by the Ministry of Industries in the Savar area. SMEF could consider capitalizing it. The TESS of the SMEF would have to recruit a professional Leather Technologist to set the CFC up and manage it. Land will need to be acquired, of course. Throughout the process of the installation of the CFC, SMEF's team leader (the Leather Technologist) will need to liase actively with the Bangladesh Leather Manufacturers and Exporters' Association, so that there is an adequate degree of 'user' buy-in. SME Foundation will only commit equity towards the creation of such a CFC if there is no worthwhile private entrepreneur who seems willing to take the risk and if an accurate appraisal were to establish beyond any shadow of reasonable doubt that the CFC would indeed have value. It is known that some land has already been earmarked for the establishment of CFC and common effluent plant on the proposed site for the leather cluster near Savar. Could this be possible to allot that plot to the SMEF or, better still, to a consortium to be formed comprising the BSCIC and the SMEF?

(75) It is recommended that the SMEF puts forward the leather and leathergoods sector for development on a 'mission-mode'. It is recommended that the SMEF puts the leather and leathergoods sector as a major element of its agenda for efficient and inclusive growth in the manufacturing industries. That done, we recommend that the SMEF launches in-depth but an in-house sector development programme for the upgrading of capacity, infrastructures, human resources and financing avenues for the development of the leather and leathergoods sector. Towards this end, the SMEF should recruit a leather technology consultant for long-term appointment with it. That incumbent would be tasked to conceive ways and means of implementing the present tactical action plan. In the process of implementing it, the incumbent leather technologist would also have the mandate of adding new, and more specifically conceived new, elements to this action plan.[25]

(76) It is recommended that SME Foundation increase its commitment of financial resources towards the acquisition of greater in-house technical specialization relating to the

[25] It is not unusual at all that a client would retain the services of professional consultant(s) in order to do due diligence, appraise the ideas and conceptions that often take the often embryonic formulations in a large report, like the present one, of which the tactical action plan is one, albeit important, part. And such appraisal is a quite necessary part of building the 'architecture' for a sector development programme.

environmental-compliance issues in general, and the technical minutiae of setting up common effluent treatment plants in the tanning cluster now under negotiation.

(77) Actions must be taken to enhance affordable supply of credit to the designer goods industry, especially to 'micro' and 'small' firms in the industry. Towards this end, the SME Foundation ought to try to 'fast-track' the onset of credit wholesaling in a targeted manner to firms in production clusters that have achieved critical supply mass in a national context.

(78) The SMEs in general and the firms in the MiSmall class of firm need to be proactively mainstreamed into being more abundant users of information and communications technologies. The SME Foundation would certainly like to become even more involved in harnessing the ICTs for the management and dissemination of knowledge and knowledge-based public-goods inputs for advancing the common good of the producers and players of the leather and leathergoods goods industry of Bangladesh.

ACTION PLAN FOR LIGHT-ENGINEERING INDUSTRY

Capacity Building through skill development

Industrial / Agro machinery and Automobile Spare parts
(79) Develop specialized technical training on metallurgical technology. Technical training should be provided to the machine shop personnel to improve the quality of their work. (Implementation partners: BSCIC, BITAC, NPO, MAWTS etc.)...

(80) Develop specific programmes of training on LEIs machine technology (such as CNC, EDM, etc), with the accent on the focus on first-generation machines and especially the "finish" of the products; Welding and how to make "nice" welding, drilling machines, bending machines, cutting machines, lathe machines, lock/punching machines. Know how to clean and prepare the equipment before painting. Carry out a first painting and second painting of the equipment to be exported. Introduce quality control and how to measure the quality. Export packing is also very important and how to fix box sizes in order to maximize the content in a container either a 20 ft or a 40 ft container. Trainings on machining allowances and tolerances and operation of CNC machinery such as lathe, milling and boring (Implementation partners: BUET, BSCIC, BITAC, MAWTS etc.)

(81) Organise training on Mechanical design, CAD, CAM. The business support institutions (i.e. BITAC, BUET, etc.) could offer these training commercially. These institutions should have wide circulation among the entrepreneurs and re-design their course according to market demand.

Foundry

(82) Organise training on welding. Formal welding training/courses for technicians are available under technical and vocational education program. (Implementation Partners: BSCIC, BITAC, NPO, MAWTS etc.)

(83) Develop training on pattern making, mechanical design, CAD, CAM (Implementation partners: BSCIC, BITAC, NPO, MAWTS etc.).

(84) Develop trainings on practical technology of casting covering the product development and casting design, pattern making, standard practices in moulding process, standard

practices in melting cast iron using cupola and induction furnaces and test inspection and counter measures of casting defects. SEDF has brought an expert from India to introduce upgraded technology and to set up induction furnaces in 2 foundries in Bogra on test basis. (Implementation partners: BSCIC, BITAC, BUET, NPO, MAWTS etc.)

(85) Train the managers, engineers, skilled technicians on quality and technical knowledge of foundry technology on the regular basis covering both the practical as well as technical theory and methods (Implementation partners: BSCIC, BITAC, BUET, NPO, MAWTS etc.)...

(86) Develop trainings and organise workshops for entrepreneurship development; strengthen entrepreneurs' motivation and business entrepreneurial culture (Implementation partners: BUET, BIM, BSCIC, DU etc.).

Training for improving management and Commercial skills of foundry and Manufacturing

(87) Develop trainings on sales management, marketing and how to prepare and organise participation in international trade fairs, on distribution channels, on gathering and analyzing information related to products, market segments or competitors, and on how to target specific countries (Implementation partners: FBCCI, DCCI, BUET, BIM, DU, BSCIC, etc.)...

(88) Develop trainings on accounting management. Find out which currency to use. How long the offer can be valid or make the contract terms subject to any currency fluctuation in order not to "loose" on the currency and any other issue related to payment and minimizing the commercial risk (Implementation partners: BIM, DU, BSCIC, BITAC, BUET, etc.)

(89) Develop trainings on logistics. Find out the best and most efficient way to transport the goods to the buyer, how to get the products to the harbour, where to make the packing into container – at the warehouse – or at a forwarding agents place. How to stow the container in order to avoid damage during transportation. What type of shipments to use and what packing is needed to prevent any transportation damage, what type of insurance? (Implementation partners: BIM, BUET, DU, BSCIC, etc.)

(90) Develop trainings on e-commerce (using the e for enterprises directly or through ecentres hosted in TSIs or TPOs. Investigate whether the products are normally traded through these channels. Find out if the target buyers are end-users or importers or agents before selecting this way of trading (Implementation partners: BIM, DU, IEB, BSCIC, BITAC, BUET, MAWTS etc.)

(91)Trainings on export processing, finance, marketing and regulations Ask different bankers with experience in handling export document. What regulations do exist in the country and what regulations do the importing countries have (Implementation partners: FBCCI, DCCI, BUET, DU, BSCIC, etc.)

(92) Develop trainings for entrepreneurs on export processing and export financing mechanisms such as L/C matters Organize with export qualified and oriented bankers seminars training how to prepare required export documents in order to meet L/C and other requirements. This could be export invoice, packing list, certificate of origin, Bill of Lading, quality certificates etc (Implementation partners: EPB, BPC, BUET, DU, BIM, FBCCI and DCCI, etc).

(93) Train Light Engineering stakeholders on communicative English. Organize special training in English for export managers and stakeholders in communications with potential customers. This is for writing and speaking. (Implementation partners: local training institutes, etc.)

(100) Train producers/exporters on how to approach banks, on how to manage credits and on how to develop a constructive relationship with banks and on import process (Implementation partners: EPB, BPC, DU, BIM, FBCCI and DCCI, etc.)

(101) Develop specific training programmes for foundries and factories on quality control and best practices. Prepare and have drawings of each and every part with reference numbers, which have to be manufactured before assembling the machine/equipment. Check the raw materials, measure all parts before start assembling/welding the machine/equipment. Measure the machine/equipment after assembling according to drawings. Check the cleaning of the machine/equipment before painting. Check the painting (thickness etc) Check the export packing (Implementation partners: BSCIC, BUET, BITAC, NPO, MAWTS etc.)...

Other Trainings and best practices

(102) Visit to other foundries especially outside Bangladesh to experience the best working practices in foundries producing cast iron with cupola or induction furnace (Implementation partners: Min. of Industry, Min. of Commerce, BPC, SEDF, LEIC NPO, etc.)

(103) Organise regular group training courses in the scope of quality control and safety awareness (Implementation partners: BSCIC, BUET, IEB, BITAC, DCCI, etc.)...

(104) Train and arrange counseling desk in EPB, BPC, FBCCI and DCCI. Build the capacity of these organizations to offer specific services needed the sector stakeholders (Implementation partners: EPB, BPC, FBCCI and DCCI, etc.).

(105) Build capacities by training the banks to assess credit requests for the sector to understand the sector preoccupations (Implementation partners: BIM, EPB, BPC, DU, FBCCI and DCCI, etc.).

(106) Seek donor funds available (like the Danish DANIDA or EU) for training of students in technical schools, a forum for product development could also be created (Implementation partners: SEDF, DANIDA, CIDA, DFID, EPB, BPC, BUET, DU, BIM, FBCCI and DCCI, etc.).

(107) Develop new entrepreneurship programmes especially from qualified graduates (Implementation partners: BUET, BIM, EPB, DU, BPC, FBCCI and DCCI, etc.).

Task 2: Access to Finance

(108) Integrate in the LEIs Value Chain mechanisms allowing all the steps of the VC to access to finance from banks, government agencies and other financial service institutions…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(109) Undertake a study comparing the LEIs financing mechanisms and bank interest rate existing in neighbouring countries and competitors countries and based on that develop appropriate reforms to build a better financial environment…(Implementation partners: Ministry of Finance, Ministry of Industries, Ministry of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(110) Develop a dialogue with banks to improve mechanisms to provide finance to the sector at lower rates and learning from the previous failures. Single digit interest rate should be introduced and the interest calculation must be standardized. (Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(111) Hedging on bank exchange rates. Banks and credit agencies availing credit could facilitate by having a reduction of interest rates and softening collateral requirements to access credit. This could be achieved through corresponding macroeconomic and structural policies directed to lowering risks in the economy, inflation and strengthening banking and credit system Capital investment interest rate and running capital interest rate should be different. Banks should disburse a significant amount of 30-40% of the total credit amount to the LE industries as loans (Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

Equipment investment

(112) Encourage and promote leasing programmes or grants to help SMEs modernize their equipment and increase volumes and quality products…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BUET, BITAC, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(113) Coordinate investment in new technology / machines…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BUET, BITAC, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(114) Coordinate investments in new machinery and equipment in order to utilize this investment as much as possible. …(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial Organizations, EPB, NBR, SMEF, BUET, BITAC, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

Equity investment

(115) Remove barriers to equity investment in LEIs. Identify the barriers that exist and which are slowing done the process to equity investment in LEIs…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(116) Encourage and promote venture capital mechanisms allowing foreign investment to be attracted to the LEIs sector opportunities…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial

organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

Communication

(117) Build effective communication with banks by organizing seminars where bankers and stakeholders will exchange views and find solutions through an action plan to develop appropriate financial services for allowing the sector to access financing…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

Create a fund to allow TSIs employees to have access to trainings in their speciality (Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).
(118) Create a fund or a mechanism to facilitate financing for stakeholders to prepare and participate with effectiveness to trade fairs…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(119) Create a LEIs export group to examine how to simplify the export process development of document for bank such as a single window…(Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(120) Training entrepreneurs on how to have access to finance (export financing, capital investment, joint ventures) Organize training and seminars with different bank who is specialized and professionals in the different finance areas, investment in capital goods – rental arrangements and/or leasing arrangements available. Here it could be both bankers and other financial institutions. Find out what are their requirements and terms for entering such arrangements (Implementation partners: EPB, BPC, BUET, DU, BIM, FBCCI and DCCI, etc.).

Technology Upgradation

(121) SMEF must do a great deal more, moving the light-engineering industry gradually from first to new generation machinery and improving quality monitoring and source of reference. Various activities bringing about technology up-gradation & development, technology transfer & dissemination, integration of modern machinery & production system, R&D, empowerment with ICT to be implemented including articulation of quality assurance system. As well, establishment of facility centers are essential to strive for development of diversified new & quality products for export is needed.
(122) SMEF ought to raise awareness in favour of building capacities for manufacturers to meet export requirements in terms of quality and production volumes through training involving Quality control and Quality assurance (Qc/Qa) and Good Marketing Practices (GMP).

(123) Upgrade to better moulding and melting processes with available technology in the market (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(124) Assistance should be provided so that machinery manufacturers and electronic firms can interact with each other in an effort to upgrade local products. BUET can provide assistance in this connection (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(125) Collect and disseminate regularly all available data and technical information on local foundries and assist in updating practices and improving the product (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(126) Technical support services should be provided to the local machinery manufacturer so as to enhance their capability of machine design. BUET can provide assistance in the machine and product design (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(127) Carry out a R&D on local sand, molding processes and new material besides cast iron (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(128) Design specific programmes for R&D institutes and Public organizations. How can the production process be simplified, how can the wear and tear parts be strengthen in order to avoid breakage – break downs – and save parts for same by the customers. Make tests of machines – short and long terms tests in order to evaluate and see the capacity and the strength of the machines/equipment before starting exporting (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(128) Interchange of technology and training (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

Diffusion of New Generation technology

(129) Investigate which countries are going from 1st generation of different products to 2nd generation in order to be "first" in the market at the right time and with the right price. Develop a study on new generation technology on how to adapt it to Bangladesh. Implement activities in accordance with work plan (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(130) Replace gradually the first generation machinery with new machinery capable of providing the machining services in much better accuracy (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(131) Develop use of material such as carbon steel, alloy steel, etc of known specifications for quality and high performance products. Establishment of linkage among importers,

producers and consumers of raw materials may help in making the required raw materials available. …(Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

Build Inherent Capacity

(132) Develop a local expertise for servicing and application in the metal industries and centre for metallurgical as a source of references for local foundries (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(133) Recommend entrepreneurs to be flexible enough to involve step-by-step quality monitoring systems and procedures at each stage in the production cycle to aid corrective measures where variances arise (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(134) Streamline testing operations to ensure quality compliance for products destined for local or international markets, to allow foundries to access spectrometer and also to facilitate import of raw material (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(135) Build capacities for manufacturers to meet export requirements in terms of quality and production volumes through training involving Quality control and Quality assurance (Qc/Qa) and Good Marketing Practices (GMP). (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(136) Support on exposure to modern machines and technology through workshops, exhibition and discussions with foreign suppliers. (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.) SEDF is working in the similar field to upgrade technology and has created some linkages with a few institutions and organizations in Indian for ensuring incessant communication mechanism, however this could be taken to an advance level with collaboration to pertinent national institutions to arrange workshops, exhibitions and other meaningful events.

(137) Set up a basic requirement of testing and control laboratory in Dhaka & Bogra and other districts which provide services in area of chemical composition analysis (spectrometer), physical properties testing (tensile test and Brinell hardness test), microstructure analysis, sand testing and heat treatment facility (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(138) Take facility from 5 BITAC (Dhaka, Chittagong, Khulna, Chandpur, and Bogra) (Implementation Partners: BITAC)

(139) Develop quality gradually into world-class quality (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.

(140) Requisition of Spectrometer, physical properties equipment and sand testing facilities for foundries for producing casting of international requirement. (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(141) Establish a common export-packing branch (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.).

(142) Get Internet access – develop Light Engineering IT centres (Implementation Partners: BSCIC, BUET, BITAC, NPO, BPC, FBCCI, DCCI, Trade Bodies & Associations, Chambers, universities and institutions etc.)

(143) Build a monitoring cell comprised of public-private partnership to monitor the initiatives taken to improve the technical capacity of the sector, this monitoring cell should be led by the private sector; SME Foundation, BSCIC, Investment Board etc. could be the potential partners for the monitoring cell

(144) Develop quality management guideline for BITAC, BSCIC, NPO, RDA

(145) Develop collaboration between academia and practical experienced people to improve the technology

Marketing

(146) Make the products visible in the domestic and international markets

(147) Establish a common export / marketing office / company

(148) Establish a brand image either individually or collectively. (Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(149) Adopt advanced marketing technique with commensuration of economical status of the target market (Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(150) Investigate the possibilities to be supplier to different European manufacturer – start in small scale and develop this in a way that the Bangladesh manufacturer can take over more and more and maybe end up with manufacturing complete machinery for European exporters. (Implementation partners: Min. of Industries, Min. of Commerce, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(151) Prepare better catalogues / brochures in perfect English (Implementation partners: EPB, NBR, SMEF, BUET, BITAC, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(152) Organise and centralise through EPB the collection of products of small enterprises in order to show them at the international fairs as the small entrepreneurs do not have the capacity to attend those kind of international events to showcase their products (Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(153) Establish price preference for SMEs as practiced by India and other developing countries (Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.

(154) Arrange for periodic/permanent exhibition of locally produced non-electrical and electrical machinery in the country (Implementation partners: Min. of Finance, Min. of Industries, Min. of Commerce, Bangladesh Bank, Commercial Banks, Financial organizations, EPB, NBR, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.). Ensure entrepreneurs participation in LE international trade fair (Implementation partners: Min. of Industries, Min. of Commerce, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

Access to market information and dissemination

(155) Develop an information flow network to disseminate market, prices and technical information…(Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(156) Strengthen commercial representatives in the embassies in order to “sell” t5he LE products (Implementation partners: Min. of Industries, Min. of Commerce, EPB, SMEF, FBCCI and DCCI, Trade Bodies, Professional Associations, Chambers, etc.).

(157) Organize and structure Market data access. The sources are widely fragmented and data poorly disseminated. Modern technology that readily allows instant availability is not fully utilized. Skills in interpreting data are lacking. Light Engineering expertise and feedback from overseas clients and embassies in key countries is lacking …(Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(158) Improve and strengthen flows of Information and communication to local and export markets through database creation of exporters and buyers of respective products, information dissemination through market bulletins and information exchange, and exporters and manufacturer meetings…(Implementation partners: Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

Communication within the sector and with abroad

(159) Contact and collaborate with foreign trade organizations through local associations (e.g. BEIOA) (Implementation partners: EPB, Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

(160) Develop locally CNG 3 wheelers and BITAC can take initiatives to develop the local expertise; this technology can be brought from India in order to create an import substitute.(Implementation partners: BITAC, Min. of Industries, Min. of Commerce, Min. of Finance, Donor agencies, EPB, SMEF, BPC, FBCCI and DCCI, Trade Bodies and Associations, Chambers, etc.).

ACTION PLAN FOR PLASTICS INDUSTRY

(161) Formulatng SME friendly macro and sectoral policies.

***** SME friendly Tax Policies, Import Policy, Export Policy and Special credit policy.
***** Undertake necessary regulatory measures to ensure easy entry and exit of the firms
Reduction of hassles in:

- Issuing registration certificates
- trade licenses
- fire licenses
- boiler licenses
- environmental clearance certificate

* Reduction of VAT and other taxes.
Reduction of hassles in:

- Issuing registration certificates
- trade licenses
- fire licenses
- boiler licenses
- environmental clearance certificate

* Reduction of VAT and other taxes.
* Conduct a nation-wide sample survey.
* Build a data base for informed policy making
Preferential access to credit facilities
***** Reduction of collaterals
***** Reduction of interest rate charges
***** Diversification of the financial products by the banks and other lending institutions.
Alloccation of funds for R&D activities.
***** Setting up a Plastics Technology Institute / Centre
* Create quality control, testing facilities etc. by setting up testing laboratories in the technical universities.
* Upgrade technological standards of the recyclers.
* Enhance cooperation between and entrepreneurs and the universities for R & D activities.
* Set up technology inclubation centers.
Increased need-based training facilities on:

- use of machines and their maintenance.
- plastics engineering
- heat treatment, quality control.
- mold making and design.
- product design.
- work safety issues.
- waste management.

* Idetification of new products and processes.
* Arrange plastic product fairs at national and regional level.
* Special advisory services to be provided by SME foundation.
* Special support service facilities to be provided by EPB to the exporters.

* Build product display centers through public-private cooperation and partnership.

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Volume-3

Bangladesh's Plastics Products Industry, baseline, Profile, Performance, and Plans for Upgrading

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June, 2010

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Executive Summary

National Plastics Industry

The Plastics Products industry now constitutes a sizeable sub-sector of the national Chemical Industry consisting of more than 3000 operating units which processed an estimated 4,38,000 tons of plastic resins including 1,75,000 tons of virgin resins and 2,63,000 tons of recycled resins in 2005. The current annual per capita consumption of plastics in Bangladesh is estimated to be 3.37 kg which is way below the global average of 20.4 kg, but it is increasing steadily overtime at a rapid pace because of its continued and sustained intrusion as a material of daily necessity and a product of both household and industrial use. The industry provides direct and indirect employment opportunities to roughly 1.0 million people, contributes to an estimated gross output of Tk. 65557 million (or 1.47% of GDP) and export earnings of Tk. 16367.6 million.

Because of its versatility in different dimensions and its ever expanding application and use potentials ranging from simple domestic wares to high-tech products, plastics is characteristicly a high-growth industry globally and in Bangladesh. Judged by the consumption of the imported raw-materials, the plastics industry registered an average annual growth rate of over 28% with the value of imports at current prices rising from Tk. 9549.78 million in 2001/2002 to Tk. 31662.55 million in 2006/2007. The annual growth in physical terns was close to 10% during the same period, with imports of plastics materials rising from 0.196 million metric tons in 2001/2002 to 0.288 million metric tons in 2006/2007.

One notable trend in the industry growth is the gradual development of a plastics recycling sub-sector in the Dhaka City. An estimated 60% of the plastic wastes was recycled by over 300 small units (employing reportedly less than 5 workers per unit) which provided employment opportunities to roughly 20-25 thousand workers and saved an estimated US$ 44 million worth of imports of virgin plastics by the domestic manufacturers in 2005.

Salient Features of the Sample Enterprises:

Moving from the national aggregate to the sample enterprises within the Plastics Industry, the current survey studied a sample of 139 firms/enterprises which comprise roughly 4.6 percent of the total industry population. Of the total sample, 86% are SMEs and 14% are large enterprises as per the BBS definition.

The average enterprise size works out to 17.7 workers per enterprise for the MiSmall and 156 workers per enterprise for MeLarge size groups. The incidence of female workers in the Plastics Industry of Bangladesh is rather negligible at 9%. In the MiSmall category, it is a puny 3.5% compared to 10% in the MeLarge enterprises.

The average length of work experience of the employees in the overall sample is 8 years which reflects rather young age of the sample enterprises. This is not unexpected in view of the fact that the average age of the sample firms is found to span slightly over 11 years.

Nearly two-thirds of the plastics products manufacturers in the entire country are located in the two largest cities of Dhaka, followed by Chittagong. The sample enterprises are characterized by the similar location pattern, with largest concentration being in the parts of old Dhaka, especially Lalbagh and Islambagh clusters.

The major product segments turned by the sample enterprises consist of poly bags, hangers and other accessories for readymade garments, household products, containers and packaging materials, PVC pipes and fittings, shoes and sandals, CD and DVD cassette covers, and plastic compounds, sheets and films. A notable new trend seems to have been a strong diversification into production of hangers and various RMG accessories treated as “deemed exports” by the recent Export Policies of the Government.

The sample enterprises are dominantly owner-managed units, followed by sole proprietorship in the MeLarge enterprises. While partnership is prevalent in all size categories in varying degree, registered partnership is conspicuously absent. Interestingly, there is not a single women-owned enterprise in our sample, while women entrepreneurship in the formal manufacturing operations is also scarce at the national level.

The entrepreneurs in the Plastics Industry of Bangladesh have high levels of educational background and the length of their formal education increases monotonically with increase in enterprise size. While the average length of formal education for the overall sample is 13.6 years, it is significantly higher (15.3 years) for the MeLarge enterprises than that (12.6 years) of the MiSmall enterprises indicating higher level of educational attainment of the entrepreneurs. However, none of the entrepreneurs/managing directors seems to have been exposed to specialized training relevant to their businesses.

Relating to the economic circumstances at the start-up time by the entrepreneurs, the MiSmall establishments are observed to have average employment of 17 persons per enterprise as against 156 persons reported by MeLarge enterprises. Excluding the large enterprises, the representative employment size at start for the SMEs as a whole turns out to be 34 persons per enterprise, which is considerably larger than the national average of 20-25 for the SME sector.

The MiSmall enterprises report an average start-up equity capital of Tk. 5237 thousand per enterprise whereas the corresponding average reported by the MeLarge enterprises is Tk. 25646 which is nearly five times higher than that of the former categories. Likewise, whereas the MiSmall units report an average start-up debt finance of Tk. 4808 thousand, the corresponding figure reported the MeLarge categories is Tk. 13937 thousand which is three times that of the MiSmall categories. Equity including retained earnings appears to be the dominant source of start-up capital of choice by the entrepreneurs in the plastics industry. The high dependence of SMEs on “entrepreneurs equity” at the start of their businesses is a general characteristic of the SMEs in Bangladesh and elsewhere.

Own-Account Production (OAP) as opposed to contract manufacturing (CM) is the dominant business model prevalent in the plastics industry of Bangladesh. More than 76% of the sample establishments practice OAM model reflecting great deal of specialization and in-house production system. In terms of both physical units and value of output, the gross output per establishment is significantly higher (by nine times) for the MeLarge groups than the MiSmall categories of establishments practising OAP business models, as expected a priori. Similarly, the average scale of output per establishment is nearly five times higher in the MeLarge enterprises than that of MiSmall enterprises for the CMs. The ratio of gross value added (GVA) to Gross Output (GO) is 31% in the OAP and 35% in the CM business models for all enterprises and the difference in the two ratios is statistically significant. However, the differences in the ratios of GVA to GO in both business models between MiSmall and MeLarge enterprises is small and statistically insignificant.

Based on the type of products produced which spread over a large variety in the Plastics Industry, three major types of processing techniques are used. These are: (i) Injection Molding (ii) Blowing and (iii) Extrusion. The manufacturers are overwhelmingly dependent upon imported machines purchased mostly from China, Taiwan, Japan and South Korea. Only a few simple molds and dices are manufactured domestically, but are of low grades. Lack of modern, high quality mold making and mold design facilities is considered by the entrepreneurs in the industry as a perennial problem affecting product quality and design. Except a few hand tools and equipments, most of the machineries used are either automatic or semi-automatic, though the engineering experts consider the prevailing technology level in the industry to be intermediate and/or low based on their assessment of the various processing techniques used by the manufacturers in Bangladesh.

By comparison, the recyclers are dependent mostly on locally developed technologies which comprises machines, such as, cutter, shredder/grinder, extruders and Pulitzer. These machines are used to convert reusable plastics wastes and pellets into recycled plastic resins.

The technology platform prevalent in the Plastics industry is quite diverse, involving use of core machines and auxiliary machines and equipments. Overall, the average member of machines used is found to vary between 4 to 6 and above; the average number increases systematically with increase in enterprise size indicating both high degree of mechanization and capitalization of the larger enterprises. This is found to significantly influence levels of productivity and productive efficiency of the MiSmall and MeLarge enterprises in the industry.

The Plastics Industry being technology intensive with prominent presence of machine dominated production process, is expected to induce the entrepreneurs to be relatively more concerned with maintaining high technological standards through continuous improvements and up-gradation of technology. A high threshold of research and development (R&D) efforts is thus expected from them. With an overall 12% of the sample entrepreneurs irrespective of enterprise size being involved in R&D activities, their technology improvement and innovative zeal seems to be rather modest.

The analysis of factor proportions and factor productivity situations in the sample enterprises reveals that capital-labour ratio increases systematically with increase in enterprise size from micro to large enterprises. The average capital-labour ratio of the MeLarge enterprises (Tk. 482 thousand) is more than twice the corresponding figure (Tk. 237 thousand) for the MiSmall enterprises. For the overall sample the average is found to be Tk. 321 thousand.

The magnitude of both average physical labour productivity and machine productivity of different size groups of enterprises also reveals similar trends. In both cases, the average, magnitudes tend to increase monotonically with rise in enterprise size. More interestingly, the average capital productivity measured in terms of capital-output ratio also shows clear tendency to rise with firm size.

The analysis of the all important issue of access to finance in terms of access of the sample enterprises to institutional loans, average loan size and interest rates confirms the popular belief that the MiSmall enterprises are not only relatively under-banked they also have to pay more for less loans. As against 39 cases (or 28%), obtaining loan from scheduled banks there have been 44 cases (31.6%) of the overall sample enterprises receiving at least one trade credit during the study period 2006-2007.

The analysis of the relative importance of equity and debt in financing start-up capital requirement shows that while overwhelming proportion (85%) comes from equity capital for all sample enterprises, it is staggeringly high (92%) for the MiSmall enterprises and nearly 80% for the MeLarge categories. A highly unfavourable debt-equity ratio of 15:85 speaks of conspicuous absence of equity capital availability for the SMEs.

Likewise, the Plastics Processing Industry is seen to be adversely affected by short-fall in their working capital provisioning of roughly 32%. The shortfall is relatively high (35%) for the MiSmall establishments compared to that (27%) of the MeLarge establishments. As noted earlier, the average weighted interest rate (14.7%) paid on institutional loans by the MiSmall enterprises during the study period is higher by 2.1% compared to the rate (16.8%) paid by the MeLarge enterprises. More significantly, the MiSmall borrowers are found to be grilled more seriously by the suppliers of trade credit by compelling them to pay a staggering weighted average rate of interest of 25.24% compared to 18% charged from the MeLarge enterprises.

Both MiSmall and MeLarge enterprises in the Plastics Industry Depend overwhelmingly on the wholesalers as marketing channels for selling their products in the domestic market, the respective proportions being 81.4% and 77.6%. The next important channel is seen to be commissioned agents (13.2%) for the MeLarge and miscellaneous channnels (12%) for the MiSmall categories. And as expected, the use of the wholesaler is not without a price tag. Over 81% of the sales for the entire sample is found to be on credit for an average 44 days through paying a premium of 0.43% for taking trade credits from the wholesales. More seriously, payments from the wholesalers are also delayed adding to the woes of liquidity crisis facing the SMEs.

Overall, roughly 54% of the sales revenues generated in the Plastics Industry are seen to be derived through exports, with the residual 46% being derived from sales in the domestic market. One plausible explanation of dominance of export sales is high incidence of enterprises in the overall sample producing garments accessories which are considered as “deemed exports” under governments export policies.

Based on the use of personal computers, internet connection, mobile phones etc. the ICT platform of the sample firms appears to be reasonably broad based, but more wider connectivity is desired to enhance greater efficiency and growth through adding to flexibility, dynamism and competitiveness of their businesses.

More than two thirds of the overall sample enterprises consider their management style to be flat, there being no hierarchical division of managerial functions. The proportion is expectedly much higher (82%) among the MiSmall categories where ownership and management is in most cases characteristically inseparable.

The analysis of elasticities of physical output with respect to employment size and number of machines used by the sample enterprises shows (Table 1.16%) that the labour elasticities with respect to physical output are higher for the MiSmall enterprises compared to those of the MeLarge enterprises. On the contrary, the machine elasticities exhibit reverse results for the two size classes. And as noted earlier, the weighted average capital-output ratio turns out to be 0.75 for the MeLarge enterprises, whereas the corresponding average for MiSmall enterprises is 0.89. This implies higher productivity of capital in the large size categories in the Plastics Processing Industry of Bangladesh.

The results obtained from production function estimates (Table 1.17) reveal that the elasticity of output with respect to labour is significantly higher compared with that of capital. This reinforces our findings in the previous Table and suggests primacy of labour as the key factor of production in the Plastics Industry of Bangladesh.

The average rates of both gross profits and net profits for the overall sample studied is found to be impressively high at 28% and 22.57% (Table 1.20) respectively. Not surprisingly, the rate of return (ROI) is significantly higher on average for the MeLarge enterprises than that of MiSmall enterprises. This is quite expected as the MeLarge enterprises are better capitalized, have secure bank credit lines, better socio-economic network and are much more better organized as production entities.

Among various regulatory factors impacting operations of the business enterprises the imposition of ban on the polythene shopping bags as part of environmental compliance requirement high rates of VAT, income tax and complicacies, involved in issuing trade licenses are noted as the debilitating factors hurting growth of their enterprises.

While suggesting important areas of policy interventions by the Government for helping growth of their enterprises, the major emphasis is seen to be put on reduction of VAT and other duties on imported raw-materials, ensuring adequate and uninterrupted power supply, lower interests on bank loans and transparency in Government rules and regulations by the overwhelming majority of the entrepreneurs.

The econometric exercise conducted for formulation of the growth strategy for the Plastics Industry suggests that a pro-poor growth strategy would require public policy intervention in the following areas:

- Stimulation of demand for labour by the entrepreneurs through keeping the reservation price of labour (i.e. minimum opportunity cost).
- Increased provision of capital, especially for the MiSmall enterprises to ensure better capacity utilization, procure material inputs and hire skilled workers and technicians.
- Stimulation of the demand for capital by the entrepreneurs through lowering the interest rate charges.
- In addition to the above broad public policy areas, some policy measures that need to be put in place to meet special needs of the Plastics Industry include the following:
- Modernization and technological upgradation of the recycling facilities.

- Relocation of the small-scale recyclers from the congested Islambug-Lalbug areas to convenient location outside the city for environmental and work safety considerations.
- Creation/setting up of a Plastics Technology Institute with integrated facilities for research, technological innovation, training and quality control facilities.
- Setting up a separate Industrial Estate/Park for the Plastics Industry with technology as well as business incubation facilities.

A detailed policy metrics is added in the strategic action plan elaborating on the road map for future growth of the plastics industry of Bangladesh.

1.1. Industry Profiles at National Level

The Size of the Bangladesh Plastics Industry

Manufacturing of plastics products currently constitutes a sizeable sub-sector of the national chemical industry of Bangladesh. According to the industry insiders (BPGMEA) and various recent micro studies (Sakib et. al. 2004, Islam, S. 2008, Ahmed M. U. 1998 and 2002, Yusuf, A. M. 2003), the plastics industry consists of roughly over 3000 enterprises which provide direct and indirect employment opportunities to nearly 1 million people.

Another important indicator of the size of the plastics industry is the magnitude of consumption of raw materials by the industry. Since nearly 100% of the polymers are imported in Bangladesh, the quantity of imports may be taken as a good approximation of the consumption of plastics in the country. According to the BPGMEA figure collected form NBR, the value of import of plastics raw materials at current prices increased from Tk. 9549.78 million in 2001/2002 to Tk. 31662.55 million in 2006/2007, registering an annual average rate of growth of over 28 percent. In physical terms, the growth was over 9 percent per annum over the same period with imports rising from 0.196 million metric tons in 2001/2002 to 0.288 million metric tons in 2006/2007.

Based on an estimated 4,38000 tons of plastic resin used by the industry including 175000 tons of virgin resin and 263000 tons of recycled resin in 2005 (BPGMEA, 2008) the per-capita consumption of plastics in Bangladesh is estimated to be 3.37 kg per year. While this is much lower compared to the global average of 20.4 kg and the developed country average of a staggering 80 kg, consumption of plastics is increasing in the country at a rapid pace.

Recycling of plastic wastes has developed into a sizeable industry in the Dhaka City, saving costs of manufacturing and helping waste management. An estimated 60% of the plastic waste was recycled in the country by over 300 small-scale (employing less than 5 workers per unit), informal, and unregistered recyclers providing employment to roughly 20-25 thousand workers and saving US$ 44 million worth of imports in 2005 (Shaheen and Maksudur, 2001 and BPGMEA, 2008). This has important policy implication for upgrading the recycling industries through provision of access to credit, technology, training and marketing services to modernize their production techniques and enhance quantity of recycled plastics materials.

The plastic industries sector is also emerging as an important source of export earnings. During 2006-2007, the total export earnings of the industry stood at Tk. 16367.6 million, of which 41.6 percent was direct exports and 58.4 percent was deemed exports. The deemed export category comprises export items for readymade garments and other export industries which generally include garments accessories and packaging materials. Across the board, the major export items constitute poly bags, polythene sheets, plastic hangers, toys, tooth brush and ball pens. Direct export earnings from plastic products industry shows notable buoyancy recording a percentage increase of over 300 percent of its share in total GDP rising from 0.25% in 2002/2003 to 1.07% in 2006/2007. The export markets spread over twenty two countries of North America, Europe and Asia.

1.2. Selected Features of Bangladesh's Plastics Products Industry

The field survey covered a sample of 139 enterprises from the plastics industry representing roughly 4.6 percent of the total industry population. The sample consists of 86 percent SMEs and 14 percent large enterprises (Table 1.1), reflecting purposive selection of predominantly SME enterprises as delineated in the TOR of the study. The study is basically on six SME sub-sectors though a small sample of large sized enterprises has also been enumerated for purposes of comparing relative performances of the MiSmall and MeLarge enterprises. Out of 139 sample enterprises only 20 are of large size category whereas 119 belong to the SME category.

Table 1.1: Size Distribution of the Sample Enterprises and their Enterprise and Employment characteristics, 2006/2007

Firm size class	No. of Firms	% of total	Average Employment per firm			Employment size per firm
			Production workers	White-collar worker	Others	
Micro	23	16.5	7.28	1.52	0	8.6
Small	69	49.6	16.25	5.26	0	21.0
Medium	27	19.4	79.92	13.65	.04	75.8
Large	20	14.4	242.9	25.7	.40	261.2
MiSmall	92	66.2	13.84	4.26	0	17.7
MeLarge	47	33.8	150.78	18.89	.20	156.4
All	139	100.0	59.16	9.10	.06	63.6

Source: SMEF Survey, 2008

The average enterprise size of the MiSmall enterprises in the sample is 17.7 workers per enterprise while it is 156 persons per enterprise in the MeLarge enterprises. As expected, the MeLarge enterprises also engage greater number of white collar workers compared to the MiSmall enterprises, the average number of the two categories of workers being respectively 18.89 and 4.26 for the two size classes.

Table 1.2 report sex-segregated figures on the number of workers per enterprise and their length of work experience. The incidence of female workers in the Plastics Industry of Bangladesh works out to be roughly around 9% which is negligible by any standard. In the MiSmall enterprises the proportion is 3.46% as compared to 10% in the MeLarge enterprises.

Table 1.2 Sex Segregated Data on the Workers and their Work Experience

Firm size class	Average No. of			Average years of experience of		
	Male workers	Female workers	All	Male workers	Female workers	All
Micro	5.7	.2	8.6	6.2	2.7	6.5
Small	20.4	.75	21.0	6.4	4.1	7.3
Medium	71.5	3.4	75.8	7.1	3.1	8.6
Large	211.7	50.6	261.2	5.5	3.8	10.0
MiSmall	16.7	.6	17.7	6.3	4.0	7.1
MeLarge	131.2	23.1	156.4	6.5	3.5	9.3
All	55.4	8.2	63.6	6.4	3.7	8.0

Source: SMEF Survey, 2008

The average years of work experience of the workers of the overall sample is 8 years which reflects rather young age of the sample enterprises. This is not surprising in view of the fact that the average age of the sample studied is found to be spanned over only 11.6 years.

Geographical distribution of the sample enterprises (Table 1.3) is in close conformity with the pattern of location of the enterprises at the national level. Nearly two-thirds of the plastics products manufacturers in the country are located in Dhaka, followed by a quarter in Chittagong. The same is also true of the sample enterprises. In the Dhaka city, the largest concentration is in parts old Dhaka, especially Lalbagh-Islambagh cluster.

Table 1.3: Geographical distribution of sample establishments in the plastic Goods Industry, 2006/2007

Location	No. of establishments	% of total
Dhaka	90	64.7
Chittagong	34	24.5
Gazipur	6	4.3
Uttara	4	2.9
Savar	2	1.4
Narayongonj	3	2.2
Total	139	100

Source: SMEF Survey, 2008

The major segments of the Bangladesh Plastics Industry consist of ploy bags, hangers for readymade garments, household products, containers and packaging materials, PVC pipes and fittings, PVC shoes and sandals, CD and DVD cassette covers, plastic compounds, films and sheets etc. A notable change in the industry product composition has been strong diversification into production of hangers and various RMG accessories treated as deemed exports under new export policy and PET bottles CD and DVD cassette covers, containers of household and industrial use, toiletries, and engineering products, etc stimulatd by domestic demand growth.

Data in Table 1.4 reveals ownership characteristics of the sample enterprises. Over 70% of the MiSmall enterprises being under sole proprietorship confirm dominance of owner-managed units in the SMEs. The next higher incidence of sole proprietorship is somewhat surprisingly high in the MeLarge categories, though that of private limited ownership is the highest in these size groups as expected a priori. While partnership is prevalent in varying degree across all size categories, registered partnerships is almost conspicuously absent in the overall sample except a single case in the small size group.

Table 1.4: Type of Ownership of the Sample Enterprises

Co. Size	Sole Proprietorship		Partnership		Reg. Partner		Private Limited		Public Limited		Total	
	%	unit	%	unit	%	unit	%	unit	%	unit	No.	%
Micro	96	22	4	1	0	0	0	0	0	0	23	100
Small	64	44	17	12	1	1	17	12	0	0	69	100
Medium	26	7	15	4	0	0	52	14	7	2	27	100
Large	30	6	5	1	0	0	60	12	5	1	20	100
MiSmall	72	66	14	13	1	1	13	12	0	0	92	100
MeLarge	28	13	11	5	0	0	55	26	6	3	43	100
All	57	79	13	18	1	1	27	38	2	3	139	100

Source: SMEF Survey, 2008

Though the overall incidence of women entrepreneurship is relatively low (10-12%) across all industries at the national level, it is totally absent in our sample (Table 1.5) in the plastics processing industry. Indeed women entrepreneurship is yet scarcely visible in the formal manufacturing industries sector of the country as a whole.

Table 1.5: Invisibility of women-owned enterprises, 2006/07

Types of enterprises	% of female-owned enterprises in the total	% of male-owned enterprises in the total
Micro	0	100
Small	0	100
Medium	0	100
Large	0	100
All	0	100

Source: SMEF Survey, 2008

As evidence of entrepreneurial preparation and performance is considered as the defining characteristic of success by Schumpeter in building an enterprise from initiation to steady growth and expansion, three yardstics are used by this study to measure entrepreneurial preparation. These are: (i) number of years of formal schooling obtained by the entrepreneurs; (ii) any specialized academic technical training acquired by the entrepreneur which is directly related with running an enterprise in the concerned industry; and (iii) the duration of such training received by the entrepreneur.

Length of formal education and the extent of acquisition of specialized training obtained by the sample entrepreneur in the Bangladesh Plastics industry is revealed by the data in Table 1.6. Several findings can be noted from the Table. First, the length of formal education of the entrepreneurs increases monotonically with enterprise size with the average duration being 13.6 years for all enterprises. Second, the average educational attainment of the entrepreneurs of MeLarge establishments (15.3 years) exceeds that of the MiSmall categories (12.6 years) by over 20% and this difference is statistically significant. Finally, none of the entrepreneurs/managing directors seems to have been exposed to any specialized training. As a modern science-based industry, successful operation and management of plastics industry requires higher educational background of the proprietors/managers compared to other traditional industries[26]. While the higher incidence of graduates among the sample entrepreneurs meets this criteria, that of specialized training would have certainly enhanced their level of performance.

[26] However, available evidence on the relationship between level of enterprise performance and entrepreneurs' level of formal education is inconclusive. Length of work experience is found to impact directly on the entrepreneurial performance (Ahmed M. U. 1976) quite significantly.

Table 1.6:
Length of formal education and the extent of acquisition of specialized training by the Entrepreneurs in Plastic Industry (Averages)

Firm size class	Average Age of the enterprises since establishment	Average years of formal education by the entrepreneur			% with any specialized training	Average duration of such training (No. of years)
		Mean	Standard deviation	Coefficient of variation (%)		
Micro	11.4	10.4	4.7	221.5	0	0
Small	11.1	13.6	11	123.4	0	0
Medium	12.4	14.3	3.2	443.3	0	0
Large	11.5	16	2	789.7	0	0
MiSmall	11.2	12.6	4.2	297.4	0	0
MeLarge	10.6	15.3	12.9	118.1	0	0
All firms	11.6	13.6	5.2	394.5	0	0

Source: SMEF Survey, 2008

1.2.1. Entrepreneurial Preparation and Practices

Economic circumstances facing the entrepreneurs during the life cycles of their enterprises are discussed next. This is done through discussing the scale of operations at start in terms of size of employment, number of machines and mobilization of start-up capital. The results relating to these variables are presented in Table 1.7. The MiSmall establishments are observed to report an average employment of 17 persons per enterprise against the average headcount of 261 reported by MeLarge enterprises. However, excluding the large enterprises, the representative employment size at start for the SMEs as a whole turns out to be only 34 persons per enterprise. Similarly, while the MiSmall enterprises report an average number of machines of 7, the corresponding number for the MeLarge establishments in the plastics industry is noted to be 37.4.

Table-1.7:
Start-up economic circumstances of the sample establishments in the Plastic Goods Industry

Firm-size	No. of start-up		Total start-up financial capital mobilized(tk-000)			
	employees	machines	Equity/ Retained earning	Bank loans	Non-bank loans	Loans from friends, relatives
Micro	4.6	2.3	1295	975	188	266
Small	19.8	5.3	10443	1993	647	0
Medium	52.1	8.6	13106	6750	0	0
Large	136.1	33.1	35400	16406	0	0
MiSmall	11.1	3.6	5237	1808	399	266
MeLarge	99.4	22.4	25646	13937	0	0
All	21.3	5.8	7586	11620	377	266

Source: SMEF Survey, 2008

The MiSmall units report an average start-up equity capital of Tk. 5237 thousand per enterprise. Whereas the corresponding equity for MeLarge units in the plastics industry is noted to be Tk. 25646 thousand. Similarly, whereas the MiSmall units in the industry report an average start-up debt of Tk. 4808 thousand, the corresponding figure for the MeLarge establishments is reported to be Tk. 13937 thousand which is three times that of the MiSmall establishments.

As shown later in Table 1.23, equity including retained earnings appears to be dominant source of start-up capital of choice among the entrepreneurs in the plastics industry. Use of debt or access to debt from the institutional sources is quite negligible. The particularly high dependence of the micro, small and medium establishments on the entrepreneurs' equity at the start of business enterprises is a general characteristic of the SMEs in Bangladesh[27].

Table 1.8:
Differences in specialization: own-account production versus contract manufacturing in Plastic Goods Industry, 2007

Firm size classes	Proportion of units that are in engaged in				No. of products and bye-products	
	Own-account production (OAP)	Contract Manufacturing (CM)	Others	Total	Average no. of main products produced	Average no. of bye-products
Micro	64	24	12	100	2.2	0
Small	75	20	5	100	2.3	0
Medium	77	11.5	11.5	100	1.7	0
Large	90	10	0	100	1.7	0
MiSmall	72	21.5	6.5	100	2.3	0
MeLarge	82.5	11	6.5	100	1.7	0
All firms	76.5	16.4	7.1	100	2	0

Source: SMEF Survey, 2008

1.2.2. Business Model Differences: Own-Account Manufacture (OAM) versus Contract Manufacturers (CM)

The OAM categories of producers are those who implement each of the stages of the life-cycle of being a manufacturer, i.e. conceiving business idea, making business plans, setting up production units, buying raw materials, accessing finance, setting production batches, fixing price and marketing the final products. If all these can be done successfully making the business profitable the entrepreneur may be deemed to have a proven track record. By comparison, a CM is a business model in which the manufacturer essentially works as an agent of a third party without having to take risks and face much of uncertainty. He is basically a final stage player in the manufacturing process who produces according to product specifications and standards and negotiates a price leaving him a positive margin of profits over unit cost of manufacturing. The third type is the "others" category who are involved in dual-mode businesses doing both own-account production and contract jobs and being a producer as well as a part-time trader of items similar to those that he also manufactures.

We can observe from Table 1.8 that own-account production is the dominant business model prevalent in the plastics products industry of Bangladesh. More that 76 percent of the

[27] A survey of empirical evidence on the issue is available in Ahmed, M. U. (1984 and 1987).

sample establishments practice this model of business reflecting great deal of specialization and in-house production system. While a paultry 16 percent are seen to be involved in contract manufacturing an insignificant 7 percent belong to the other "category. We can also note that the difference between the MiSmall and MeLarge size groups of establishments is of the order of less than 10% in respect of respective proportions of OAP in their total numbers. Interestingly, the practice of OAP business model is seen to be positively associated with size of enterprises. The last column of the Table informs us that the average number of main products manufactured by the sample enterprises in various size categories is 2, there being no by-products.

Tables 1.9 and 1.10 report scale of output per establishment and the value of gross output produced by them arranged in order of their sizes, ranging from micro to large. For the OAPs, physical output per establishment for the MiSmall and MeLarge establishments are respectively 162.6 and 1525.3 units. For all OAPs, the physical output per establishment is found to be 668.7 units. By comparison, the average scales of output for the CMs are systematically low (except for the micro size group) and mostly significantly low. Thus, physical output per establishment for the MiSmall and MeLarge CMs are respectively 119.9 and 587.3. Both sets of mean differences per establishment between the MiSmall and MeLarge establishments are statistically significant. Likewise, the value of average gross output per establishment for the MeLarge size groups among the OAPs is Tk. 242.52 million compared to Tk. 25.86 million for the MiSmall size class, i. e. is more than 9 times as large.

Table 1.9 :

Differences in scales of output between own-account productions versus contract manufacturing in the Plastic Product Industry, 2006 / 2007

Firm size classes	Average scale of output per unit in (physical units) (000)				No. of producers		
	Own-account production	Contract manufac-Ture	Others)	Total (avg)	Own account producers	Contract manufacturers	Others
Micro	42	45.8	19.6	40.0	14	12	9
Small	195	151.7	65.1	180.6	52	28	9
Medium	895.2	611	634.4	834.6	21	6	9
Large	2260.4	551.5	0	2089.5	18	4	0
MiSmall	162.6	119.9	42.3	145.5	66	40	18
MeLarge	1525.3	587.3	634.4	1367.6	39	10	9
All firms	668.7	213.4	239.7	786.2	105	50	27

Source: Six Sector Studies Survey, 2006/07

Table 1.10:
Average value of Gross Output by different types of establishments, 2006/2007

Firm size classes	Value of gross output per establishment, across three types (Tk. Million)			
	Own-account producers	Contract manufacturers	Others	All
Micro	6.67	7.28	3.11	6.36
Small	31.02	24.12	10.35	28.72
Medium	142.33	97.17	100.87	132.71
Large	359.41	87.68	0	332.24
MiSmall	25.86	19.06	6.73	23.13
MeLarge	242.52	93.37	100.87	217.45
All	106.33	33.93	38.11	125.01

Gross value added as percentage of gross value of output, 2006/2007

The average scale of output per establishment for the CMs of the MeLarge size class at Tk. 93.37 million is nearly 5 times higher than that (Tk. 19.06 million) of the MiSmall size class. The upshot is that the average unit values of the products of the MiSmall category of establishments are significantly lower compared with that of MeLarge establishments.

Information on gross value added (GVA) relative to gross output (GO) by OAP and CM business models is presented in Table 1.11. The ratio of GVA to GO is 31% in the OAP and 35% in CM establishments for all enterprises and the difference in the two ratios is statistically significant. However, the difference in the ratios of GAV to GO in the two business models between the MiSmall and MeLarge enterprises is rather small and thus statistically insignificant. The same alsoholds true and case of the "Others" category where the GVA ratio to GO between the two size categories is small, though it is significantly higher for the overall sample i.e. 40% compared to 31% for the OAPs and 85% for the CMs.

Table 1.11:
Gross value added relative to Value of gross output, per establishment, across three types of establishments (%)

Firm size classes	Gross value added relative to Value of gross output, per establishment, across three types of establishments (%)			
	Own-account producers	Contract manufacturers	Others	All
Micro	32.7	32.4	27.4	32.0
Small	30.4	36.0	50.7	32.4
Medium	29.4	25.0	41.8	30.4
Large	33.2	52.2	0	35.0
MiSmall	30.9	34.8	39.0	32.3
MeLarge	31.2	35.9	41.8	32.4
All firms	31.0	35.0	40.0	32.0

Source: SMEF Survey, 2008

Conceptually, technology embraces (i) manufacturing process; (ii) product functionally, durability and user convenience; (iii) product asthetics; and (iv) the asthetics and environmental dimensions of product packaging.[3] Technological capacity is thus a critical determinant of competitive efficiency. The role of technology has assumed particularly greater importance in the globalised production and market environment where the competition is fierce. Access to profitable technology is difficulty, because it is proprietary in nature and inherently costly because of information asymmetry and other imperfection affecting its markets. Public policy intervention of thus needed to fill the competitive technological gap facing the SMEs because of scale barriers and resource constraints.

1.3. Technology Platform in the Plastics Products Industry of Bangladesh.

Technology platform is meant to describe the technologies of production in use and the factor proportions prevalent in the plastics industry sector. Conceptually, technology embraces (i) manufacturing process; (ii) product functionality, durability and user convenience; (iii) product asthetics; and (iv) the asthetics and environmental dimensions of product packaging.[3] Technological capacity is thus a critical determinant of competitive efficiency. The role of technology has assumed particularly greater importance in the globalised production and market environment where competition is fierce. Access to profitable technology is difficult, because it is proprietary in nature and inherently costly because of information asymmetry and other imperfection affecting its markets. Public policy intervention is thus needed to fill the competitive technological gap facing the SMEs because of scale barriers and resource constraints.

1.3.1. Production Techniques in the Plastics Industry

Given a large variety of products produced and a wide range of processing techniques used for converting plastics materials into products of daily use, there exists a broad spectrum of technological alternatives in the industry. For example, while a giant PVC Pipe manufacturer or a industrial parts and spares producer uses state of the art technology (highly sophisticated and automated computerized machines), a tiny unit producing potes ad pans does everything mostly using a hand operated molding machine.

As noted earlier, the plastics products are used in a wide range of applications, such as, garments accessories, household wares, packaging, building and construction materials, electrical and electronic equipments, industrial equipments and spares and products of agricultural and medical use. Based on the type of products produced, the three major types of processing techniques used in the industry include: (i) Blowing, (ii) Extrusion; and (iii) Injection Molding[4]. The plastics products manufacturers are overwhelming dependent upon imported technology and the machines are imported mostly from China, Taiwan, Japan and South Korea. Only a few simple molds and dices are produced domestically. Except a few hand tools and equipments, most of the machineries used by the plastics products, manufacturers are either automatic or semi-automatic. Nearly 60% of the respondents report that they use automatic machines, followed by 30% reporting use of semi automatic

[3] Details on these theoretical aspects of technology regime including access to profitable technology by different size of enterprises are succinctly discussed by Chowdhury, N. in the report on Designed Goods Indusry.

[4] Details on these theoretical aspects of technology regime including access to profitable technology by different size of enterprises are succinctly discussed by Chowdhury, N. in the report on Designer Goods Industry.

[5] Detailed illustration of plastics processing techniques by using these machines is available in Islam M.S. (2008).

machines and another 6% reporting use of manually operated machines. However, engineering experts of BUET consider the prevailing technology level in the industry to be intermediate and/or low, based on their assessment of the processing techniques used by the manufacturers.

By comparison, the recyclers are dependent mostly on locally developed technology which comprises machines, such as, cutter, shredder/grinder, extruder and pellitzer. These machines are used to transform plastic wastes and pellets into recycled plastic resins.

The diversity implicit in the prevailing technology platform in the Plastics Processing Industry of Bangladesh is exhibited by Tables 8.12 and 8.13. It is observed from Table 1.12 that the core machines used by the sample entrepreneurs include injection molding, blow molding and extruders; the remainder are auxiliary machines and equipments used for different auxiliary processes such as mixing, cutting, cooling, compressing, crashing and printing etc. Overall, the average number of core machines used is seen to vary between 4 to 6 and above. For the MiSmall category, the average number of machine used per enterprise is significantly lower (3 to 4) than that (8 to 10) used by the MeLarge enterprises. As expected a prori, the number of machines used per enterprise increases systematically with the size of enterprises, except in case of the use of extruder machines for manufacturing of PVC based products. In this case, our sample might be slightly biased towards covering more of PVC shoes and sandal producers who are dominantly small-scale operators.

Table 1.12:

No. of machines/equipment per establishment in the Plastic Goods Industry

Machine Name	Micro	Small	Medium	Large	MiSmall	MeLarge	All
Injection Molding m/c	1.5	2.8	6.8	11.5	2.5	8.1	4.7
Hand M/c	3.7	8.4	45	50	5.8	47.5	12.2
Rotational/vertical/tooth brush/other	4	2.76	7	10.6	3	10	6.8
Recycle m/c	0	0	0	1	0	1	1.0
Pvc M/c	1	4.5	0	0	3.8	0	3.8
Filling Blow m/c	2.6	3.5	5.6	13.9	3.4	9.2	6.2
Blow Molding m/c	0	2.7	8	11	2.7	9.5	4.4
Granule M/c	2	3.4	2	0	3.2	2	3.0
Roller m/c	2	1	0	0	1.5	0	1.5
Mixing M/c	1.3	1	0	1.4	1.2	1.4	1.3
Cutting M/c	1.6	1.9	2.4	10.6	1.84	6.3	4.0
Chilling M/c	1	2	6.2	7.1	1.3	6.9	5.9
Compressors M/c	1	1.3	2.7	9.7	1.3	5.7	4.2
Cooling M/c	1	1.4	2.8	4.2	1.3	3.3	2.6
Mold	8.2	35.7	8.5	116.7	30	54.8	36.7
Crasher	0	1.6	6.5	1.5	1.7	4.0	3.0
printing	1	1.5	1.7	2.3	1.5	2.0	1.8
Hooper	1	0	3	2	1	2.5	2.0
hit/molding/punching	1	2	2.4	3	1.6	2.8	2.5
Side Sealing	0	1.5	1.2	3	1.5	1.5	1.5
Auxiliary other	0	0	5	31.7	0	21.0	21.0

Source: SMEF Survey, 2008

Table 1.13:
Average Price Per Unit of Machinery Used in the Plastic Goods Industry (Tk000)

Machine Name	Micro	Small	Medium	Large	Mismall	Melarge	All
Injection Molding m/c	877	1500	2110	6100	1495	3250	2178
Hand M/c	10	15	13	22	12	17	16.7
Rotational/vertical/tooth brush/other	300	1312	9000	8668	1110	8723	5263
Recycle m/c	0	0	0	2900	0	2900	2900
Pvc M/c	250	547	0	0	488	0	488
Filling Blow m/c	528	1389	1741	5323	1258	3293	2227.5
Blow Molding m/c	0	925	4000	2000	925	3000	1616.7
Granule M/c	170	250	300	0	236	300	245.7
Roller m/c	600	400	0	0	500	0	500
Mixing M/c	45	216	0	1100	130	1100	373
Cutting M/c	180	604	715	1769	535	1223	855.6
Chilling M/c	62	300	342	868	141	677	562.5
Compressors M/c	120	131	723	1138	130	960	684
Cooling M/c	80	200	288	492	185	342	287.8
Mold	23	121	70	458	101	236	137.5
Crasher	0	136	207	400	136	303	232
printing	600	1717	1976	3741	1358	2824	2466.3
Hooper	25	0	50	300	25	175	125
hit/molding/punching	400	625	480	1032	550	802	752
Side Sealing	0	840	1000	1340	840	1170	1343.3
Auxiliary other	280	425	540	800	352	670	597.5

Source: SMEF Survey, 2008

The information on the unit prices of the machines used by the sample enterprises is contained in Table 1.13. The average unit price of the machines used by different enterprise size groups is also observed to vary positively with enterprise size, perhaps because of both larger number of machines used and the higher degree of sophistication of such machines.

The research and development (R&D) efforts made by the entrepreneurs across various size groups of firms in the Plastics Industry appears to be modest (Table 1.14). Overall, 12 percent of the sample units are seen to be involved in R&D activities and the manpower engaged carrying this function varies between 2 to 4 persons per enterprise.

Table 1.14:
Research and development Efforts of the Entrepreneurs

Firm size	% of total unit in R&D	Avg. number of employee	Amount of annual expenses (000)	% of revenue
Micro	13.0	1.3	51	1.2
Small	10.1	2.9	215	0.9
Medium	18.5	2.4	50	0.0
Large	10.0	4.0	4800	0.4
MiSmall	10.9	2.4	168	1.0
MeLarge	14.9	2.9	2425	0.2
All	12.2	2.6	670	0.8

Source: SMEF Survey, 2008

In terms of annual expenses made for R&D functions the MeLarge enterprises stand out as the clear leaders, followed by the MiSmall categories, this is quite understandable given the relative financial standing of the two size classes of firms. The highest percentage of revenue expenditure observed for the micro enterprises is explained by the very low revenue base relative to the revenue expenditure on research committed by one single enterprise in the size class.

Tables 1.15 through 1.20 shows factor proportions and factor productivity situations pertaining to the Plastics Products Industry of Bangladesh. Analysis of these issues is of critical importance to identify efficiency of factor utilization in a situation of resource scarcity, especially capital, affecting developing countries like Bangladesh. Theoretically, countries with abundant labour and scarce capital, would choose labour-intensive production techniques to ensure optimum utilization of resources. However, higher productivity of both labour and capital being by assumption outcomes of relatively more mechanized and hence more capital-intensive technologies involve trade-offs and pertinent policy decisions reflecting policy priorities.[5] It is thus important that we carry out an exhaustive analysis of the relative factor intensity and factor productivity issues in the Bangladesh Plactics Industry.

Table 1.15:

Capital-labor ratios and physical productivity in Bangladesh's Plastic Goods Industry, 2006/2007

Firm-size	Capital per worker (Tk-000)	Labor productivity	Machine Productivity
Micro	229	6812	23282
Small	243	7853	33803
Medium	438	10636	57654
Large	542	8501	91078
Mismall	239	7593	31173
Melarge	482	9728	71877
All	321	8315	44936

Source: SMEF Survey, 2008

Table 1.15 reports capital-labour ratios and average physical productivity of labour and machine. The use of the capital labour ratio is indicative of how efficiently scarce capital is combined with relatively abundant labour in generating value added in the Plastics Product Industry of Bangladesh. Capital is measured in terms of value of fixed assets used by the enterprises. Fixed capital stands for the replacement cost of plant and machineries plus the value of other support capital stock,such as, vehicles, generators, furnitures and fixtures, several findings worth reporting emerge from the Table.

First, capital labour ratio is found to increase persistently with increase in enterprise size from the 'micro' to 'large' enterprise size. The average capital labour ratio of MeLarge enterprises (Tk 482 thousand) is more than twice the corresponding figure (Tk. 239 thousad)

[5] However, use of total factor productivity in place of partial indicators of factor intensity, evidence of factor substitution possibilities, and use of sophisticated and dynamic production function analysis have, to a large extent, resolved these controversies.

for the MiSmall enterprise size class and the difference is statistically significant. For the overall sample, the average capita-labour ratio is Tk 321 thousand.

The next column in the Table exhibits weighted average labour productivity in units of the homogenous outputs for the industry. It is obtained by dividing, for each size group, total physical output, by the corresponding sum of the firms' employment. Likewise, average machine productivity is obtained dividing, for each size group, total physical output by the corresponding sum of firms' number of core machines.

Interestingly, the magnitude of both average labour productivity and average machine productivity among different size class reveals similar trends. In both cases, the average magnitudes tend to increase systematically with increase in size except for labour productivity for the large size class. However, the averages for the MeLarge are significantly higher than those for the MiSmall and for the average of the entire sample. The margin of large advantage in average labour productivity over that of MiSmall is 28% and in case of machine productivity the margin of the MeLarge advantage is of a staggering 120%.

We turn next to discuss the technology regime in greater details by moving to examine them in terms of their underlying production function characterists.

1.3.2. Production Function and Productivity Analysis Marginal Physical Productivity

The discussion of technological characteristics of the sample firms cannot be complete without discussing their underlying production-function characteristics. This is done through fitting both Cobb-Douglas (CD) and Trans-log (TL) production functions to the data.

CD has been the functional form of a production function of the longest standing in the applied economic literature. This is fitted using the following formulation:

$$Q = AL\alpha k(d-1) \quad . \ . \ . \ . \ . \qquad (1)$$

Where Q represents level of output;
A represents in abstract sense, the state of technology,
L represents the amount of labour used by the technology
K represents the amount of capital used by the technology

Through using a suitable logarthnic transformatio jof equation (1) we obtain

$$Ln(Q) = LnA+\alpha LnL+\alpha\text{-}1(Lnk) \ldots\ldots\ldots\ldots\ldots(2)$$

Alternative production functions include the Cobb-Douglas and Constant Elasticity of Substitution (CES) production functions. The CD is given by:

$$Ln\alpha j.t=\beta iLn\times jit\text{-}\mu jt+Vjt \ldots\ldots\ldots\ldots\ldots(3)$$

All inputs are preferably measured in physical units. Thus Q is measured for Plastics Industry in terms, (such as dozens of Hangers or pieces of containers etc.), L is measured using person-years and capital in capital-years. With a CD function, the return to scale is unity and the elasticity of substitution between labour and capital is also equal to unity, several studies in Bangladesh (quoted in Chowdury, N. 2008) have successfully used CD formulation to estimate returns to scale in several Bangladesh industries.

A more flexible form of production function is the Trans-log Production Function. The most frequently used trans-log function is a second order log-linear form. It is a relatively flexible functionrial form, as it does not put restrictions of constant elasticities of production nor elasticities of substitution between inputs.

In general terms, this can be expressed as:

$$LnQjt=\beta tLn\times jit+\frac{1}{2}(\sum_{i}\sum_{k}\beta ikLn\times ji.t-\mu jt+Vjt.....................(4)$$

where Qjt is the output of the establishment in period t and Xjit are the variable and fixed establishment inputs (ik) to the production process. The error erm is separated into two components, where Vjt is the stochastic error term and µjt is an estimate of technical efficiency.

Results Obtained from Estimation of the Function

Of both CD and TL functions, two alternative versions of each function is implemented. In the traditional CD functional form, output is said to be a function of just labour and capital. Labour in this case refers to total workers including but production and non-production (white collar) workers. Capital refers to replacement cost of fixed assets as defined earlier. The alternative functional form used introduces a third variable which is the aggregate of material inputs that include raw-materials of all kinds used in production. Each production function is estimated in one of three alternative versions; the main differentiator among the three being whether we measure output in physical or value terms. Where output is in physical terms, it is measured in units of homogenous output as discussed earlier. In that case labour and material inputs are also measured in physical terms, i.e. labour in person year and inputs in units of homogenous-inputs. Fixed capital is always measured in money terms.

In estimating the production function in TL forms having three explanatory variables we mean that there are in all nine variables on the right hand side of the production function form (excluding the constant term). The following Table (............) presents the estimated coefficients of both forms of the production function.

Table 1.16 discusses the elasticities of physical output with respect to employment size and number of machines in use per enterprise in the sample. Estimates are invariant with respect to number of units. These estimates are obtained by multiplying estimates of LP or MP as the case may be by the inverse of the ratio of the average (at arithmetic mean level) to the corresponding output. For this purpose, heterogonous

Table 1.16:

Elasticities of Physical Output with Respect to Labour and Machine

Enterprise Size	Labour Elasticity	Machine Elasticity
Micro	1.16	0.00
Small	1.32	0.81
Medium	2.03	0.51
Large	0.25	0.32
MiSmall	1.24	0.90
MeLarge	0.44	1.06
All	0.66	0.58

Source: SMEF Survey, 2008

output has been first expressed in 'equivalent units'. These estimates are, inter alia, fully comparable across various enterprises within the industry. While the labour elasticities with respect to physical output are higher for the MiSmall enterprises compared to those of the MeLarge enterprises the machine elasticities exhibit reverse results for the two size classes.

Table 1.17 informs us about the weighted average capital-output ratios across various enterprise sizes in the Plastics Industry of Bangladesh.

Table 1.17 :
Weighted Average Capital-Output Ratios of the Sample Enterprises By Size Groups

Enterprise Size	Capital-Output Ratios
Micro	0.93
Small	0.87
Medium	0.70
Large	0.83
MiSmall	0.89
MeLarge	0.75
All	0.84

Source: SMEF Survey, 2008

For the entire sample, the weighted average capital-output ratio (COR) turns out to be 0.84. The corresponding average for the MiSmall enterprises is found to be 0.89 compared to the corresponding average of 0.75 for the MeLarge enterprises. However, the medium sized enterprises appears to be the most efficient user of scarce capital returning the lowest COR of 0.70.

Production Function and Productivity Analysis:

Having discussed CLR and COR, we present next the results obtained from fitting production functions of the Cobb-Donglas form to the data. The results obtained from the CD production function estimates are presented in Table 1.18. The dependent variable is the natural log of the gross value of output. The independent variables are natural log of the number of workers employed, natural log of capital employed, and natural log of homogenous-unit inputs used by the enterprises.

Table 1.18:
Coefficients of Production CD Production Function Elasticity of Output With Respect to Labour and Capital)

Independent Variables	Cobb-Donglas Multiple Equation Estimation	
	Regression Coefficient	t-statistics
Constant	4.30*	26.67
L	0.172*	4.45
K	0.065*	2.2
I	0.756*	35.03
R^2	0.97	
F-statistic	145.0	

Source: SMEF Survey, 2008

Each of coefficients presented in the Table returns values that are statistically significant and have the expected signs. The elasticity of output with respect to labour is significantly higher compared with that of capital. This suggests the primacy of labour as the key factor of production in the Plastics Processing Industry of Bangladesh[28].

Next, we turn to examine the hypothesis of the constancy of the returns to scale in the Plastics Industry of Bangladesh. We use the CD function for the purpose which also reveals the underlying production function characteristics of the sample firms.

CD has been the functional form of a production function of the longest standing in the applied economic literature. This well-known function is represented by the formulation:

$$Q = AL^{\alpha}K^{(1-\alpha)} \quad \text{...}(1)$$

Where Q represent the level of output;

A represents, in an abstract sense, the state of the technology;

L represents the amount of labour used by the technology;

K represents the amount of capital used by the technology.

With a suitable logarithmic transformation of the equation (1), we get

$$Ln(Q) = LnA + \alpha LnL + (1\text{-}\alpha)LnK \quad \text{..................................}(2)$$

Alternative production functions include the Cobb-Douglas and CES (Constant Elasticity of Substitution) production functions. The Cobb-Douglas production function is given by:

$$\ln Q_i = \beta_0 + \sum_j \beta_j \ln X_{j,i} + \varepsilon_i$$

All inputs are preferably to be measured in physical units. Thus Q will be measured for the light engineeringindustry using physical units (eg yards or pieces), L will be measured using person-years and capital in capital-years.

With a CD production function, the returns to scale is unity, and the elasticity of substitution between labour and capital is also equal to unity. There have been a large number of studies using Bangladeshi data of whether the Cobb-Douglas formulation remains a relevant representation of the underlying technological relationship between input and output in several industries.

A more flexible form of production function that is worth considering here is the Trans-log Production Function. The most frequently used being a translog function, which is a second order (all cross-terms included) log-linear form. This is a relatively flexible functional form, as it does not impose assumptions about constant elasticities of production nor elasticities of substitution between inputs. It thus allows the data to indicate the actual curvature of the function, rather than imposing *a priori* assumptions. In general terms, this can be expressed as:

$$\ln Qi = \beta 0 + \sum_j \beta j \ln Xj,i + \frac{1}{2}\sum_j \sum_k \beta j,k \ln Xj,i \ln Xj,k + \varepsilon_i$$

where Q_j is the output of the establishment *j* in and $X_{j,i}$ and $X_{j,k,}$ are the variable and fixed establishment inputs (*i*,*k*) to the production process.

[28] The findings for the other five sub-sectors in this respect is also the same, reinforcing the argument that labour is the critically important factor of production in these industries.

Empirical Implementation of the Production Function

Of both the CD and TL production functions, we implement two versions each. The first of these is a traditional CD functional form, in which output is said to be a function of just labour and capital. Labour in this case is about all kinds of labour, including the white collar workers too in the mix. Capital is about fixed capital. The alternative functional form throws into the melting pot a third variable, namely, the sumtotal of material inputs. Such inputs include raw materials of all kinds that have been used in production. We estimate each of the production functions in one of three alternative versions, the chief differentiator among these three is whether we measure the 'output' in physical or value terms. Where output is in physical terms, the dependent variable is measured in units of the homogeneous-output already talked about. In that case, labour and inputs are also measured in physical terms---labour in person-years, and input in units of homogeneous-inputs.[29] Fixed capital is always measured in monetary terms. When it comes to estimating the production function in TL forms, having three explanatory variables mean that there are in all nine variables on the right hand side of the production function form (not counting the constant term). Table 1.19 reports the empirical results.

Table 1.19:
Coefficients of production functions (of various kinds), 2006/2007

Explanatory variable	Cobb-Douglas: single equation estimation		Trans-logarithmic: single equation estimation	
	Regression coefficient	t-stat	Regression coefficient	t-stat
L	0.682	6.02	0.432	1.207
k	0.380	4.28	0.085	0.293
I			0.405	2.878
L*L			0.058	0.639
K*k			-.005	-.117
I*I			0.078	2.885
L*K			0.018	0.303
L*I			-.077	-2.31
K*I			-.003	-.120
R^2	0.696		0.973	
F-ratio	155.98		508.4	
L=labor=capital, I=input				

Source: SMEF Survey, 2008

Estimates of the regression coefficients from a CD functional form are also estimates of the elasticity of the function with respect to those arguments of the function. Output has an elasticity of 0.68 with respect to labour, and of 0.38 with respect to capital. The F-ratio---which is a summary measure of how well-specified the functional form under review is for the data on hand for the most parsimonious form of the CD function is the higherst, at 156.0. After we throw 'input' into the mix, the F-statistics, rises dramatically, to 1451.0. This implies that the 'extended version' of the CD functional form is far more preferably compared with the earlier, parsimonious version.

[29] Once again, we use price relatives, this time for inputs, in order to 'chain' comparator inputs into units of 'benchmark' input.

According to the Cobb-Douglas specification, the returns to scale is constant. Both coefficients are highly significant and intuitively signed. The TL function too is fairly well-behaved, with most of the coefficients being intuitively signed and statistically significant.

TL functional form does not add to the r-squarred, but it subtracts from the F-ratio. Overall, the CD functional form is the best-fitting among all alternatives considered.

We also test for whether returns to scale are constant in this industry. The steps adopted leading up to the test are as follows:

Estimating returns to scale in the plastics goods industry of Bangladesh

Some production functions are linearly homogeneous of degree one. A production function is linearly homogeneous of degree one when doubling the quantity of each input in the production function also doubles the output that can be obtained from it. Alternatively put, the returns to scale on a linearly homogeneous production function of degree one are also unitary. In such a case, returns to scale are also said to be constant. It is of some importance to be testing the foregoing two estimated production functions for the constancy of the returns to scale. It is now to this that we turn. We now test for whether returns to scale are constant in this industry. The steps adopted leading up to the test are as follows:

The hypothesis of constant returns to scale is $\hat{\beta}_L + \hat{\beta}_K = 1$
The F statistic for the hypothesis of a Cobb-Douglas model is

$$F = \frac{\left(\hat{\beta}_L + \hat{\beta}_K - 1\right)^2}{Var(L) + Var(K) + 2 \times Cov(L, K)}$$

The following table (8.20) shows that in both cases (of versions 1 and 2), the calculated value of the F statistics is much, much lower than the critical value. We can’t reject the null hypothesis of returns to scale being constant and unitary for light engineeringindustry.

Table 1.20

Sector	F statistic Version 1		F statistic Version 2	
	F value	Critical value	F value	Critical value
Plastic goods industry	0.0056	3.93	.0084	3.07

Source: SMEF Survey, 2008

For this industry, we find that the null hypothesis that returns to scale in it are constant can not be rejected. Increasing returns to scale are not proven for the light engineeringindustry. Let us now turn to discuss the results from multivariate regressions that seek to explain the drivers of labour-productivity. The point of this exercise is to see if we can a number of diagnostic variables that affect, one way or the other, gross value added per worker across the enterprises in the sample in the Plastics Industry. A glossary of the explanatory variables may be useful. Education relates to the education of the Managing Directors. Bank loan, cluster, automation, OAP, micro, Dhaka, Chittagong are all dummy variables, taking either 1 or 0 as values. Capital relates to fixed capital per worker. Results are discussed based on regression coefficients that are statistically significant at least at 10% error probability level (using * and ** signifying significance at 5% and 10% levels, respectively): Table 1.21 reports the results. As observed Table 1.21, labour productivity is significantly positively driven by automation, and to a certain extent by product price. Firm's age, workers' experience, Chittagong locational dummy and micro dummy variable each has a negative coefficient on the LP function.

Table 1.21:
Determinants of Labour productivity

	Gross value added in Taka		Gross value of output in Taka	
Variables	**Co-efficient**	**t-statistics**	**Co-efficient**	**t-statistics**
constant	3.62	1.445	6.795	2.882
owners education	-.001	-.056	-.006	-.572
own account	-.038	-.182	.168	.847
Age of unit	-.017	-1.701	-.018	-1.968
Workers experience	-.072	-2.078	-.057	-1.745
cluster	-.095	-.494	.118	.648
Bank Loan	.232	1.180	.326	1.760
Auto Machine	.394	2.154	.542	3.15
Fixed capital per employee	.000	.625	.000	.249
% of output exported	.335	1.549	.375	1.845
Dm(Micro)	-.655	-1.696	-.319	-.877
Dm(Small)	-.295	-.979	-.098	-.345
Dm(Medium)	.095	.304	.229	.776
Dm(Dhaka)	-.407	-1.266	-.593	-1.963
Dm(Chittagong)	-.285	-1.760	-.276	-1.813
Average product Price	.023	1.546	.008	.594
input_import	.566	1.473	.585	1.617
R2	.361		.410	

Source: SMEF Survey, 2008

Finally, stochastic frontier function (SFF) was estimated to determine the value of the efficiency frontier of the sample enterprises in each industry to ascertain the distance from the SFF and also calculate the productivity deficit of the sample observations from the frontier[30]. In case of Plastics Industry, bank loan, increase in product price, locations in Dhaka and Chittanong etc. were found to be important factors affecting distance from the efficiency frontier and determining the efficiency levels.

1.4. Access to Finance

The all important issue of access to finance of the sample enterprises is analysed in the context of three important variables to give us a framework of discussion. These include: (i) size structure of loans; (ii) structure of interest rates; and (iii) structure of trade credit. We discuss these indicator variables in turn.

1.4.1. Structure of Loan Sizes

Table 1.22 provides information on the number and proportion of the sample enterprises with access to institutional loans, average size of loans and average interest rates.

[30] Interested readers are referred to Chowdhury, N. (2008) for details on the SFF estimation procedures and industry-wise results obtained from the analysis. Table 8.20 reports ratio

Table 1.22:
Structure of institutional loans taken by establishments in Plastic Goods Industry, 2006/07

Firm-size	%of loan taker	No. of loan taker	Avg loan size	Interest (%) Rate
Micro	17	4	750	17.1
Small	33	23	1975	16.4
Medium	67	18	16253	15.1
Large	75	15	43367	14.2
Mismall	29	27	1794	16.8
Melarge	70	33	28577	14.7
All	43	60	16525	15.5

Source: SMEF Survey, 2008

The proportion of enterprises that has obtained a loan from at least one scheduled bank or leasing company during the study period is 28% - overall there have been 39 cases of establishments taking a bank loan.

There seems to have been significant dispersion of loan sizes and interest rates around both of these averages with regard to the enterpise size variable. In comparison with MiSmall size class, medium and large groups (the MeLarge categories) have significantly larger bank loan contacts: Tk. 40017 thousand vs. Tk. 1874 thousand.[6] The average provisioning of bank loan for the MeLarge establishments is more than 20 times as large as for the MiSmall enterprises. More importantly, while the MiSmall enterprises are dwarfed in terms of the loan sizes, the average rates of interest paid by them (17.2%) are significantly higher than those paid by the MeLarge enterprises (15.1%). The implication is that the MiSmall enterprises are not only relatively under-banked, they also have to pay more for less loans.

Table 1.23:
Structure of non-institutional loans by establishments in Plastic Goods Industry, 2006/07

Firm-size	No. of loan taker	%of loan taker	Avg loan size(Tk-000)	Interest (%) Rate
Micro	3	13	733	17.0
Small	8	11.6	1513	15.3
Medium	5	18.5	3650	13.0
Large	1	5	9000	11.0
Mismall	11	12	1300	14.1
Melarge	6	12.8	4541	14.8
All	17	12.2	2444	14.3

Source: SMEF Survey, 2008

Table 1.23 informs us about the proportion of enterprises having non-institutional loans, average loan size and average interest rates paid on such loans. Among the sample enterprises in the Plastics Products Industry that has taken at least one non-institutional loan is 12.2%. Overall, there have been 17 cases taking a non-institutional loan. The average size of a non-institutional loan has been Tk. 2444 thousand. While there have been significant differences in the average loan contacts by the MeLarge (Tk. 4541 thousand) and MiSmall establishments (Tk.1300 thousand), the rates of interest paid by both size categories are seen to be statistically almost same.

[6] These averages are calculated based on only the cases where a loan contact was actually issued to the sample enterprises.

Table 1.24:
Structure of trade credit availed by establishments in Plastic Goods Industry, 2006/07

Firm-size	No. of credit taker	%of credit taker	Avg credit size(Tk-million)
Micro	10	43.4	1.58
Small	24	34.7	5.52
Medium	3	11	11.72
Large	5	25	32.03
Mismall	34	37	4.95
Melarge	8	17	9.87
All	44	31.6	7.81

Source: SMEF Survey, 2008

The next Table 1.24 shows the proportion of sample enterprises in the Plastics Industry which obtained at least on suppliers credit during the study period, 2006-2007. There have been 44 cases of an enterprise availing a trade credit constituting 31.6 percent of the loan taking enterprises. The Plastics Products Industry has thus great deal of exposure to trade credit. The average size of a trade credit contracted by the loan takers works out to be Taka 7.81 thousand. The incidence of trade credit takers is significantly higher among the MiSmall enterprises (37%) than among the MeLarge enterprises (17%). However, the average loan size contracted by the MeLarge enterprises is higher (Tk. 9.87 thousand) than that (Tk. 4.95 thousand) obtained by the MiSmall enterprises.

1.4.2. Needs and Requirements for Finance in the Plastics Products Industry of Bangladesh

Capital used in a business is broadly identified into two categories: fixed capital and working capital. While fixed capital is for meeting long-term investment needs extending generally over five to ten years or more, the working capital is for meeting relatively short-term needs of upto one year. Corresponding to these typologies, there emerges the need for "term loans" of longer maturity and working capital loans of shorter maturity of upto one year.

The financial requirements of the SMEs in Bangladesh are found by most empirical studies (Ahmed, M.U., 1987 and 1999, Chowdhury and Miah, 2006 and Chowdhury and Rahman, 2008) to concentrate mostly on short-term working capital loans.[7] Working capital requirements and availability thus forms the corner stone of assessing the degree of SME access to institutional financing in the present study.

[7] An important explanation is that term-loans from the institutional sources are hard to come in the way of the SMEs became of their scale barriers on the supply side and lack of credit-worthy business proposals on the demand side for subsequent expansion. By choice they have to fall back upon previous savings, friends and relatives and other non-institutional lenders and occasionally partner's contributions to make a modes start. Once they make a shoe-string start, the going gets tough due to limited availability of short-term working capital loans which hey need most (Ahmed, M.U., 1987).

Table 1.25:
Average equity-debt ratio in Bangladesh industry

Firm-size	% equity	% of debt firms	Debt and equity ratio
Micro	93	7	7:93
Small	91	9	9:91
Medium	78	22	11:34
Large	79	21	21:79
Mismall	92	8	1:23
Melarge	78	22	11:34
All	85	15	15:85

Source: SMEF Survey, 2008

Table 1.25 informs us about the relative importance of equality and retained earnings vis-à-vis debt as sources of finance at short-up of the sample enterprises in the Bangladesh Plastics Products Industry. It is observed from the Tale that overwhelming proportion of the enterprises have had to start with equity infusions or with retained earnings. While the proportion is staggeringly high (92%) for the MiSmall enterprises, it is also nearly 80% for the MeLarge establishments in the overall sample. In other words, debt financing in the form of long-term start-up capital has been a conspicuous source of capital availability for the sample establishments in general and the SMEs in particular in the Bangladesh Plastics products industry.

1.4.3. The State of Provisioning of Working Capital Finance

Working capital consists of five sub-components which are: (i) value of input inventories; (ii value of work-in-progress; (iii) value of output inventories; (iv) average value of the receivables; and (v) the amount of cash at hand and bank.

Needs for working capital finance closely, correspond to the concept of capacity utilization. It is thus important to assess the economically relevant capacity of the enterprises before discussing their working capital needs. The respondents were asked about how many days in a year do they generally want to keep their factories open. We also so skilled from the respondents information about the extent of utilization of their capacities. There are two measures of economic capacity, namely, the output equivalent of the amount of days of intended operations cited by the respondents and the capacity directly cited by them. In every case, the lower of the two values was used.

Table 1.26 shows the value of average working capital by different components per enterprise and also that of total working capital per enterprise. The value of average of the total working capital per enterprise stands at Tk. 102.47 million. As expected a priori, the average for the MiSmall is Tk. 33.87 million which is five and half times lower than the average (Tk. 185.93 million) for the MeLarge enterprises.

Table 1.26:
Working capital provisioning per establishment

Firm-size	Raw materials inventory(Tk-000)	Spare parts(Tk-000)	Finished goods(Tk-000)	Cash(Tk-000)	Receivables(Tk-000)	Total working capital(Tk-Million)
Micro	164	18	2665	182	1220	4.25
Small	1844	147	34657	321	4011	40.98
Medium	25192	292	93457	784	6114	125.84
Large	23204	525	211606	2282	23942	261.56
Mismall	1425	115	28734	286	3313	33.87
Melarge	24347	391	146074	1421	13700	185.93
All	9174	208	85596	670	6826	102.47

Source: SMEF Survey, 2008

Table 1.27 presents the weighted average capacity utilization of three major products per enterprise in the Plastics Processing Industry. It is seen to increase in a tidy monotonic fashion across the four size classes. At 65.16 percent, the weighted average capacity utilization of the micro enterprises is the lowest. The small establishments do marginally better at 65.93% and the medium and large size categories score 68.38% and 81.14% respectively. The MeLarge establishments out perform the MiSmall establishments by a clear margin of over 8 percent.

Table 1.27:
Weighted average capacity utilization in the Plastic goods industry of Bangladesh

Firm size class	% of utilization of capacity						
	Of Three Major Products			Av. Revenue from Three Major Products			Weighted average capacity utilization
	One	Two	Three	One	Two	Three	
Micro	66.3	65.33	67.33	80.01	45.32	17.23	65.95
Small	64.48	65.06	57.27	74.94	43.44	22.58	65.16
Medium	70.56	73.36	62.4	78.91	42.16	21.12	68.38
Large	81.2	73	85.6	81.27	31.81	24.01	81.14
MiSmall	64.93	65.12	58.94	76.21	43.85	21.69	65.36
MeLarge	75.09	73.21	73.9	79.91	37.81	22.56	73.81
All firms	68.37	67.68	64.29	77.46	41.94	22	68.22

Source: SMEF Survey, 2008

In the same Table, the proportion of revenue generate from three major products of each sample enterprise is also shown. These percentages (or relative shares) are used as weights in switching from product-specific capacity utilization estimates to an average weighed capacity utilization discussed above.

We can thus argue that shortfall in the achievement of capacity utilization is itself a measure of the degree of shortfall in the provisioning of working capital that the sample firms supper from. Overall, the Plastics Products Industry is affected by a shortfall in the working capital provisioning of roughly 32%. However, the MiSmall establishments are characterized by a shortfall in their working capital provisioning of some 35%, whereas the MeLarge establishments. Suffer from a shortfall of some 27%.

The sample enterprises are found to pay an average rate of interest of 15.5 percent on the loan taken from the institutional sources. The interest rate varies negatively with firm size, going down systematically with increase in the size of enterprises. At 14.7%, the MeLarge enterprises are observed to pay 2.1% less than the interest charges (16.8%)paid by their MiSmall counterparts. Not only that the MiSmall size groups remain considerably unbanked, they are also discriminated by having to pay more for the loans they borrow.

Contrary to a priori expectation, the borrowers in the Plastics Industry of Bangladesh are found to have paid a relatively low average interest rate (14.3%) for loans received from the non-institutional sources. This is perhaps due to high incidence of interest-free loans obtained by the borrower from their friends and relatives.

Another interesting point to note is that almost same rate of average interest charges have been paid by the MiSmall and MeLarge enterprises for the non-institutional loans. This is also found to be true in case of the weighted average rates of interests paid for both institutional and non-institutional sources (Table 1.28). However, stark contrasts are noted relating to the interest charges paid by the sample borrowers for the trade credits both as a whole as well as across different size classes. First, the weighted average interests paid by all the loan takers in the sample pay a significantly higher rate (18.75%) than that (15.54%) paid for other types of loans. The difference between the two rates at a factor of 3.21 is statistically highly significant.

Table 1.28:
Weighted average Interest rates

Enterprise size	Institutional and non institutional loans	Institutional, non institutional and trade credit
Micro	15.24	28.72
Small	16.05	24.98
Medium	14.72	15.02
Large	15.87	19.08
Mismall	15.93	25.94
Melarge	15.52	18.0
All	15.54	18.75

Source: SMEF Survey, 2008

More significantly, the MiSmall size groups of enterprises are seen to have been grilled by the suppliers of trade credit much more seriously by compelling them to pay a staggering weighted average rate of 25.24% in interest charges compared to 18.0% charged from the MeLarge size groups of enterprises. While both MiSmall and MeLarge borrowers had to pay relatively higher premium for trade credit, at a difference of 7.94%, the MiSmall borrowers have been at severe disadvantage compared to the MeLarge borrowers while contracting trade credits from the suppliers.

1.5. Analysis of the Marketing Chain and Marketing Practices

Marketing is the task of bringing the consumers and producers together. This is a vital function to perform efficiently, i.e. at least possible resource costs. Understanding how competitively a market performs involves examining the costs of and normal returns to marketing. On the cost side, we look at the cost of production, cost of spatial arbitrage and the cost of distribution and sales. Finally, the wholesale and retail margins of the major products manufactured by the sample producers covered by the study.

1.5.1. Cost of Production

Table 1.29 presents information on the average cost of production of the products that are produced by the sample enterprises in the Plastics Processing Industry of Bangladesh. It is observed that the average cost of production per enterprise of the micro category in the sample is Tk. 4951 thousand, as compared to Tk. 22491 thousand for small enterprises, Tk. 102069 thousand for medium and Tk. 282485 thousand for the large size enterprises. This shows a clearly significant difference among the four size classes of firms in terms of cost of production per enterprise.

Table 1.29:
Average cost of production of final produce in Plastic goods industry of Bangladesh

(Taka per unit)

Enterprise size	Cost of production per establishment (Tk. 000s)	Physical output, in homogeneous units (000)	Cost of production per unit of output (Tk).
Micro	4951	40.03	123.6
Small	22491	180.6	123.3
Medium	102069	834.63	124.5
Large	282485	2089.54	127
MiSmall	18106	145.48	123.4
MeLarge	178842	1368.63	125.6
All firms	72455	559.06	124

Source: SMEF Survey, 2008

Likewise, cost of production per unit of output also increases by size, but at a relatively moderate rate. Differences in the equality of raw-materials, degree of mechanization, wages paid to the workers etc. are the plausible reasons explaining the differences in the unit cost of production among different size groups of enterprises.

Table 1.30:
Average retail prices of four major categories of final produce in Plastic goods industry of Bangladesh

(Taka per unit)

Firm size	Poly(Kg)	Hanger(Dozen)	Container(Pcs)	Household(Pcs)
Micro	141	0	12	16
Small	151	55	26	20
Medium	169	79	35	47
Large	177	88	22	0
Mismall	148	55	21	18
Melarge	174	83	29	47

Source: SMEF Survey, 2008

Not surprisingly, the retail prices of four major types of products produced by the small enterprises vary significantly among various size groups (Table 1.30). In case of all four products the MeLarge enterprises out-price the MiSmall enterprises at significantly high margins. The implication is that the marketing margin systematically differs between the MiSmall enterprises and their competitors MeLarge enterprises.

The marketing margin for the small establishments as a whole is defined as follows:

$$Mi = \frac{Pw - P_F}{P_F} \times 100$$

where Mi is the enterprise-specific marketing margin, Pw is the price at the wholesale level, and P_F is the ex-factory price at the producers level. The estimated marketing margin computed through using this formula for the Plastics Industry samples stands at 37 percent.

1.5.2. Organization of Sales

This section analyses the marketing strategies of the sample enterprises in terms of their reliance on different sales options used c.e. through direct sales, wholesales, commissioned agents etc.

As seen from Table 1.31 both MiSmall and MeLarge enterprises depend overwhelmingly on the "wholesalers" as marketing channels for selling their products in the domestic market; the respective proportions being 81.4% and 77.6%. The next most important channel is seen to be commissioned agents (13.2%) for the MeLarge enterprises and the miscellaneous / other channels (12%) for the MiSmall enterprises.

Table 1.31:
Market channels for domestic sales in the Plastic goods industry

(Per cent)

Firm size class	% sold domestically through wholesalers	% sold domestically through own outlets	% sold domestically through agents	% sold domestically through others
Micro	83.8	5.8	0	10.4
Small	78.5	7.8	0	13.7
Medium	83.6	2.7	4.5	9.2
Large	72.7	4.5	18.5	4.3
MiSmall	81.3	6.7	0	12
MeLarge	77.6	3.4	13.2	5.8

Source: SMEF Survey, 2008

Excessive dependence of particularly the MiSmall enterprises on the wholesalers is not difficult to explain. Since opening one's own sales outlets requires good deal of capital establishments, the MiSmall enterprises can hardly afford it because of their restricted access to finance and consequent liquidity crunch.

Overall, the sample prices are found to have used on average 36 wholesalers in disposing their outputs (Table 1.32). The average number used by the MeLarge enterprises is significantly higher (50) than that (23) used by the MiSmall enterprises. As expected, the use of the wholesalers as marketing channel is not without a price tag. This is reflected through the terms and conditions under which the wholesalers do their businesses with the manufacturers. For example, over 81% of sales for the overall sample was on credit for an average tenure of 44 days. More importantly, the manufactures had to pay a premium of 0.43% for taking supplier credit from the wholesalers. This is disproportionately much higher (0.47%) for the MiSmall enterprise than that (0.12%) for the MeLarge enterprises because of the formers' weak bargaining strength.

Table 1.32:

Wholesaling market channels in the Plastic goods industry (Per cent)

Firm size class	Number of wholesalers	% to be sold on credit	Average tenure for the credit	% premium charged	% that remains unpaid for at end of year
Micro	12.5	75.3	10.1	0.29	9.8
Small	27.7	77	47.8	0.53	17.1
Medium	20.6	87.6	49.5	0.6	13.5
Large	101	86	68.3	0.22	14.5
MiSmall	23.7	76.5	37.5	0.47	15
MeLarge	50.4	87	56.6	0.12	14.5
All firms	36.4	81.5	44	0.43	14.3

Source: SMEF Survey, 2008

Not only that the payments of the wholesalers are impeccable involving delayed payments and charging, as much as 14% of the disbursements by them are seen to have remained unpaid. The dues to be collected after due dates by the MiSmall enterprises have been 15% as against 14.5% for the MeLarge enterprises. This must have more severely affected the MiSmall enterprises making their equity crisis worse. Needless to reiterate, policy interventions are called for to provide adequate institutional credit support to the SMEs in the Plastics Processing Industry.

The average size of direct sales outlets in terms of number of employees, wage and administrative cost payments involved is reported in Table 1.33. As expected, all these outcomes are seen to be positively associated with enterprise size reflecting higher expenses involved in maintaining larger fleet of sales personnel and sales outlets.

Table 1.33 Direct sales outlets channels in the Plastic goods industry (Per cent)

Firm size class	No. of Employees per enterprise	Administrative cost(Tk-000)	Average Wages	% Rejected
Micro	2	10	3200	1.3%
Small	5	50	5000	5%
Medium	16	150	7000	4%
Large	23	230	8500	3%
MiSmall	4	38	4400	3.9%
MeLarge	19	210	8000	3.1%

Source: SMEF Survey, 2008

1.5.3. Relative Importance of Export Versus Domestic Sales

Information relating to comparative reliance of the sample establishments on domestic versus export markets is presented in Table 1.34. Overall, roughly 54 percent of the revenues generated in the Plastics Products Industry are derived from exporting, with the residual 46% being generated from sales in the domestic market. The difference in sales to export market between MeLarge and MiSmall enterprises is quite significant, standing respectively at 49% and 36%.

Table 1.34:
Comparative prominence of export-oriented versus domestically-marketed goods in the Plastic goods industry (Per cent)

Firm size	% of revenue derived from		
	Sales domestically	Exports	Total
Micro	100	0	100
Small	58	39	97
Medium	62	38	100
Large	37	57	94
MiSmall	61	36	97
MeLarge	47	49	96

Source: SMEF Survey, 2008

The average number of principal customers per enterprise for the sample is 27 (Table 1.35). The difference between the MiSmall and MeLarge categories of enterprises on this count is quite significant; the respective numbers are 13 and 22. Remarkably, all exports in the industry irrespective of enterprise size are "deemed exports" and no export is effected through using "unofficial" channels.

Table 1.35:
Number of principal customers buying from sample observations in the Plastic goods industry (Per cent)

Firm size class	No. of principal customers	Of exports, % that has been exported through others	% exported unofficially
Micro	5	100	0
Small	16	100	0
Medium	30	100	0
Large	26	100	0
MiSmall	13	100	0
MeLarge	22	100	0
All firms	27	100	0

Source: SMEF Survey, 2008

1.6. The ICI Platform of the Plastics Products Industry

A strong ICT base enables efficiency and growth of business enterprises by enhancing connectivity, providing greater, quicker and easy access to information and knowledge and thus adding to flexibility and dynamism required to enhance competitiveness, productivity and sustained growth.[8] Positive net contribution of IT to total factor productivity of the IT using industries in the US economy is well documented, as quoted in Chowdhury, N. (2008). Building a strong ICT platform is thus an inescapable necessity for any modern business to create technopreneurs, encourage innovation, maintain a flexible business network and take advantage of opportunities in the global market.

1.6.1. Degree of ICT Penetration

The state and degree of reliance on the ICI facilities by the small enterprises is reported in Tables 8.36 and 8.37. A number of observations can be made from the Tables. First, in the

[8] A detailed discussion of the benefits of ICT in business growth and development is available in Rahman, M. (2008).

overall sample more than half of the establishments own at least one personal computer. Second, nearly 42% of the enterprises have an internet connection and a remarkably high proportion (92.1%) have at least one mobile phone. Third, the percentage of sample enterprises having at least one fixed telephone stands at nearly 72% which is significantly higher than the proportion (41.7%) having internet access. This suggests that fixed telephone lines still remain an important mode of connectivity side by side with the mobile telephones for running business in the Plastics Products Industry. A plausible reason might be inadequate broadening of the base of the internet bandwidth provisioning which is still to reach the desired level of growth in Bangladesh.

Table 1.36:
Profiles of the penetration of information and communications technology into Plastic Goods Industry, Bangladesh, 2006/2007

Farm status	ICT % of establishments with				
	At least one personal computer	At least one server	At least one Internet connection	At least one No. of mobile phone	At least one fixed telephone line
Micro	4.3	0	0	78.3	21.7
Small	34.8	5.8	27.5	95.7	76.8
Medium	92.6	14.8	70.4	92.6	92.6
Large	100.0	70.0	100.0	95.0	85.0
Mismall	27.2	4.3	20.7	91.3	63.0
Melarge	95.7	38.3	83.0	93.6	89.4
All	50.4	15.8	41.7	92.1	71.9

Source: SMEF Survey, 2008

Table 1.37 :
Profiles of the penetration of information and communications technology into Plastic Goods Industry, Bangladesh Average Number of computer, software and Internet Used Per Enterprise

Firm size	Computer	Servers	Internet access	Mobile phone	T&T
Micro	1.0	0.0	0.0	1.4	1.2
Small	1.9	1.3	2.7	3.4	1.5
Medium	3.5	1.3	2.9	10.1	3.2
Large	25.9	2.0	13.6	29.8	6.8
Mismall	1.9	1.3	2.7	3.0	1.4
melarge	13.4	1.8	8.4	18.6	4.6
All	9.3	1.7	6.5	8.4	1.8

Source: SMEF Survey, 2008

Table 1.37 informs us about the average number of personal computers, servers, mobile and fixed telephone connections used by each user in the sample enterprises in the Plastics Industry of Bangladesh. Establishment owning personal computers reported ownership of an average of 9.3 personal computers and an average of 1.7 server-grade computers. Those owning mobile phones and land phones reported an average of using 8.4 mobile phones and 1.8 fixed telephones per user. Overall, the density of computer and mobile phone utilization is at present notable, but needs to penetrate further to broaden the ICT base to link clients, promote business, deliver services, and leap forward.

Table 1.39:
Management structure in Plastic Goods Industry, Bangladesh

Co size	Flat structure	Hierarchical structure	All
Micro	96	4	100
Small	78	22	100
Medium	48	52	100
Large	15	85	100
Mismall	82	18	100
Melarge	34	66	100
All	66	34	100

Source: SMEF Survey, 2008

Table 1.39 throws light on the management structure in the sample enterprises. Respondents were asked to assess whether their management structure is flat or hierarchical. Flat management structure generally implies style of management being informal where there is no division of tasks and no formal chain of command. Such informality is most often one of the defining characteristics of the MiSmall enterprises, at times even medium sized enterprises. Hierarchial management structures are, on the other hand, characteristics of large and corporate business entities where the managerial tasks and responsibilities are well defined and formalized.

The responses received from the sample enterprises on their management structures recorded in the above Tale reveal interesting features. First, 66% of the respondents are seen to consider their management style as being flat; whereas 34% think that it is hierarchial. Second, notable difference in the management model practised by the MiSmall and MeLarge enterprises can be observed. Whereas 82% of the MiSmall enterprises consider themselves to have 'flat' management structure, the corresponding proportion for the MeLarge enterprises is only 34%.

1.7. Analysis of Profitability of the Sample Enterprises

Enterprise profitability is a critical prerequisite for internal growth of firms and surplus generation to contribute towards long-term industrial growth of the economy. This is especially so for the MiSmall categories with limited access to external sources of funds, and of necessity, having to rely significantly on retained earnings as the dominant source of capitalization both at start and subsequent expansion phases of their life cycle.

Table 1.41 reports ratio of gross profits to total assets and the rates of returns on investment (ROI) which is defined as net profits as percentage of the total capital employed. Capital is measured in terms of replacement cost at current prices of each of the three types of fixed capital and working capital including net receivables.

Table 1.41:
Gross and Net Profits as Percentage of Total Investment in the Bangladesh Plastics Processing Industry, 2006/2007

Enterprise Sizes	Gross Profits % of Total Investments	Net Profits as % of Total Investments
Micro	24.8	20.58
Small	26.9	20.93
Medium	38.3	32.47
Large	41.7	36.59
MiSmall	26.5	20.86
MeLarge	39.7	34.17
All Sizes	28.0	22.57

Source: SMEF Survey, 2008

Across the size classes, the average rate of both gross profits and net profits for the overall sample, is impressively high at 28% and 22.57% respectively. Second, the gross profit as percentage of total capital employed is consistently higher compared with net profit as percentage of total capital employed. Third, the ROI is significantly higher on average for the MeLarge enterprises compared to that of the MiSmall enterprises. This is not unexpected as the MeLarge enterprises are better capitalized, have secure bank credit lines, better networked both socially and economically, and are much more better organized as a production entity.

1.8. Impact of the Regulatory Regime on the Prospective Growth of the Sample

Enterprises:

The sample entrepreneurs were asked about the regulatory compliance intrusions which in their opinion were most seriously limiting the rate of growth of their enterprises. The respondents had the options to point out as many as three regulatory barriers impeding their growth. The replies received from them across various size classes are presented in Table 2.21 in percentages.

Table 1.42:

Peresstage of Cases Where Various Regulatory and Institutional Barriers are Pointed out as the Most Serious Impediments

Enterprise Sizes	VAT	Income Tax	Issuance of Trade License	Issuance of TIN	Environmental Compliance	Satisfying Chief Boiler Inspector	Satisfying BSTI
Micro	30.4	13.0	34.8	0.00	56.5	0.00	0.00
Small	43.5	20.3	20.3	7.2	59.4	0.00	0.00
Medium	51.9	33.3	14.8	7.4	81.5	0.00	0.00
Large	40.0	30.0	10.0	10.0	45.0	0.00	0.00
MiSmall	40.2	18.5	23.9	5.4	58.7	0.00	0.00
Melarge	46.8	31.9	12.8	8.5	66.0	0.00	0.00
All Sizes	42.4	23.0	20.1	6.5	61.2	0.00	0.00

Source: SMEF Survey, 2008

Several important results emerge from the Table. The imposition of loan on the production of all types of polythene shopping bags on grounds of environmental degradation by the Government since 1st January 2002 in Dhaka City and 1st March 2002 countrywide irrespective of biodegradability of the bags of different thickness is considered by the industry insiders as the most serious blight. This is clearly reflected through the sentiments expressed by over 60% of the respondents across all size groups among the sample enterprises when they regard the requirement for environmental compliance as the serious obstacle to their growth. Indeed, the proportions rise as-high, as 81% of the respondents from among the medium size groups mentioning it as a constraint. Empirical Studies (Sakib, 2005) have subsequently shown that it may be prudent on the part of the Government to introduce legistative measures (i.e. levies and duties on the use of non-biodegradable polythene shopping bags instead of complete ban on all grades of polythene bags) as has been done in Ireland and South Africa. Side by side, the policy makers may also encourage recycling and recovery of plastic shopping bags and educate the general consumers about improved waste management techniques to reduce irresponsible littering. Next to environmental compliance, VAT is found to be rated as the second important debilitating factor hurting enterprise growth in the industry, followed by the tax related complicacies. Surprisingly, none of the Plastic Industry owners finds any of the institutional BDS providers adversely affecting their business activities.

The respondents were asked about possible areas of policy interventions they would like to recommend for implementation by the Government of Bangladesh to facilitate growth of their businesses. The answers received from them are reported in Table 1.43. The respondents were free to indicate more than one intervention as a result of which the percentages do not add upto 100.00. Two interesting observations can be note from the Table.

Table 1.43:
Areas of Policy Interventions Suggested by the Sample Respondents

Suggestions	Leather & Footwear	Electrical& electronics	Light engineering	Designer goods	Plastic	Agro & food processing
The VAT rate to be decreased		27.4				37.8
Import duties on inputs to fall	24.46	11.3	19.01	15.5	33.1	23.6
Power outage to be reduced	20.1	10.5	52.82	9.7	53.8	22
Interest rate to be decreased	12.51			20.4	16.9	20.4
Bank loan to be easily available	11.2	18.5	30.28	7.8	10.8	15.8
Decrease direct taxes			5.63		11.5	9.4
Increase production						7.8
Greater transparency in rules		6.2	4.23	12.6	16.2	7.8
Political Stability				3.9		6.2
Greater emphasis on training	0.71				10.0	6.2
Refriegerated space on cargo plane						3.2
Increasing buyers/ orders				8.7		
Arrangement of international fair				2.9		
Separate clusters	3.9	11.3	16.20		10.0	
Easy shipment	1.26				13.1	
Land for job worker	5.71					
Bigger protection from imports	10.5					
Upgrade technology	5.9	3				
Common facility center			5.63			
Others	3.75	25				

Source: SMEF Survey, 2008

First, the major emphasis is on the reduction of VAT and of other import duties on basic raw-materials, so that the user costs of imported inputs could be kept to a low level. The second interesting but very usual concern expressed by the respondents is about ensuring regular and continued supply of power which is the most serious irritant for the manufacturers of industrial products in general and for the Plastics Industry owners in particular. Availability of power including electricity and gas being critically important for continuous running of the machine dominated production process in the industry, its scandalous fluctuations hit them badly. Reduction of interest rates on bank loans coming next and neck to neck with the need for transparency in government rules and regulations reiterate the entrepreneurs' concern about high interest rates on loan and the loan on the production of poly bags of all types without much justification.

1.9. Towards Formulation of A Future Growth Strategy for the Plastics Processing Industry of Bangladesh

The growth of the sample enterprises over their life-cycles has been estimated using four variables, namely, employment, equity, revenue and number of machines. Compound annual growth rate for each of these variables for the sample firms across various size classes has been estimated using, for example, the formula:

$Ri = \exp (\ln(Et-\ln(Eo)/n)-1$

When R is the growth rate

Et is employment in the study year 2006/2007

Eo is employment in the year of inception

n is the number of years of firms life since start-up and

i is an index at firm level

The average annual compound rates of growth recorded by the sample enterprises in the Plastics Industry are reported in Table 1.43. The notable

Table 1.44:

Growth Performance of the Sample Enterprises

Growth In:	Micro	Small	Medium	Large	MiSmall	MeLarge	All Sizes
Employment	6.6	12.7	14.4	15.6	11.1	14.9	12.4
Equity	10.8	13.3	12.6	14.2	12.7	13.2	12.9
Revenue	7.8	8.3	13.8	14.6	8.2	14.1	10.2
Machines	1.2	8.8	14.0	9.3	6.9	12.0	8.6

Source: SMEF Survey, 2008

Observation to emerge from the Table is that in terms of all the indicator variables, the overall sample enterprises recorded positive growth varying between 10 to 12 percent except for the number of machines. In case of all the indicators, the MeLarge enterprises registered higher average annual compound rates of growth varying between 12 to 14 percent compared to MiSmall enterprises.

Of the important drivers explaining the annual compound growth rate in employment, availability of bank loans, urban locations in Dhaka and Chittagong and higher unit price of the products appear to be the relatively more important determinants of employment growth (Table 2.55 in the six-sectors Synthesis Report). On the contrary, age of enterprises, degree of automation and education of the entrepreneurs returned negative values of the coefficients of employment-growth function.

The estimates of input demand functions for labour, fixed capital and raw-materials return results (reported in Table 2.50 of the Six-Sectors Synthesis Report) with important implications for public policies determining future growth of the six study sectors[31].

The value of the estimated labour demand function, for example, suggest the need for lowering the reservation price of labour (or its minimum oppertunity cost) while selling their labour power. Increased capital provisioning, especially for the MiSmall enterprises is needed to energize higher demand for labour.

[31] The readers are referred to Chowdhury, N. (2008) for details on the theoretical arguments, estimations results obtained. Therefrom and relevant policy implications.

The value of the estimated capital demand function suggests that in order stimulate demand for capital by the entrepreneurs, policies have to be put in place to lower the prevailing interest rates, so that access to capital by the MiSmall enterprises becomes easier and affordable.

With output having a strong and positive coefficient in the material input demand function suggests the policy need for lowering the prices of raw-materials to stimulate the demand for inputs used by the sample enterprises.
Overall, therefore, prudent public policy interventions required for energizing pro-poor growth through acceleration of the growth of the MiSmall enterprises in the Six study sectors should include stimulation of demand for labour, capital and material inputs, better capacity utilization and knowledge application by the entrepreneurs so that a virtuous circle of accelerated growth is created in these industry sectors.

1.10. Strategic Action Plan for Supporting Accelerated and Sustained Growth of the Plastics Industries Sector in Bangladesh

1.10.1. Introduction

The growing importance of the plastics industry in the national economy of Bangladesh in terms of its contributions to enterprise creation, employment generation, industrial value added and export earnings is reasonably documented by recent studies. Because of their ever expanding application and use potentials, ranging from simple domestic wares to modern high tech products, the industry offers almost unlimited prospects for continued future growth and expansion. As dominantly small and medium scale foot-loose industrial activities, the plastics industries sector is also poised to play strategic role in the process of pro-poor growth by generating relatively low-cost employment and income-earning opportunities at widely dispersed locations. However, the innate strengths and opportunities for future growth of the sector must be carefully nurtured and consolidated in the face of various operational constraints and global challenges. As such, a strategic action plan needs to be designed to facilitate unhindered growth of the sector by fully exploiting its intrinsic merits and dynamic growth and expansion capabilities.

A brief resume of the salient features of the plastics industry highlighting its strengths and weaknesses is in order as a prelude to laying out of the strategic action plan. While analysis of the survey findings has been the primary guidelines for these available secondary sources have also been combed to supplement information gaps.

1.10.2. Salient Features of the Plastics Industry of Bangladesh

An industry of relatively recent origin in Bangladesh showing notable presence since 1980s and surging ahead at rapid strides during 1990s in a free market environment, the Plastics Processing Industry has now come off age and reached considerable maturity. It is now a sizeable industry consisting of more than 3000 production units, producing an estimated gross output of Tk. 65557 million (or 1.45% of national GDP) estimated bythissurvey and providing direct and indirect employment opportunities to roughly 1 million people.

Judged by imports of polymer resins and its consumption overtime, the overall industry registered an annual average rate of growth of 28% in value terms and close to 10% in physical quantities in the recent years. The growth performance of the sampled units is also notable; 12.4% in head counts, 12.9% in equity and 10.2% in resources. While still a domestic import substitution industry, it is making steady inroads into the world of exports by earning Tk. 16367.6 millions of foreign exchange in 2006-2007.

Another notable structural change in the industry is the growth of a considerable recycle sub-sector within the industry comprising over 300 recycling units and employing roughly 20-25 thousand people. Recycling of plastic wastes is critically important for steady growth of the plastics processing industry as it offers environmental benefits, recovers reusable resources and saves foreign exchange by reducing the need for importing virgin plastics raw materials. However, the recycling business needs to be modernized and relocated out of the congested arms of old Dhaka. As a high-growth industry with remarkable potentials for future expansion in both domestic and export market because of its ever expanding applications and use potentials, it is important to understand the dynamics, strengths weaknesses and challenges determining future growth of the industry.

A fleet of highly educated and innovative entrepreneurs initiated the industry and brought it to its present status. But future growth and expansion of the industry faces multi-dimensional constraints and challenges which the entrepreneurs cannot handle on their own. The Government, the industry associations and other concerned stakeholders need to wake joint efforts to enable the industry to move ahead amid many challenges.

1.10.3. Major Constraints and Challenges

On an industry-wide basis, a complex of problems currently confront the entrepreneurs affecting their smooth operations. These are shortage of technical expertise in trouble shooting of the processing machines, lack of mold designs, and mold making facilities, testing facilities for quality control, lack of skilled workers, and proper management of plastic wastes. At the macro level, frequent policy changes involving faulty decisions relating to VAT and other tax anomalies in import duties on raw-materials and finished goods etc. These problems need urgent attention to ensure competitive survival and growth of the industry in both local and overseas markets.

Technology Needs and Capacity Building

As a technology-intensive industry because of is machine dominated production a critical determinant of competitiveness of the entrepreneurs especially in the constantly changing technologies and technological advances is constant innovation of product development and product design. This is indispensable for product diversification, access to innovative processes and designs and stimulating high productivity. Testing laboratories for quality control services for both raw materials and final goods, heat treatment knowledge for the recyclers, facilities for mold design and mold making, upgradation of existing technologies and assimilation of new and existing technologies and availability of technical consultancy services are identified by the researchers, analysts and the entrepreneurs as the pressing technological needs of the plastics processing industry of Bangladesh.

Business Development Services

Since the industry is dominantly SME oriented the entrepreneurs face myriads of constraints relating to business promotion and development. Inadequate access to finance primarily because of high collaterals and high interest charges, appropriate training facilities required to develop technical manpower lack of management and other business advisory services including access to information and marketing constitute the binding operational constraints.

Promotional and Support Services Providing Institutions/Organizations

Except a moribund plastics division in BITAC offering limited mold making facilities there is no specialized institutional outfit catering to the needs of the plastics industry in Bangladesh. Setting up an Institution of Plastics Technology/centre offering research, training, quality testing and waste management services is repeatedly voiced as the most pressing need of the industry by its owners and managers. Selection of appropriate machineries, improved processing techniques mold design by using computer aided design (CAD), heat treatment facilities, training of skilled technicians and workers etc. are the support services most keenly wanted but seriously lacking at present.

In the light of these concurrent operational dynamics and constraints of the industry, the lay-out of the strategic action plan is provided below.

8.10.4. Constituent Elements and Areas of Interventions of the Strategic Action Plan Industry

Strategic Goals	Actions/Activities	Outputs/Outcomes	Impacts
Creating enabling environment tonsure level playing field for all sizes of enterprises within Plastics Industry.	* Formulating SME friendly macro and sectoral policies. * SME friendly Tax Policies, Import Policy, Export Policy and Special credit policy. * Undertake necessary regulatory measures to ensure easy entry and exit of the firms	* Neutral macro and sectoral development policies. * Competitive policy environment * Easy entry and access of the enterprises.	* High growth of the Plastic Industry. * Increased contribution to GDP. * Increased contributions to employment creation and exports.
Easing regulatory barriers	* Reduction of hassles in: • Issuing registration certificates • trade licenses • fire licenses • boiler licenses • environment certificate	* Easy availability of business promotion certificates. * Quick start of new business * Enhanced growth of new enterprises.	* Minimum regulatory barriers. * High rate of new enterprise creation and entrepreneurship development.
	* Reduction of VAT and other taxes.	* Acceleration of industry growth	* Enhanced growth of the industry.
Creation of a detailed data base for the investors, policy makers and service providers	* Conduct a nation-wide sample survey. * Build a data base for informed policy making	* Accurate diagnostics of industry needs and problems.	* Informed and pragmater policy making * Effective policy implementation.
Increased Access to Finance	* Preferential access to credit facilities * Reduction of collaterals * Reduction of interest		* Growth in overall credit flow to the SMEs.

Strategic Goals	Actions/Activities	Outputs/Outcomes	Impacts
Technological capacity building and upgrading adaptation and diffusion of new technology	rate charges * Diversification of the financial products by the banks and other lending institutions. * Allocation of funds for R&D activities. * Setting up a Plastics Technology Institute / Centre * Create quality control, testing facilities etc. by setting up testing laboratories in the technical universities. * Upgrade technological standards of the recyclers. * Enhance cooperation between and entrepreneurs and the universities for Road activities.	* Increase in credit disbursed * Cost of funds reduced	* Greater availability of funds allowing smooth operation. * Increased technological capacity development. * Technology up gradation. * High growth high-technical firms. * Increased productivity and competitiveness. * Greater market penetration.
Human Resource Development	* Set up technology inclusion centers. *		* Higher and sustained growth of the industry.
Increased Access to Market	Increased need-based training facilities on: • use of machines		* Increased availability of trained and skilled

Strategic Goals	Actions/Activities	Outputs/Outcomes	Impacts
Institution Building and Infrastructure Development	and their maintenance. • plastics engineering • heat treatment, quality control. • mold making and design. • product design. • work safety issues. • waste management.		manpower. * Growth of technology-intensive production capabilities and spin-off firms. * Increased work efficiency and higher productivity. * Improved waste management
	* Identification of new products and processes. * Arrange plastic product fairs at national and regional level. * Special advisory services to be provided by SE foundation. * Special support service facilities to be provided by EPB to the exporters.	* Increased availability of R&D funds. * Enhanced R&D promotion for SMEs	
	* Build product display centers through public-private cooperation and partnership. * Set up a separate institute of plastics technology and engineering * Develop a separate Industrial Estate for Plastic Industry * Strengthen BITAC and expand and upgrade BITAC's plastics related facilicties and services	* Increased innovation of new products, processes, and designs. * Increased product and market diversification. * Improved quality of the recycled materials. * Stimulation of higher productivity. * Greater market penetration. * Need based skill developent * Increased availability of technicians and workers.	* Enhanced and sustained longrun growth of the industry * Greater contributions to GDP, employment exports

Strategic Goals	Actions/Activities	Outputs/Outcomes	Impacts
		* Increase in product quality and design. * Greater work safety • Greaer environmental protection • Greater and easier market penetration. • Increased sales and revenues. • Increased exports and greater foreign exchange earnings. * Easy availability technology improvement transfer adoption and diffusion facilities. * Technological modernization * Faster growth and expansion of the industry in a business-friendly location * Easy and cheaper availability of utility services * Easy availability of various other technological support services. * Better utilization of capacity * Greater possibilities for linkages with regional plastics technology centres such as Asia Pacific Centre for Transfer of Technology (APCTT)	

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Volume-4

Status, Trend, Constraints and Potential of Agro Processing in Bangladesh

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A study for SME Foundation, Dhaka
By
Center for Development Studies, Dhaka

June 2010

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ACRONYMS AND ABBREVIATIONS

AFP - Agro and Food Processing
BARI – Bangladesh Agricultural Research Institute
BAU- Bangladesh Agricultural University
BBC - Bangladesh Bureau of Statistics
BFVAPEA – Bangladesh Fruits, Vegetables and Allied Products Export Association
BMPCU Ltd – Bangladesh Milk Products Cooperative Union limited
BRAC- Bangladesh Rural Advancement Committee
BRC – British Retailor Consortium
BSTI- Bangladesh Standard & Testing Institute
CAB – Consumer Association of Bangladesh
CD- Cobb-Douglas
CM – Contract Manufacturing
DAE – Department of Agricultural Extension
DCS – Dairy Cooperative Services
DFTRI – Department of Food Technology and Rural Industries
DFID – Department For International Development
DFPM – Department from Power and Machinery
ED – Executive Director
EEC – European Economic Community
EFTA – European Free Trade Association
EPB – Export Promotion Bureau
FOB – Freights On Board
GAP – Good Agricultural Practices
GMP – Good Manufacturing Practices
GoB- Government of Bangladesh
HACCP – Hazard Analysis Critical Control Point
HTST- High Temperature Short-Time
ICT – Information and Communication Technology
IFST – Institute of Food Science and Technology
ISO – International Organization for Standardization
NGO – Non-government Organization
O_2- Oxygen
OAP – Own Account Produces
PET - Poly-Ethylene-Tetrachloride
PRAN
PVDC – Poly-Venyl-Di-Chloride
REFPI – Research & Extension on Farm Power Issues
SIP - Special Induced Price
SMEF- Small and Medium Enterprise Foundation
TFP – Total Factor Productivity
TL – Team Leader
UAE- United Arab Emirates
UHT- Ultra Heat Treatment
UK- United Kingdom
USDA – United State Department of Agriculture
VAT – Value Added Tax
WB- World Bank
WTO – World Trade Organization

Executive Summary

The study reports on agro and food processing industries of Bangladesh. Using a well balanced questionnaire, survey was conducted in 139 agro and food processing establishments by qualified and trained Research Analysts. The agro and food processing industries covered were i) Fruits and vegetable processing industry, ii) Rice and wheat milling, iii) Milk, dairy products, poultry and eggs, iv) Fish processing, v) Bread/biscuit/confectionery manufacturing, breakfast foods (including cocoa processing and chocolate), malt extract, protein isolate, high protein food, etc. and vi) Aerated waters/treated water, and all kinds of soft drinks.

In rural area of Bangladesh, agro-processing which is traditional in nature is the major employer of man and women. The agro-processing is not only important source of income for rural area; it is also suitable for urban area. The production of 'deshi' food is particularly well suited for small-scale production for reasons like small capital requirement, ready availability of raw materials, simple technology and its adaptability, accessibility to local market and high return. It's importance lies in domestic value addition, cultural make-up, modern and urban living. Agro-processing activities comprise two major categories; primary and secondary operations. Primary processing operations involve activities such as crop drying, shelling/threshing, cleaning, grading and packaging.

As increased production is envisaged, there is need to have proportionate improvement in agro processing industry. Agro-processing is an important manufacturing industry in Bangladesh. The share of manufacturing value added from the food, beverage and tobacco processing industries increased from 25 percent in 1985 to about 33 percent in 2005. Although the industry is small in Bangladesh compared to many other Asian countries, it has been growing at almost 8 percent per year, comparable to growth rates in India (7.8 percent) and China (9.4 percent). The vast majority of agro-processing firms in the country are very small, with fewer than 50 workers. There are only about 246 medium-sized food-processing firms 184 large firm (firms with more than 100 workers). Data from the Economic Census of Bangladesh 2006 show that food processing firms account for 19 per cent of manufacturing industries (with 10 or more workers) and about 8 per cent of total employment in manufacturing firms (with 10 or more workers). Rural areas generate roughly 70 per cent of the jobs related to food processing. Rice mills account for the largest share of employment in the industry, generating 40 per cent of the employment. Manufacture of bakery products accounts for another 14 per cent and processing of tea and coffee accounts for 19 per cent. Processing of high value products remains quite limited.

Agro and food processing activities represent a potential source of livelihood for many poor people in Bangladesh. The overall potential of agro and food processing is huge as it can:

- Increase the value crops of poor farmers and thus yield higher returns;
- Expand marketing opportunities;
- Improve livelihoods of people;
- Extend shelf-life of commodities;
- Improve palatability of commodities;
- Enhance food security;

- Overcome seasonality and perishability constraints; and
- Empower women who are often involved in agro-processing.

Agro-processing industries play an important role in contributing country's GDP through employment generation, increase in incomes of primary producers, prevention of post-harvest losses and value addition to most primary products. The specific importance includes:

§ Improved backward linkages
§ Improve forward linkage
§ Improved home processing and storage
§ Increased women and older persons' entry into food processing
§ Improved household security for processed food product
§ Promote adequate nutrition and healthy lifestyle

Ministry of Agriculture has a mandate to disseminate research outputs to farmers and other clients (AFP industry) via the Department of Agricultural Extension (DAE) which is represented upto upazilla level. However, coverage in Agro- and food processing at ground level is not as good as the DAE is responsible for the conventional Agricultural Extension. Despite efforts to the contrary, most DAE staff are unable to keep abreast of current technology development trends in Agro- and Food processing: their capacity to provide technical training and advisory services is therefore limited. Recently a national project entitled "Enhancement o Agricultural Production and Rural Employment Through Extension of Agricultural Engineering Technologies" has been under taken employing Agricultural engineers at different Upazilla level. This project may have positive effect of Agro- and Food processing at root levels.

Growth of the agro-processing industry is hampered by various constraints that range from equipment supply to problems faced by consumers of the technologies. In the manufacturing sector, progress is limited by:

- Difficulties in accessing foreign currency;
- Reduced demand for equipment as most clients fail to mobilize resources to acquire equipment;
- Limited transfer of technology from research;
- Limited access to working capital;
- High duty and tax on imported raw material and spares. In some cases the government policies on duty and taxes charged on imported equipment discourage local manufacturing. For example industrialists are charged value added tax (VAT) on imported materials used in the manufacturing process yet the finished piece of equipment is sold without VAT making it impossible to recover costs. The manufacturers get frustrated when they pay high duty and taxes on raw materials while the competing finished products are imported at low duty; and
- The manufacturing sector has also been characterized by poor quality products, especially from the informal sector, as the enforcement of standards has not been effective. The prevalence of substandard equipment on the market at times forces the government to create conditions for importation of high quality products to protect the consumers.

- Agro and food processors face numerous constraints including:

- Poor equipment back-up service rendered by dealers, shortages and high cost of equipment and spares;
- Limited access to information from extension service;
- Limited access to appropriate packaging material for processed products, lack of marketing skills;
- Inadequate support services from training institutions, private sector consultants, small enterprise advisors, research institutions and engineering workshops;
- Erratic supply and increased cost of fuel coupled with frequent power cuts;
- Unreliable supply of raw materials, reduced demand for processed food products;
- Poor cash flow emanating from low volumes of raw materials hence low income is realized from processing;
- Failure to meet food processing regulations pertaining to food safety and hygiene practices (BSTI standard) which need to be adhered to in the industry. Attention to hygiene and basic food safety procedures is found, at times, to be limited among informal enterprises. Knowledge of specific regulations and legislation governing food safety and hygiene issues is only evident among those processors who market their product through formal outlets.
- Limited capacity to mobilize capital for equipment purchase and working capital.
- Constraints faced by producers of raw material include:
- Frequent droughts resulting in crop failure;
- Current high costs of production inputs (seed, fertilizer, chemicals etc.) resulting in a decline in the levels of production hence shortages of raw material. This factor together with the preceding one could have a compound effect;
- Lack of funding and unfavourable borrowing conditions; and
- Lack of commercial farming skills.

Addressing the Constraints

To address the constraints which embargoes or creating hindrance to the food processing business, the following measures should be considered:

§ Improvement of infrastructure
§ Selection of adequate equipment
§ Adopting technical development policies
§ Ensure raw materials availability
§ Fulfill packaging requirements
§ Promotion joint effort between government food research institute and private companies
§ Proper utilization of food preservation technology and prevention of post harvest losses.
§ Suitable fiscal policies
§ Specific R & D support measures

Growth of the agro-processing industries would result in value addition, crop diversification, shelf life enhancement, reduction of wastage, availability of hygienic food to consumers at affordable prices, anytime, anywhere, as well as generation of employment, thus benefiting farmers, processors, consumers and the economy of the country as a whole. To harness these opportunities, an integrated holistic approach should be initiated through public-private partnership to motivate farmers and food processors and also to provide linkage between technology, economy, environment and society for speedy development of food processing industries to build up a substantial base for production of value added food products for domestic and export markets with a strong emphasis on food safety and quality.

Employment, technological, financial, production, economic and policy status of the AFP industry:

The production labourer was highest (25.4%) in micro size firms and lowest in large size firms (7.9%). The small and medium sizes firms were possessing 12.5% and 14.4% production labourers respectively. The percentage of white collar workers needs be reduced for better productivity and also for profit in different categories of firms. The dominancy of male worker was observed in six categories of AFP industries. Male workers were highest (96.6%) in micro size firms and lowest (76.4%) in large size firms. The percentage of male workers in small and medium size firms were 91.9% and 81.4% respectively. Dhaka and Chittagong are the most productive among the clusters, with Dinajpur and Khulna bringing up the rear. The productivity sweepstakes are cleanly swept up by the two major metropolis of the country.

Large food firms were established earlier in Bangladesh (average 16.42 years) compared to the micro and small firms. Micro firms/industries were established later (average 6.63 years ago). Average duration of all the agro and food processing industries is 12.22 years. Table 3.4 interprets that formal education level of the large entrepreneur is higher (average 14.42 years) than the small entrepreneur (average 12 years). The MiSmall establishments in the Agro and Food Processing (AFP) sector report an average start-up headcount of 12.41, the corresponding headcount for the MeLarge establishments in this sector happens to 39.72. Whereas the representative MiSmall establishment in the Agro and Food Processing sector report an average number of machines of 2.74, the corresponding number for the MeLarge establishments in this sector happens to 4.

The representative MiSmall establishment in the Agro and Food Processing sector report an average start-up debt of Tk. 716660, the corresponding debt for the MeLarge establishments in this sector happens to Tk. 7972490. On an average, the debt-equity ratio at start-up of the four categories of micro, small, medium and large firms in the AFP sector is found to be 25:75, 30:70, 30:70 and 31:69 respectively. The percentage of no debt firms was lowest (58.33) large category firms and highest (94.11%) in medium category firms. Micro and small size firms possessed 90.91% and 74.39% no debt firms. Though the average of all firms loan taker was 20.87%, the medium and micro sizes firms enjoyed 5.89% and 9.09% loan respectively. The major share of the loan (41.07%) was enjoyed by the large size firms. Among the micro, small, medium and large industries, only small category industry is engaged in contract manufacture and the ration of contract and own-account products is 1:0.04. The average number of main products produced by Mismall and Melarge almost same 2.30 and 2.32 and that of bye products are 0.17 and 0.19 respectively. Micro size firms in AFP sector produces highest average number of main product (2.36) among the four categories. The small, medium and large sizes firms produce 2.29, 2.30 and 2.26 average numbers of main products.

The MeLarge firms in the AFP sector had a gross output of Tk. 40848.19 thousand and that of MiSmall Tk. 6220.24 thousand, i.e. gross out put of MeLarge is 6.56 times higher than that of MiSmall. Whereas the gross output of large firms in this sector is 13.39 times higher than medium, 18.69 times higher than small and 121.35 times higher than micro firms in AFP sector. Value added as a percentage of sales for the MiSmall class of establishments was found to be 31.54 in SMEF study-2007. For the ICS-2002, this is found to be 34.4%. Considering that Bangladesh economy has become even more outward-oriented during the six intervening years since 2002, thereby increasing competitive pressure on the domestic manufacturers.
Labor productivity (in thousand Taka worth of value added per worker employed) in Mismall was found to be Tk. 375.45 thousands in 2002 as compared with Tk. 359.9 thousands in 2006/7. That is a striking similarity.

The major products of this business include pickle, jam/jelly bakery products, soft-drinks, confectionary products, poultry and fisheries products and so on. Micro-size firms were in different categories of establishment except fisheries, bakery and poultry. In small and medium firm size classes the average number of machinery per establishment was highest in fisheries sector which was followed by pickle/jam/jelly sector respectively. The situation was quite different in case of large, Mi large and Melarge firms were the average number of machines per establishment were higher in pickle/jam/jelly processing sector. It is clear from this Table that pickle/jam/jelly sector is quantitatively the most populous category of machines is use in the AFP industry of Bangladesh and the second most populous category was fisheries (average 10). The poultry and rice mill sectors were using minimum number of machines per establishment because these sectors employed more laboures to complete the processing work manually.The manufacturing establishments in this industry essentially belong to f major categories, namely, (i) fish products (BSIC 0302); (ii) Dairy products (BSIC 0405 and 0406); (iii) Sugar and confectionery (BSIC 1704 and 1806); (iv) Baker products (BSIC 1905) (v) Jam, jelly, Ketchup etc. (2007, 2009, 2103) and Soft drinks (BSIC 210 and 220)

The average unit price of different machine in different firm-sizes of fisheries in four categories ranges from 2.5 lac to 4.51 lac. By comparison, unit prices of pickle/jam/jelly processing machine for small, medium and large firms were 0.75, 0.84 and 2.84 lac respectively which some to be very much affordable. The unit price of small and medium size rice mill were almost similar. This was also true for unit price of small and medium flour mills. However, the unit price of sweet processing machine in different firms sizes were cheaper and in the range of 0.516 to 0.525 lacs. The average unit price of all firms was highest for drinks, second fisheries, third flour mills and so on. The highest variation in unit price was observed in poultry processing machine which ranges from 0.038 lac (micro) to 60.00 lac (large). Micro size firms are established on own land by 45.40% entrepreneurs. Another 45.40% entrepreneurs of this category have rented their land for established industry. Only 9.20% of the owner of micro size industry have own and rented land. The firm was established in average on 35.10 decimal area of land with a cost of 49.7 million Taka. The cash payment for land made by them was minimum (Tk. 5.50 thousand) and among the four categories of firms.

Estimates of the regression coefficients from a CD functional form are also estimates of the elasticity of the function with respect to those arguments of the function. Output has elasticity of 0.916 with respect to labour, and of 0.209 with respect to capital. The F-ratio, which is a summary measure of how well-specified the functional form under review is for the data on hand for the most parsimonious form of the CD function is the highest, at 63.928. According to the Cobb-Douglas specification, the returns to scale are constant. Both coefficients are highly significant with expected signs. The TL function too is fairly well-behaved, with most of the coefficients being intuitively signed and statistically significant. The TL set of results suggest that the returns to scale are slightly increasing. Micro size firms are not getting any loan from banks or leasing companies. Small and MiSmall took 72.64% and 73.12% loans respectively. The bank loan enjoyed by the medium, large and MeLarge were between 98 to almost 100%. The table 3.25 shows that different SME firms received loan mainly from banks. The per cent of loan takers highest in large firms (50%) and in other firms the loan takers were between 31 to 39%. This may be noted that SME industries in AFP are not taking much loan from banks and other leasing. Companies or these entrepreneurs are not getting enough loans for their business. The leasing company loan was negligible. The interest rates of the bank ranged from 15 to 18% with average value of 17.83%. This also seemed to be very high. The rate of interest may also be deterrent factor for entrepreneurs to be less interested in taking loans.

The medium, large and Melarge firms of AFP sector did not take non-institutional loan. The micro-credit loan was also non-existent in AFP sector. The micro-small and MiSmall firms took non-institutional loan and the average sizes ranged from Tk. 600,000 to Tk. 604,000 only. The interest rate for micro and small sizes firms were 10% and their for MiSmall was 2.5% only. The non-institutional loan enjoyed by the firms were 100% informal. The micro size firms in AFP sector did not receive or get trade credit though the trade credit takers ranges from 9.68 to 16.67 with average of 11.51%. The average trade credit ranges from Tk. 703,000 to Tk. 3430000. The interest rates were in the range of 10.08 to 12.48% that seemed to be lower than the interest rate of bank loans. The % of debt farm in AFP sector rages from 74.39 (small) to 94.11 (medium) at the time of start-up. This is a clear indication that most of the entrepreneurs in SME industries in AFP sector started their industrial production with own capital only. On an average 20.87% entrepreneurs were in debt at the time of start-up.

Only 6.68 percent of the revenue in this industry are generated through exporting, and the residual of 93.32% are generated from domestic sales by all firms. Melarge establishments received highest share (13.87%) in export markets as compared to Mismall establishments (4.62%). That said, the survey found a statistically significant difference between MiSmall and MeLarge establishments in terms of the exposure to the export markets. The percentage of domestic output marketed using own-outlets of the MeLarge establishments relative to MiSmall split is 29.42% and 23.65% only respectively. This might be due to fact that the MiSmall establishments out-depend the MeLarge establishments when it comes to relying upon wholesalers

The rate of selling of products on credit is found higher in Melarge establishments (14.49%) as compared to Mismall establishments (11.22%). Average calculated tenure for the credit among the all firms was 35.96 days. The Melarge establishments show maximum tenure of 51.96 days while Mismall establishments show only tenure of 28.05 days. The percentage of premium charged varies widely among the firm size classes (Table 3.38). Maximum percentage of premium (5.18) is charged in medium size establishments followed by Melarge type of establishments (4.04%) while minimum percentage of premium (0.75%) is charged in Microsmall type of firms in agro & food processing sector. The large establishments employ maximum percentage (68.75 of agents and minimum percentage (3.00) is found in small enterprises in this sector. The rate of total wages/month provided by the firms also varied significantly among the establishments. The average wages/month among the firms is found Tk.20730.00 only.

Cost of production per firms in the Agro and Food Processing Industry is presented in Table 3.41(a). The average raw materials costs in all firms is calculated Tk.33.68 millions. The highest raw materials costs (Tk. 81.24 million) is incurred by Melarge firms which is followed by Large firms (Tk. 24.69 million) while the lowest raw materials costs (Tk. 1.48 million) is incurred by Micro establishments. Similar trend of results is also observed in case of costs incurred for parts and components, repair and maintenance among the firms in the sector. The amount of wages provided by different categories of firms varies widely among the establishments under study. The average wages provided by all firms is calculated Tk.2.812 millions. The total wages of Tk. 20.97 million is incurred by Large firms which is followed by Melarge firms (Tk..6.99 million) while the lowest raw materials costs (Tk. 0.25 million) is incurred by Micro enterprises in the sector. The variations in other expenses among the establishments are also found more or less in similar trends.

Small-scale industry is using comparatively more modern facilities such as, PC, servers, internet, business automation software and mobile phones than medium scale industry among the firms under study. Large-scale industry is more equipped with modern communication and management facilities than the other industry, which is obvious. The use of PC (76.26%), servers (7.91%), internet access (56.83%) in Large firms was highest as compared to others firms under study. The use of fixed telephone is found absent in micro and small firms while the use is found in less than 1.0 per cent among the other four sizes of firms. Use of business automation software in large industry was found 169.78%, which might be due to less production cost of items and also more profit earned by them. The percentage of mobile phone used in large industry was 129.5%, which indicates that some of the employees are using more than one set of mobile phones.

The highest percentage of hierarchical profile (58.3) was found in Large firms which was followed by 39.10% in Melarge firms. Hierarchical of management increased with the increase in size of the industry i.e. medium size industry was having more hierarchy than small size and the large size than that of medium size. However, the flat profile of management was found inversely proportional with the size of the industry i.e. the largest firm was having the lowest flat profile of management (33.30%) while the highest flat profile of management (100%) was observed in small-scale firms. The medium and large size firms, in addition to flat and hierarchical profiles of management, other forms of management structure were observed while other profile of management was completely absent in micro, small and MiSmall types of firms.

Recommendation

The agro-processing industry in Bangladesh has potential to meet the local needs and export requirements. The SME enterprises have potential to create employment opportunities especially if the enterprises are nurtured to produce for both domestic and export markets. However, the AFP sector currently faces many problems that emanate from various negative aspects of the national economy, uncertainty that exists over access to finance, advice, information and reliable markets. The major areas that need improvement in the industry are:

- The response of the agro and food processing industry to the changes in the agrarian sector. With the reduced farm sizes and increased number of farmers, there is need to develop small- and medium-scale processing equipment that cater for the full spectrum of agricultural commodities produced in the country. Emphasis should then shift from small-scale farmers aspiring to own the processing technology to improving access to the technology. This can be achieved by creating conditions that favour establishment of agro-enterprises to encompass processing of meat, milk and the related products, as well.
- There is no lack of clear government policy on agro-processing yet it has potential to drive the economy. Government policies that enhance performance of medium grain milling enterprises, livestock feeds manufacturers, fruits and vegetable products processors need to be put in place as a tool for empowering indigenous entrepreneurs.
- Fruit and vegetable processing is a viable business venture given that there is a high level of production of the products and a wide range of small- and medium-scale processing equipment available in the country and in the region. Establishment of medium-scale fruit and vegetable processing enterprises will help reduce heavy losses experienced by producers and ensure product availability on the market. Entrepreneurs need to be exposed to available technologies and the range of products that can be manufactured to encourage uptake of this new business.
- There is need to enforce food safety and hygiene standards as well as protect consumers against nutrient insecurity and undesirable tastes.
- The current farming practices require higher levels of mechanization and a wider diversity of equipment designs so as to keep pace with changes in production techniques as new crops are introduced. It may no longer be viable now for individual farmers to own primary processing equipment as the reduced farm sizes may not justify such investment. Encouraging establishment of processing service providers may lead to optimum utilisation of equipment and will take away from the farmer the worries associated with repairs and maintenance of equipment.
- Research in agro-processing equipment does not meet national expectations. The public and private sectors must be mandated to undertake collaborative research with the formal equipment manufacturers and offer research and testing services to the informal sector which does not have the capacity to conduct serious and meaningful research.
- Training offered to agro-processors needs to include business management skills as these are lacking in most business people. This entails that training in agricultural colleges and universities should also encompass the same to ensure competence of extension officers in the subject.
- The Faculty of Agricultural Engineering and Technology, BAU, Faculty of Mechanical Engineering in different universities and Technical Services in the Ministry of Agriculture should broaden their knowledge and capacity to offer

technical assistance and advice, support and extension services that cover a much bigger range of equipment, ownership modalities and financing models.

- The most critical limiting factor in equipment manufacturing is limited access to foreign currency. This has led to delayed delivery of orders or complete failure to do so. Agro-processing equipment manufacturing has a strong bearing on the success of the agrarian reform hence the manufacturers need to make a collective presentation to the government for them to be classified as a special facility by GoB..
- The limited capacity of processors to purchase equipment can be alleviated in a number of ways that include conducting research on how costs of production can be reduced, advocating for removal of VAT on imported materials used in manufacturing, introducing low cost finances for both manufacturers and processors, and preferential allocation of foreign currency to manufacturers and promotion of service providers.
- The policy for obtaining particular permits, and clearances for agro-processing industries (now problematic) should be simplified.
- The energy shortage (gas fuel and electricity) is major threat for flourishing Agro-processing in the country. Some policy measures should be under taken to ensure energy supply in agro-processing industries.

- The income from the agro-processing industries should be exempted from tax until 2020. Subsidies may be provided for fuel and electricity to benefit SMEs in agro-processing.
- The GoB may adopt a package of incentives and facilities for agro-processing sector that will include: an income tax exemption for export earnings, whereby all exporters of agro-processors will get a 50% exemption in income taxes; an exemption in insurance premium; bond facilities for export oriented agro-processors; facilities for duty-free importation of capital machineries for export oriented industries; ability to import 20% of required spare parts of machineries every two years, duty free; a tax holiday and a duty draw-back scheme. In addition to these incentives, the exporters of agro-processing sector may be allowed to receive a cash subsidy of 30% of the net repatriated Freight On Board (FOB) value.
- The port of Chittagong is well served by several of the world's premier carriers of perishables – including Maersk, American President Lines, NYK, and Hapag Lloyd – and it boasts sufficient container yard capacity and refrigerated plug slots to support increased throughputs of perishables. Greater use of sea freight would reduce the average cost of all perishables exported from Bangladesh and thus improve their competitiveness in the export market.

Section 1

Introduction

1.1 The context

Bangladesh has many positives as an economy: diligent farmers, a mostly flat, deltaic terrain, and mostly enabling climate for cultivation. These natural features have enabled the Bangladeshi agriculture, forestry and fisheries sectors to support our way of life by supplying fresh foods in wide variety including fruits, vegetables, and cereals, marine and animal products. This of course creates opportunities. That said, 60% of the about 140 million people living in Bangladesh are “functionally” landless, without access to sufficient land for their habitation. Three million among these people are added to the population each year, two millions are born into poverty. This population is expected to double in the next twenty years, increasing the already serious pressure on land and the number of land less. Consequently, a large and increasing proportion of the population has to seek income generation other than independent agricultural production.

In rural area of Bangladesh, agro-processing which is traditional in nature is the major employer of women. The agro-processing is not only important source of income for rural area; it is also suitable for urban area. The production of ‘deshi’ food is particularly well suited for small-scale production for reasons like small capital requirement, ready availability of raw materials, simple technology and its adaptability, accessibility to local market and high return. It’s importance lies in domestic value addition, cultural make-up, modern and urban living. Agro-processing is defined a collection of activities, applied to all the produces, originating from agricultural farm, livestock, aqua-cultural sources and forests for their conservation, handling and value addition to make them usable as food, feed, fiber or industrial raw materials. Hence, the scope of the agro-processing industry encompasses all operations from the stage of harvest till the material reaches the end users in the desired form, packaging, quantity, quality and price. Although post-harvest and processing practices for preservation and processing of agricultural produce for food and medicinal uses have been practiced in Bangladesh since long ago, inadequate attention to this sector has dragged the sector. But agro and food processing (AFP) is regarded as the sunrise sector of the national economy in view of its large potential for growth and likely socioeconomic impact specifically on employment and income generation.

1.1.1 Agro processing

Agro-processing activities comprise two major categories; primary and secondary operations. Primary processing operations involve activities such as crop drying, shelling/threshing, cleaning, grading and packaging. These activities are mainly carried out at the farm and only transform the commodity into a slightly different form prior to storage, marketing or further processing. Secondary processing operations entail increasing nutritional or market value of the commodity and the physical form or appearance of the commodity is often totally changed from the original. Some examples of secondary processing are milling grain into flour, grinding groundnuts into peanut butter, pressing oil out of vegetable seeds, pressing juice out of fruit, making cheese out of milk and manufacturing of mince meat. Depending on type of commodity, equipment needed for primary processing is completely different from that used in secondary processing or major adjustments/modifications need to be done to suit either.

As increased production is envisaged, there is need to have proportionate improvement in agro processing industry. Agro-processing is an important manufacturing industry in Bangladesh. The share of manufacturing value added from the food, beverage and tobacco processing industries increased from 25 percent in 1985 to about 33 percent in 2000 (World Bank, 2008). Although the industry is small in Bangladesh compared to many other Asian countries, it has been growing at almost 8 percent per year, comparable to growth rates in India (7.8 percent) and China (9.4 percent) (World Bank, 2008). The vast majority of agro-processing firms in the country are very small, with fewer than 50 workers (World Bank, 2008; BBS, 2007). There are only about 246 medium-sized food-processing firms 184 large firm (firms with more than 100 workers) (BBS, Business Registry, 2007). Data from the Economic Census of Bangladesh 2006 show that food processing firms account for 19 per cent of manufacturing industries (with 10 or more workers) and about 8 per cent of total employment in manufacturing firms (with 10 or more workers). Rural areas generate roughly 70 per cent of the jobs related to food processing. Rice mills account for the largest share of employment in the industry, generating 40 per cent of the employment. Manufacture of bakery products accounts for another 14 per cent and processing of tea and coffee accounts for 19 per cent. Processing of high value products remains quite limited.

1.1.2 Food Processing

Small-scale farming in Bangladesh rarely provides sufficient means of survival in many rural areas. It is therefore imperative to explore alternative income generating opportunities to support poor families who can no longer fend for themselves from the land based activities alone. Recent researches demonstrate that rural households depend on a diverse portfolio of activities and income sources. Some households are looking towards activities such as food processing as means to enhance the livelihood they can achieve from a limited area of land. There has been no real acceleration of agricultural growth despite extensive Governments efforts with respect to seed-fertilizer-water technology. The government is undertaking efforts on market –oriented demand driven steps which will, it is expected, provide demand stimulus to the growth of the sector. Agro-processing/agro-based industries is expected to play a vital role here

Food processing encompasses a range of products, processes and technologies that has the potential to provide opportunities for employment and income generation for the relatively poorer segments of the society. This is particularly worthy, because agriculture and other formal sectors unable for absorb the growing labour force comprising men and women. It is learnt from different studies and survey findings that there are vast opportunities for the rural people specially the poorer segment to earn a living from local food processing. Market is generally available but sometimes they have to face large entrepreneurs who have aggressive marketing program and enjoy economics of scale. The market for this sort of food processing is fast growing and therefore there should not any fear that it would “Crowd of” the scope for existing or would be private entrepreneurs. An idea about the Food processing industries may be obtained from table 1.1 given below.

1.2 Study objectives and methodology

To pinpoint the opportunities and challenges that are present or likely to arise in agro and Food Processing Industry in Bangladesh as the demand grows for food products is the main objective of this study. In this study concentrated effort was given in a series of specific cases studies in fruits and vegetables processing, rice and wheat milling, milk, dairy, dairy products, poultry and eggs, fish and shrimps processing, bread, biscuit and confectionary manufacturing, aerated water and alll kinds of soft drinks. These particular commodities and sub-sectors were selected for the study as they were found to have potentially strong growth prospects. The study highlights into a range of issues including commodity competitiveness and the institutional, technological, infrastructure, policy and regulatory factors that are likely to influence the extent to which Bangladesh can take advantage of existing and potential opportunities. The study also focused on strength and weakness and identify short, medium and long term actions that will enhance productivity and growth in Agro and Food Processing industry in the country.

This study is based primarily on findings from field survey conducted in Bangladesh between February and September 2008. It also utilizes secondary data from a large body of studies conducted earlier within Bangladesh. A broad range of stakeholders such as agro-processors, exporters and managers were interviewed using a comprehensive questionnaire formulated specifically for this particular study.

1.3 Report outline

In addition to introduction on agro and food processing, the report includes the perspective of agro and food processing industry in Bangladesh in section 2 and an overview in agro and food processing in section 3. The section 4 provides backbone information on geographical distribution, workers experience, formal education of entrepreneurs, economic characteristics, debts, own account and contract production, gross value added in products, diversity implicit in technology platform (unit price, total price, machine cost etc.), land resources utilization, capital labour ratio, productivity elasticity, determinants of labour productivity, structure of loan, structure of trade credit, interest rates, equity debt ratio, working capital, relative weights of various products, utilization of capacity of industry, cost of production, retail price, market channels (domestic, wholesale etc.), commission agents channel, annual growth, ICT in formation and so on . A brief action plan has been included in section 5. A summary recommendation may be found in the concluding part of the executive summary. For all citations and secondary data utilization, references have been mentioned; however, missing of any reference, might be due to our unwilling mistakes.

Table 1.1: Food processing firms in Bangladesh

		Firm size (%)		
	Number of firms	**Small**	**Medium**	**Large**
Manufacturing enterprises	32,911	78	8	13
Agro-processing enterprises	6,139	93	4	3
Rural Agro-processing enterprises	3,974	93	3	3
Urban Agro-processing enterprises	2,165	93	4	3
Manufactures of edible vegetable oil(except hydrogenated)	133	92	3	5
Manufactures of dairy products	97	90	4	6
Manufactures of grain mill products	226	93	5	2
Rice Millers	3,885	97	3	0
Manufactures of bakery products	1,145	93	4	3
Manufactures of cocoa, chocolate and sugar confectionery	100	94	2	4
Processors of tea and coffee	97	13	16	70
Manufactures and Processors of other food products	456	81	7	12

Source: World Bank Bangladesh Development Series, Paper No. 21, February 2008

Note: Small enterprises have 10-50 workers, medium enterprises have 50-100, and large enterprises have more than 100.

Section 2

A perspective of agro and food processing industry in bangladseh

Time has come when like western countries, Bangladeshi population too has to increasingly rely on ready-to-serve and eat, hygienically processed and well-preserved food. Modern technology has also brought in better, more hygienic and more economical ways of processing and preserving food. New food industries are entering the market with new products and more and more companies are diversifying and expanding faster in the processed food items than in their traditional products.

2.1 Food and its processing industry

Bangladesh has an agricultural economy one way or the other, with more than 80% of her population being engaged in production, processing and distribution of food. Agriculture and animal husbandry produces basic food and unprocessed raw materials for various finished food. It is very essential for 140 million people of Bangladesh that every grain of food is preserved, processed and made into human consumable products. The large potential of preventing loss and wastage of food material and providing large scale employment to Bangladeshi people thus rests with proper processing and preserving food materials. Food processing thus becomes extremely important for our economy. Till recently proper thrusts were not given in establishing agro and food processing industry. However, Government, understanding the importance of this area on economy of the country, has established SMEF and progressive thrusts are being applied to this sector of activity.

Food processing is envisaged to be a major plank in the strategy for country's agricultural development during the Fifth Plan period and beyond. The thrust on the manufacture of quality processed food and their export in large quantities and also larger domestic consumption will trigger a number of beneficial changes, including the following.

- Modernisation of horticultural production system.
- Distribution of industrial activity throughout Bangladesh, thereby avoiding large scale migration of rural population to cities.
- Nutritional supplement to the domestic consumers by providing hygienic and quality products
- Stable prices to the agricultural produces and uniform release of food products to the local and international consumers.
- Substantial export earnings leading to a favourable balance of payment situation.
- Considerable increase in employment potential in rural areas.

2.2 Some Basic Issues

At present our food processing industry faces both external and internal constraints. External constraints include the cost disadvantages in the international marketing framework, while internal constraints comprise lack of suitable processing technology, infrastructure for distribution, storage and marketing facilities. Till such time as the internal constraints are removed, the food processing industry will require supporting measures in the form of incentives, subsidies and so on. From the short-term point of view, Bangladesh requires to frame two set of policies-one for domestic sector and the other for export sector. While for the export market, there may be a need to set up sophisticated and capital intensive units supported by necessary imports against exports, the domestic front needs coordinated planning for processing, refrigerated distribution and scientific and economic packaging.

Export markets for processed foods are highly diversified, cost sensitive and, above all, hygiene conscious. Besides quality, quantity and variety of the foods required in export markets, the aspects pertaining to labeling, packaging, techniques of packaging and cost assume primary significance. These differences between domestic and overseas food processing industry could be tackled by promoting and developing those processed food areas which offer domestic source economics and maximum foreign exchange earning potential.

The items based on pineapples, mangoes, selected vegetables, shrimps and other fish could be considered as priority areas since a little attention and assistance in these lines could put too Bangladeshi food processing industry at par with overseas competitors.

2.3 Export Constraints

The biggest constraints in export are absence of credibility. Credibility comes from close maintenance of hygiene, close monitoring of quality, absolute reliability on supply and stability of prices. Developed countries are very particular about hygiene of food and any lack of hygiene or presence of unhygienic materials or bacteria, mold etc. definitely tarnishes the exporters' image. Absence of modern slaughter house, modern animal rearing technique and sophisticated meat processing know how and equipment has not allowed Bangladesh to grow into a meat products exporting country. Primitive technology adoption, unsophisticated packaging leads to such constraints. Industry should be free from investment limit shackles to freely employ latest know-how and equipment to produce product which the buyers want.

Poor quality of basic raw materials also affects the production of efficiency and qualitative aspects of the final products. The present marketing structure that involves a number of middlemen, further push-up the cost of these basic raw materials. In addition, per hectare yield of the fruits and vegetables are very poor. Even in the yield of finished products, the Bangladesh processed foods industry lags far behind the developed countries. Export of fruits and vegetables from Bangladesh have grown steadily, but the total export value remains small averaging around US$ 20 million per year since 2000. Although Bangladesh exports fruits and vegetables to about 30 market destinations, the major buyers are located in two places: the UK and the Middle East. In the UK, the bulk of exports cater to the ethnic market; small volumes have also been sold in mainstream supermarkets, primarily by BRAC. In the Middle East, the major Market outlets are Saudi Arabia, UAE, Qatar, Bahrain, and Oman and exports cater to large Bangladeshi migrant population (Bangladesh Development Series, WB No.20).

Several commonly acknowledged risks are associated with fruits and vegetables exports from Bangladesh: (i) multiple risk of microbiological contamination in the production and postharvest handling systems for exported fruits and vegetables; (ii) chemical contaminations, particularly with regards to pesticides, because exporters have limited information about which agro-chemical products are permissible, correct application rates, and appropriate pre-harvest intervals for different chemicals; and (iii) heavy metal contamination, particularly with regard to high levels of arsenic, lead, and cadmium in vegetable exports. Exports of food products manufactured under substantively unstandardized conditions results in high percentage of customer rejections, trigger user backlash, brings discredit and ultimately destroy an exporting country's brand power. Bangladesh exports when there is surplus of the food commodity and restricts export if there is a shortage. Instead, efforts should be made to sustain the productivity level. Export incentives should be rationalised and procedures should be streamlined and made free of bureaucracy. Export subsidy, incentives such as duty exemption, drawback, etc. should also be streamlined.

2.4 Inadequate Knowledge of Market

Till today exports are done on selected items to a selected number of countries. An elaborate and adequate knowledge of international market of processed food, particularly the price elasticity vis-a-vis new choice of product image and packaging are not present. This is expensive but essential for setting Bangladeshi food products to international market.

A consortium approach is absolutely necessary for market information and bidding, so that simultaneous bidding by several Bangladeshi exporters and their competition does not go in favour of the importing country. Because the typical Bangladeshi producer in the AFP industry only has a comparatively small-scale production volume, its average costs are relatively high. Compared to the competition the cost of production and the productivity of fruits and vegetables are high. Our processed food lacks consistency in flavour, taste, shelf life and other qualities. Batch to batch variation takes place and scientific quality control efforts are not made. Many a time such quality consciousness in non-existence, particularly, when scale of operation is small and technology adopted are not up to the mark. Absence of on line testing, large variation in raw material quality and inadequate blending leads to inadequacy in the quality of finished products. The price of a commodity essentially depends on the parameters discussed earlier. Price stability is effected only when these parameters are rationalised.

2.5 Domestic Constraints

Bangladesh produces 8 million tonnes of horticultural produces each year. Even PRAN, which is believed to account for more than half of the horticultural produce that moves through processed channels, only can consume an estimated 12,000 15,000 tonne per year. Even under the most liberal assumption, it appears that transformation of horticultural products into processed products accounts for less than one percent of total horticultural production. The cost of storage is very high and refrigeration technology has not caught on. Transport and distribution system lacks refrigerated wagon and where they are available the price is exorbitant. Since the beginning of the planning era, hardly any planned efforts have been made to develop the processed food industry in the country.

The preservation of certain items like pickles and other processed foods in the small sector may have the merits of generating employment and development of small entrepreneurship, but its growth would depend upon the demand for processed foods, which is a function of prices and certain qualitative aspects less results could be achieved by manipulating excise duties and offering export incentives. The root causes are backward technology, lack of quality consciousness and higher prices of fruits and vegetables. In fact the farm production has not been geared for the purpose of exports.

The industrial licensing policy, reservation status and other instructions are responsible for the poor development of the processing technology. And this has resulted in dismal image of Bangladeshi processed foods in the international market. Even in the domestic markets, the market potentials for processed foods could not be exploited on account of cost considerations. Thus economics of scale in the fruits processing has been rendered difficult by unwarranted policy guidelines and legislations.

A major constraint in the way for rapid development of food and agro processing industry is the inadequate infrastructure, 30% of the fruit and vegetable produced in the country are wasted for the lack of controlled condition storage, cold storage and pre-processing units (World Bank, 2008). Fast and reliable transport conveying the raw produce to the processing units is essential. Alternatively the processing unit should be located near the growing area. Many a time adequate road, transport, communication and utilities are not available in such area. In case of marine products trawlers, fishing accessories facilities are inadequate.

Our agriculture is decentralised, fragmented and not geared to the requirement of modern food processing technology. The farm products are non-standard in quality and yield in contradiction to the demand of the processing units. The largest cost element in a processed food industry in Bangladesh is packaging, although the packaging is poor in quality, appearance and innovativeness. Large duties and taxes on packaging materials and high cost of printing makes the packaging uneconomic.

The cost structure of large units producing processed food is such that the basic input costs are barely 15% and additional 15% is transport. The 70% chunk consists of packaging (35%), advertisement and profit margin. Large sale volume permits low profit margin, but high cost structure is a constraint in large sale volume and this is a vicious circle. Competition and cost effective production is needed to boost popularity of processed food (World Bank, 2008).

Processed foods are usually marketed by Bangladeshi companies both in the country and in the international market on adhoc basis. Rarely the seller is fully aware of the nature and characteristics of the market they are catering to. Even after the product is accepted by market the feed back from the consumer is rarely obtained and analyzed to monitor the sales. The cottage industry products which are usually ketchup, chutneys, pickles etc. are more or less sold without problem, particularly because individual volume of sales is not high. Problem comes most of the time in organised sector trying to sell food of Western taste and type.

Market research is still more essential for export as the stakes are much high. Continuous monitoring of the charging requirements of the consumer and suitable designing and modifying the product mix is an essential need to become successful in domestic and particularly in the export market. Research and development to impart better quality of the processed food to cut down the cost of production to absorb improved technology is also an essential step to improve the sales.

2.6 Basic Problems

Some of the basic problems faced by food processing industries and existing at various levels in our country can be discussed as:

a) Farm level problems

- Poor yields of farm produce and therefore low returns
- Lack of material resources necessary for development
- Primitive methods of farming, no resources to introduce mechanized farming
- No control on quality of seeds, soil nutrients, fertilizers, insecticides and pesticides and lack of finance to manage
- Dependency on weather
- Day-to-day exodus of farm labour to seek remunerative returns in urban areas
- Unavailability of handling and transportation system for immediate sale and marketing
- Lack of preservation or storage facility at the farm

b) Distributors' problems

Even though the distributor also known as the middleman, removes the cream by exploiting the farmer as well as the processor he too is not as comfortable for being connected with this sector:

- Lack of modern transportation system which would prevent transit losses
- Bad quality roads
- Inadequate cold storage capacities
- High cost of transportation
- Irregular quality of farm produce etc.

c) Processors' problems

Problems faced by processors are mainly on account of:

- Innumerable constraints at every step and complicated procedures
- Hesitation of financial institutions in funding projects of food processing industry for the market uncertainties
- High project cost because of higher import duties, high rates of interest and very high promotional expenses
- Higher cost of the farm raw material besides poor and irregular quality.

2.7 Status of Technology

The last decade of the present century that has just begun urges well for the food processing industry. The accrual of maximum benefits to the farm sector, a target of the government, can only be ensured through commensurate support to the food processing industry. While the traditional food processing technologies, viz., canning, baking, fermentation, dehydration, drying, refrigeration and freezing are bound to find increasing usage and applications, some new processes hold great promise for the future. This arises from the many advantages that these offer over alternative methods in terms of the processing cost, energy efficiency, better quality, consumer convenience etc. Among new technologies, some of which have already been introduced on a commercial scale in the country in recent years are:

a) Extrusion cooking
b) Aseptic processing
c) Thermal processing in flexible pouches and

Selection of technology of process food and agricultural products is of extreme importance as it is directly linked with the product quality, product acceptability and cost reduction of the process of production. In line with the fast growing technological advancement in every other product, food technology is also not falling behind. Every year technologies are being updated and new processes replace old one.

Technological upgrading is extremely important for the export as the competitors are continuously improving the technology used at their plant. Exporters are required to cater varied tastes and widely dispersed ethnic and traditional tastes, food habits and choice of food.

Bangladeshi consumers also have widely varying tastes and food habits coupled with many a times inhibition and restriction for certain food and condiments. As such mere copying Western technology may not be appropriate. The technology must be adapted to our condition keeping in mind the whole spectrum of Bangladeshi food, traditional and modern. Some of the important and appropriate technologies are mentioned below:

a) Extrusion cooking

This is widely acclaimed as a major milestone in food processing as, in a single step, it combines many different operations such as mixing, shearing, plasticizing, texturising, conveying, forming, puffing and drying. It is capable of using a variety of materials and converting them into many different forms. The feed is mixed and forced fed to a compression screw rotating in a barrel with a nominal clearance, where it is subjected to high share and pressure, causing the product to rise to plasticizing temperature in a short time. This and the subsequent exit through tapered and shaped discs, restructures the polymeric components in foods. A single production unit with minor changes in barrel length, screw configuration die shape and speed of rotation can yield and endless and fascinating variety of shapes sizes and textures. Formulation changes can further expand the variety in flavours, colours and taste. The advantage of the technology is:

- Simplicity of equipment and ease of maintenance

- Minimum space requirement in relation to throughput
- Energy efficient in comparison to other thermal methods
- Versatility-wide range of products
- Minimum nutrient loss (HTST)
- Low processing cost-high throughput

The technology made a beginning less than two decades ago and currently, the range of products made in the country include: snack foods (ready-to-eat and half products), breakfast cereals, weaning food, nutritional supplements for social welfare programmes etc.

b) Aseptic Processing

Another technology that has been a landmark in food processing is aseptic processing, an alternative to in-container sterilization. It has been in significant commercial use world wide since the mid 1970s. The technology made its entry into the Bangladeshi market with the introduction of UHT processed milk and has had a phenomenal growth. Fruit juice and pulp as well as their concentrates are also bulk packaged for export and industrial use.

The development of the technology is a culmination of the efforts to overcome some of the major disadvantages of canning. Aseptic processing involves the sterilisation (ultra-high temperature processing) of a fluid product, filing it into a pre-sterilized container and its closure under conditions that guarantee freedom from microbial contamination. The technology provides for a wide choice of packaging materials that include pre-formed containers like the metal can, glass bottle and PET jar or containers fabricated in-site such as cartons and pouches made of flexible paper-board / plastic laminates and thermoformed plastic cups. For bulk packaging, plastic bag-in-box and plastic bag-in-drum are used.

The sterilization of the product by UHT processing could be either by direct stream injection or indirect heat transfer through tubular or plate heat exchangers, Neutral products, such as milk requires heating to 140 C for 4-5 seconds, whereas highly acidic products like fruit juices need only 95 C for 20-30 seconds. The packaging materials are sterilized by dry heat, steam, hydrogen peroxide or bacterial chemicals.

The special merits of the technology include:

- Minimum changes in organoleptic quality
- Minimum nutrient losses
- Energy efficient process
- Only method for bulk-packaging sterilized products
- Inexpensive packaging materials
- Economy in storage and transportation of the product
- Disposable containers provide for consumer convenience

With all these advantages, it is to be hoped that, although introduced into the country rather late, every effort will be made by the government and industry alike to exploit it for national benefit.

d) Thermal Processing in Flexible Packs

Retort pouches date back over four decades and were initially developed in the USA to provide superior army rations. The technology involves packing the products in flexible laminate containers, heat sealing them and subjecting them to thermal sterilization.

The packing material is generally a 3-ply laminate, the outer layer provides the printing surface and also protects against abrasion, whereas the middle layer acts as barrier against O_2, H_2O vapour and light and inner layer, enables heat sealing.

Typically, polyester, aluminium foil and high density polyethylene form the three layers, with bonding of the layers being achieved by polyester isocyanate. Among other materials that have been used in retort pouches are PVDC, EVOH, high impact polystyrene, polypropylene co-polymer, crystallised polyester and polycarbonates. Non-foil laminates have also been used for retortable pouches and in these cases, the shelf-life can be enhanced by secondary packaging in foil containing material. Among the factors that influence throughput is pre-formed pouches vs. on-line formation from roll stock; thermal impulse vs. resistance heated hot bar sealing; and batch sterilization vs. continuous retorts.

The advantages of retortable pouches are light weight relative to strength of container material; lower (40-60% less) energy consumption than canning; needs less liquid for heat transfer inside container; improved organoleptic quality; better nutrient retention; vacuum packaging eliminates head-space gas; ease of in-container heating prior to consumption; and easy open and disposal convenience.

2.8 Subsidies for fruit and vegetable exports from Bangladesh

The Government of Bangladesh has declared the following package of incentives and facilities for export promotion: an income tax exemption for export earnings, whereby all exporters with business registered in Bangladesh will get a 50% exemption in income taxes; an exemption in the insurance premium; bond facilities for export oriented industries; facilitie4s for duty-free importation of capital machinery for export-oriented industries; ability to import 10% of the required spare parts for machinery every two years, duty free; a tax holiday; and a duty draw-back scheme.

In addition to these standard export incentives, fruits and vegetable exporters are entitled to a cash subsidy. Under the export incentive package that took effect on July 1, 2006, exporters of fresh fruits and vegetables receive a subsidy of 30% of the net repatriated Freight on Board (FOB) value. The comparative figures for exporters of potatoes, processed agro-products that used 80% of the local raw materials, and processed agro products that used at least 70% of the local raw materials are 15 %, 30% and 20% respectively. Asid from cash subsidies, fruit and vegetable exporters also receive a Special Inducement Price (SIP) for cargo shipped on Biman. At the rates prevailing in 2006, the aggregate subsidy (cash subsidy plus the SIP) for the volume of fruit and vegetable exported in 2003/04 was almost US$ 16 million – equivalent to more than 60% FOB value in 2003/04 (table).

It is recommended that the SIP currently granted by Biman should be phased out gradually, according to a clear and well –communicated schedule. Gradual elimination of the SIP could be accompanied by a parallel increase in the incentives paid by the government on the exports of potatoes, fruits, and processed products (table) The objective is to redirect subsidies toward more growth-oriented activities without reducing the overall value of the incentives paid to exporters at once.

By replacing the SIP subsidy with an increased export subsidy, exporters would be motivated less by the proportion of Biman's freight capacity that they win in the weekly lottery and by their ability to increase their overall export movement.

2.9 Use of food safety standards

The European Economic Community (EEC) comprises of member countries: Belgium, France, Germany, Italy, Luxembourg, Netherlands, Denmark, Ireland, United Kingdom, Greece, Portugal and Spain and other member countries from European Free Trade Association (EFTA) are have some common standards dealing with certain minimum manufacturing practices for quality management and proper inspection and testing. Those products which conform to these standards/practices will be allowed to be marketed in EEC and EFTA markets.

To boost our exports to the European market, it will be necessary that we conform to manufacturing practice and quality management and inspection and testing practices prescribed by these standards.

An organization with an existing food safety program can incorporate the elements of ISO 22000 into their existing system by using a stepwise approach. Most of the existing food safety standards or programs are:

- Good Manufacturing/Production Practices (GMP/GPP) and Hazard Analysis Critical Control Point (HACCP) systems based on Codex Alimentarius Guidelines
- US FDA, USDA and European RvA GMP/HACCP regulations
- Singapore Standard (SS 444)
- The Canadian Food Inspection Agency's Food Safety Enhancement Program (FSEP)
- Safe Quality Food (SQF) an American (FMI) owned scheme with some international accreditation basis – based on HACCP and ISO 9001:2000
- Eurepgap - the Euro-Retailer Produce Buying Group's Good Agricultural Practices (GAP) based program
- BRC - British Retail Consortium scheme for supplier qualification
- IFS/HDE - French / German Retailers' schemes for supplier qualification

Table 2.1 Fruit and vegetable (F&V) export subsidies

F&V	FOB export values (US$ 000s)	FOB subsidy (%)	FOB subsidy value (US$ 000s)	SIP subsidy/t (US$ 000s)*	SIP subsidy (US$ 000s)	Aggregate subsidy values (US$ 000s)
Vegetables	24,700	30	7,410	405	8,165	15,575
Fruit	137	30	41	405	45	86
Potatoes	562	15	84	405	186	270
other	9	30	3	405	3	6
Total	25,408		7,538		8,399	15,937

Source: The World Bank Bangladesh Development Series, Paper No. 21, 2008

Note: assume 45% to EU @US$ 386/t, 55% in Middle East @ US$ 420/t (9,000 tons to EU, 11,000 tons to ME)

Section 3

Agro and Food processing Industry: potential and constraints

3.1 The segments of Agro and Food Processing Industry

- Fruits and vegetable processing industry
- Rice and wheat milling
- Milk, dairy products, poultry and eggs
- Fish processing
- Bread / biscuit / confectionery manufacturing, breakfast foods(including cocoa processing and chocolate), malt extract, protein isolate, high protein food, etc.
- Aerated waters / treated water, and all kinds of soft drinks

3.2 General Overview on the Agro and Food Processing (AFP) Industry in Bangladesh

3.2.1 Potential of agro and food processing:

Agro and food processing activities represent a potential source of livelihood for many poor people in Bangladesh. The overall potential of agro and food processing is huge as it can:

- Increase the value crops of poor farmers and thus yield higher returns;
- Expand marketing opportunities;
- Improve livelihoods of people;
- Extend shelf-life of commodities;
- Improve palatability of commodities;
- Enhance food security;
- Overcome seasonality and perish ability constraints; and
- Empower women who are often involved in agro-processing.

Agro-processing industries play an important role in contributing country's GDP through employment generation, increase in incomes of primary producers, prevention of post-harvest losses and value addition to most primary products. The specific importance includes:

- Improved backward linkages
- Improve forward linkage
- Improved home processing and storage
- Increased women and older persons' entry into food processing
- Improved household security for processed food product
- Promote adequate nutrition and healthy lifestyle
- Other economic importance and potentials of food processing includes:
- Utilization of readily available (often-surplus) indigenous raw materials.
- Most technologies are available, accessible and affordable at scales that are suitable for small-scale operations.
- Increasing farmer's income by the full utilization of available indigenous raw materials.
- Equipment can often be manufactured locally creating additional employment.

- The products if chosen correctly will have a wide spread demand.
- Improving nutritional status through consumption of fruits and vegetable for a larger part of the year.
- Increased income for the sale of processed food products.
- Processing of seasonal gluts which would otherwise be wasted.
- Cutting production costs by better utilization of local natural resources (solar energy, gas etc.) and reducing transport costs.
- Generating and distributing income by decentralizing process activities and involving different beneficiaries in processing activities (investors, newly employed, farmers and small scale industry).
- Maximizing national output by reducing capital expenditure and royalty payments, minimizing imports (equipment, packaging materials, additives etc.) and maximizing export oriented product.
- Maximizing availability of consumer goods by maximization of high quality, standard processed produce for internal and export markets, reducing post harvest losses, giving added value to indigenous crops and increasing the volume and quality of agricultural output.
- Increase in convenience by having part-prepared foods available when required.
- Making available of different food products through out the year provided variety and greater nutritional balance in the diet.

3.2.2 Constraints in agro and food processing

Despite the numerous opportunities created by small-scale food processing, general producers face a growing number of constraints. The market for processed foods is becoming fiercely competitive. Large companies are marketing packaged products throughout Bangladesh and thereby squeezing out small-scale producers.

There is need for a strong integrated of agricultural development efforts with the food processing industry. Applied agricultural technology aimed at full utilization of crops needs to be developed keeping in mind the techno-commercial requirements. Crop varieties better suited for processing needs to be developed from agricultural research institutions and introduced through the agricultural extension service. For example, we need to import wheat (wheat flour) for baking (biscuits, bread, noodles etc.) industries, because when grown in Bangladesh are not suitable for quality confectionery products. In the same manner, post harvest technologies that minimize losses in quality and quantity need to be developed and transferred to the farm level. Important general constraints in food processing are as follows:

Growth of the agro-processing industry is hampered by various constraints that range from equipment supply to problems faced by consumers of the technologies. In the manufacturing sector, progress is limited by:

- Difficulties in accessing foreign currency;
- Reduced demand for equipment as most clients fail to mobilize resources to acquire equipment;
- Limited transfer of technology from research;
- Limited access to working capital;
- High duty and tax on imported raw material and spares. In some cases the government policies on duty and taxes charged on imported equipment

discourage local manufacturing. For example industrialists are charged value added tax (VAT) on imported materials used in the manufacturing process yet the finished piece of equipment is sold without VAT making it impossible to recover costs. The manufacturers get frustrated when they pay high duty and taxes on raw materials while the competing finished products are imported at low duty; and

- The manufacturing sector has also been characterized by poor quality products, especially from the informal sector, as the enforcement of standards has not been effective. The prevalence of substandard equipment on the market at times forces the government to create conditions for importation of high quality products to protect the consumers.

a) Agro and food processors face numerous constraints including:

- Poor equipment back-up service rendered by dealers, shortages and high cost of equipment and spares;
- Limited access to information from extension service;
- Limited access to appropriate packaging material for processed products, lack of marketing skills;
- Inadequate support services from training institutions, private sector consultants, small enterprise advisors, research institutions and engineering workshops;
- Erratic supply and increased cost of fuel coupled with frequent power cuts;
- Unreliable supply of raw materials, reduced demand for processed food products;
- Poor cash flow emanating from low volumes of raw materials hence low income is realized from processing;
- Failure to meet food processing regulations pertaining to food safety and hygiene practices (BSTI standard) which need to be adhered to in the industry. Attention to hygiene and basic food safety procedures is found, at times, to be limited among informal enterprises. Knowledge of specific regulations and legislation governing food safety and hygiene issues is only evident among those processors who market their product through formal outlets.
- Limited capacity to mobilize capital for equipment purchase and working capital.

b) Constraints faced by producers of raw material include

- Frequent droughts resulting in crop failure;
- Current high costs of production inputs (seed, fertilizer, chemicals etc.) resulting in a decline in the levels of production hence shortages of raw material. This factor together with the preceding one could have a compound effect;
- Lack of funding and unfavourable borrowing conditions; and
- Lack of commercial farming skills.

3.2.3 Addressing the Constraints

To address the constraints which embargoes or creating hindrance to the food processing business, the following measures should be considered:

- Improvement of infrastructure
- Selection of adequate equipment
- Adopting technical development policies
- Ensure raw materials availability
- Fulfill packaging requirements
- Promotion joint effort between government food research institute and private companies
- Proper utilization of food preservation technology and prevention of post harvest losses.
- Suitable fiscal policies
- Specific R & D support measures

Growth of the agro-processing industries would result in value addition, crop diversification, shelf life enhancement, reduction of wastage, availability of hygienic food to consumers at affordable prices, anytime, anywhere, as well as generation of employment, thus benefiting farmers, processors, consumers and the economy of the country as a whole. To harness these opportunities, an integrated holistic approach should be initiated through public-private partnership to motivate farmers and food processors and also to provide linkage between technology, economy, environment and society for speedy development of food processing industries to build up a substantial base for production of value added food products for domestic and export markets with a strong emphasis on food safety and quality.

3.2.4 Specific cases of agro and food processing in Bangladesh

A sample of commodity specific case studies of agro and food processing is given in the following sections:

3.2.4.1 Fruits and vegetable processing industry

The role of processed fruits and vegetables in domestic and export economies is quite small, although several large-scale enterprises (among them PRAN, Square, Eurasia Food Processing and BD Foods) appear committed to expanding this sector. In Bangladesh, the modern organized fruit processing industry comprises relatively small volumes of canning, freezing and dehydrating. Yet jams, jellies, and pickles are made in large quantities, cheifly by small-scale entrepreneurs in the home or cottage sector and extruded snacks, puffed rice and potato chips are made and sold in the domestic market by SMEs. Some units, especially larger ones, have modern facilities operating hygienically in conformity with the United States good manufacturing practices (GMP). On the whole, however, most facilities need upgrading and the personnel require considerable training on a wide range of topics.

Grains from improving post-harvest technology and market infrastructure as well as in addressing basic productivity issues at the farm level will have a far wider impact than exports. Exports of fruits and vegetables are less than 30,000 tons, whereas very conservative estimates place post-harvest losses at more than 2,000,000 tons.

Developing the processing sector is critically important for expanding and diversifying the fruit and vegetable sector and may also offer strong prospects for expanding exports.

Even under the most liberal assumptions, it appears that transformation of horticultural products into processed food products accounts for less than 1 per cent of total horticultural products. Bangladesh produces 8 million tons of horticultural produce each year. PRAN, which is believed to account for more than half of the horticultural produce that moves through processed channels, consumes an estimated 12,000-15,000 tons per year.

Any improvement in maintaining the cold chain intact would have a salutary effect on product quality and reduce post-harvest losses. In the near term, the absence of any cold storage capacity at the urban markets means that refrigerated transport to these points from farm-gate would have limited positive impact. For product destined to processors, on the other hand, temporary storage in any of the 320 (largely underutilized) potato/seed potato storage facilities would provide a double benefit, prolonging useful life for farmers' produce while generating incremental income for facility owners.

Exports of processed horticultural products are in their infancy. Neither BBS nor EPB maintain separate statistics on exports of processed horticultural products, although Comtrade data indicate that total exports of processed fruits and vegetables were less than US$ 1 million in 2005.

A recurrent complaint among Bangladeshi fruit and vegetables exporters has been insufficient access to air cargo space. Although horticultural exporters have benefited from subsidized air freight rates and preferential access to air cargo space from Biman Airlines, the subsidized air freight capacity of Biman meets only 30-40 per cent of the estimated demand for Bangladesh's fruit and vegetable exports. While additional cargo space is available from the numerous foreign carriers serving Zia International Airport, their unsubsidized rates are uncompetitive with those of Biman. The Biman rate structure thus serves both as an export stimulus, with respect to the cargo that it can accommodate, and as export "ceilling" with respect to the 60-70 per cent of demanded and exportable product that becomes unaffordable and uncompetitive when shipped at market rates to markets served by Biman.

For expected progress and success in SMEs in fruits and vegetables processing, following consideration may be made:

- Provide farmers, service providers and agro-processors with reliable access to power and preferably gas. The reliable provision of electricity is a national problem in Bangladesh, not one that is restricted to the food processing sector. Still, the prospects for growth in this sector are being severely compromised by this problem and would greatly benefit from its resolution
- Establish handling and transit guidelines for each commodity, based on the specific operating conditions within Bangladesh.
- Based on options identified in the review of marketing legislation and market management practices, assess necessary investments, including the construction of post-harvest management and processing facilities that will reduce waste and encourage value addition.

- Strength the effectiveness of BSTI. Determine BSTI's effectiveness in undertaking market surveillance, testing and certification to address food safety risks. Consider institutional reforms to strengthen the performance of BSTI.
- Strength local capacity in export logistics. Individual exporters and BFVAPEA require capacity building in export logistics, especially in negotiating better logistical arrangement. The first step would be developing a proposal and action plan.
- Explore and potential of sea freight as an alternative to air freight. In conjunction with shipping lines and public sector institutions, exports should identify commodities suited for export by sea, establish handling and transit temperature guidelines and conduct trails shipments.
- Address and revitalize the performance of Hortex to transform it into an effective institution.
- Build institutional capacity to meet the prerequisites for accessing new markets. As part of the process for gaining access to promising new markets for fruit and vegetable exports, especially in East Asia, develop capacity within the Ministry of Agriculture to conduct pest risk analyses and negotiate and implement work plans.
- Public-private partnerships can facilitate research on processing techniques, the use and manufacture of equipment and the development of new products.

3.2.4.2 Fine and aromatic rice milling

Chapai Nawabganj District in Rajshahi Division is well known in Bangladesh for its high production of fine and aromatic paddy and has also become the prime location for trade in this high-quality rice. The traders and millers have organized themselves under the aegis of the Chapai Nawabganj Raw Rice Mill Owners and Traders Association, consisting of 20 millers and nearly300 traders who deal primarily, if not exclusively, in raw Chinigura rice. Association members control an estimated 95 per cent of the milling and trading of fine rice in the district.

Traditional husking mills, equipped with Engleberg hullers and locally made aspirators, have long been used for milling parboiled paddy. With the expanding demand for fine aromatic rice in recent years, some millers have invested in modern mills optimized for milling raw (not parboiled) paddy, resulting in fewer broken grains and higher-quality milled rice output.
Fine paddy, including the varieties Chinigura and Chiniatap, abundantly grown in the area, is assembled by farmers in the local markets. This paddy, cultivated only during the aman season, is purchased by millers and traders from all over Rajshahi Division. Large landholders, locally called *jotdars, chowdhuries*, or *talukdars*, act as stockists of fine paddy, stocking large quantities of paddy of their own production as well as purchases from small-scale farmers. Mills typically do not hold large stocks (only 4-6 weeks of mill consumption) but instead procure stock off-season from well-known landholders in the area who often advance up to one month's credit to the mill.

One firm, which started milling fine raw aromatic rice with a traditional mill in the late 1980s, installed its first modern unit in 2000 to increase its outturn. Since then the mill has added three additional units, with imported Chinese milling machinery purchased in Dhaka and locally made elevators, husk furnace and mechanical dryers. Total installed capacity is 32 tons of paddy per day (16 hours). The owners financed these mills, which had an average cost of about Tk. 4.5 million each (including installation and erection of each unit) with their own capital. In addition to short-term credit from traders and large-scale farmers, the firm also finances other working capital requirements through an advance of Tk. 9 crores (US$ 1.3 million) by the Islamic Bank, Bangladesh. In 2005, the mill had over Tk. 4000 million (US $ 5.88 million) in total sales and a net profit of Tk. 11 million (US $ 162,000), equivalent to 2.8 per cent of total sales.

Exports of high-value rice are very small (3,800 tons in 2005, valued at about US $ 2.4 million), consisting almost exclusively of traditional local varieties exported to ethnic niche markets. Fine rice exports accounted for about 60 per cent of the total value of exports, the remainder was medium rice (such as Minicate and Pajam varieties). Most of this fine rice is sold in individual packs to Persian Gulf countries (about one-third of fine rice exports) and the United States, Canada, UK and EU (the remaining two-thirds). Medium rice varieties are mainly marketed to the EU and UK and sold in bulk (sacks).

3.2.4.3 Milk, dairy products, poultry and eggs

Bangladesh had 24.5 million cattle and 0.9 million buffaloes and produced 2.26 million tons of milk in 2005. Of the 64 districts in the country, 20 are considered suitable for milk production but the five main milksheds are Tangail, Manikganj, Tekerhat (Madaripur), Satkhira (Jessore) and Bagabharighat (Sirajganj). The Bagabharighat milkshed accounts for a major share of production and about 38 per cent of primary milk cooperative societies are located in this milkshed (Khan 2005, as cited in Knips, 2005). Milk production primarily takes place in two seasons- the lean season, from July to October and the flush season, spanning November through June. During the monsoon season (July to October), nearly one-third of the country is flooded, which drastically reduces access to gazing areas, damages green and dry fodder, and causes milk production to fall. As a result, lean production is about 30 per cent less than flush output.

Bangladesh has three categories of milk producers: the landless and smallholders, who keep 1-3 cows (local/crossbred) and sell milk directly to consumers or vendors; smallholders who own 1-5 crossbred cows and sell milk to the organized sector, including cooperative, NGOs and private processors (sometime referred to as "pocket dairies") and small to medium producers, who own 10-20 or more crossbred cows in peri-urban areas and sell milk directly to consumers, vendors, or the organized sector. About one-fourth of all milk producers are landless households.

Less than 4 per cent of national milk production enters into the formal market (the so-called "organized" sector). The bulk of milk produced domestically (81 per cent) is processed by the traditional "unorganized" sector and about 15 per cent is consumed by producer households. Locally produced liquid milk accounts for 12.8 per cent of the formal market. The rest (87.2 per cent) consists of imported milk powder.
Milk Vita, Aarong, Amu Milk, Silaidah, Bicrampur, Savar Dairy, Aftab Dairy, Safa Dairy, Tulip and PRAN are involved in processing liquid milk, making milk

products and marketing them. Bangladesh Milk Producers' Cooperative Union Ltd. (BMPCU), which sells dairy products under the brand name Milk Vita, is the largest organized diary enterprise in the country and produces about 66 per cent of processed liquid milk. BMPCU Ltd. is a two-tier milk producers' cooperative, consisting of the milk producers' cooperative at the village level and the Milk producers' cooperatives at the village level and the Milk Union collects some 200,000 liters of milk per day, and most of it is sold as pasteurized milk. More than 1,000 primary dairy cooperative societies (DCSs) are affiliated with BMPCU Ltd. Private and non-governmental dairy enterprises include BRAC (Aarong), Grameen Matsho and Pashu Sampad Foundation (GMPF) and PRAN. The nongovernmental and private organizations procure milk from farmers through commission agents.

For sustainability of SMEs in dairy it necessary to support the main areas for action outlined in the livestock policy and action plan, which include: improving collection and processing facilities; removing input constraints (feed enhancement, veterinary services and diagnostic facilities); creating and facilitating establishment of a management information system in the private sector to provide market information; establishing a regulatory body to monitor milk prices, prevent collusion and monitor quality control of dairy products; formulating a national livestock breeding policy; upgrading technical skills in the industry; controlling the quality of animals used in breeding programs and conserving indigenous livestock (GoB 2005b).

Bangladesh has experienced dramatic growth in the poultry industry with the emergence of successful commercial operations over the past 10-15 years. Although the outbreak of highly pathogenic avian influenza (HPAI) since 2007 has been a setback, by all accounts, demand for poultry products is likely to keep growing in the near future as long as the outbreak is controlled and proper measures instituted to regulate the industry, ensure food safety and restore consumer confidence. Large-scale commercial operations are well established, but the development of more small and medium enterprises (SMEs) would generate employment and potentially serve as an important avenue for poverty reduction in rural areas (see annex 1 for a summary of some recent projects/intervention in the poultry subsector). This chapter focuses on the opportunities and constraints for SMEs in commercial poultry production and processing. The large integrated operations have been and will continue to be, important for growth of the industry, but there is still plenty of space for SMEs.

Demand for poultry products (eggs and meat) has been growing rapidly. According to the 2004/05 HIES, rural residents consumed an average of 26 eggs per person per year and 2.2 kilograms of poultry meat. Consumption levels are much higher in urban areas, where per capita consumption of eggs was about 44 eggs and average poultry meat consumption was 3.8 kilograms. Estimates based on HIES data from 1995/96 and 2004/05 indicate that the production of eggs increased by around 3 per cent per year between 1995/96 and 2004/05, while production of poultry meat increased by just over 10 per cent.

The market share of the commercial poultry industry has increased rapidly over the past decade. Today around 43 per cent of meat sold in urban areas is broiler meat produced commercially. Local chickens are still preferred to broilers in rural areas. Commercial operations supply almost 80 per cent of the eggs sold on the market. In 2005 the size of the commercial poultry industry was estimated at US $ 600 million

(SEDF 2005); the broiler meat segment was valued at US $ 368 million and the egg industry at US $ 253 million. The same study estimated the value of the input and service industry catering to the poultry industry at US $ 197 million, of which the day-old chick (DOC) segment was valued at US $ 115 million and the feed industry at US $ 66 million.

Improving the quality of financial and production plans and budgets would help in securing financing for SMEs involved in the poultry industry. It appears almost impossible for SMEs to finance their initial investment through a private bank. The industry has a reputation of frequent defaults, followed by costly and complicated procedures to collect compensation from defaulters. The industry is improving on this image and banks are gaining interest. Credit programs that facilitate access to finance for poultry SMEs that have participated in a formal training program and that have prepared proper financial and production plants and budgets could be piloted. For small-scale producers, it is a disadvantage that large-scale producers receive government subsidies (they pay lower prices for fuel and electricity, and income form the livestock industry is exempted from tax until 2010). These subsidies benefit few SMEs, which are not categorized as an industry.

To support SMEs in poultry and egg productions following consideration are imperative:

- Develop models for joint public and private financing and management of research institutions to conduct research with practical applications topics important to stakeholders. More research is also urgent needed to identify where efficiency can be improved along the value chain.
- Develop a legal framework for poultry associations to be registered as economic and legal entities so they may do business on behalf of their members.
- Assistance in setting up a system of quality control and assurance for domestically produced input supplies and services and imported raw materials and inputs.
- Train farmers in poultry production and management, strengthen and upgrade farmers associations so that they can become active players in the industry and improve the quality of inputs and services.
- Upgrade professional knowledge and responsibility, facilitate a higher degree of coordination to limit the number of segments involved and improve the quality of inputs and services.
- Implement arrangements for transparent price setting, product development and marketing and for initiatives that promote and ensure food safety.
- Develop products that can satisfy the needs and demands of different stakeholders, especially the small- and medium-scale producers.

3.2.4.4 Fish and shrimp processing

Fish is a key part of the local diet: more than 60 per cent of all animal protein consumed in Bangladesh comes from fish. Per capita consumption is estimated at around 15.6 kilograms per year, similar to levels in Indonesia, Sri Lanka and Myanmar but below levels in Malaysia and the Philippines (35-45 kilograms) or Thailand (20 kilograms). Consumption data from HIES show that per capita consumption declined slightly between 1995/96 and 2000/01 from 15.9 to 13.8

kilograms but had increased to 15.6 kilograms by 2004/05. National consumption of fish increased by an average of 2 per cent per year between 1995/96 and 2004/05.

Department of fisheries (DoF) statistics show a total of 2,095,247 tons of fish (other than shrimp) were landed from inland fisheries, freshwater aquaculture, and marine fisheries for 2004/05 (GoB 2005a). Fish exports for that year totaled only 20,973 tons (allowing dried and salted fish at 20 per cent wet weight). Thus 99 per cent of fish landings were marketed and consumed domestically.

On the world market, shrimp exports have grown steadily over the past 20 years, from over 15,000 tons in 1986/87 to more than 45,000 tons in 2004/05. Estimates using data from 2003/04 suggests that 55 per cent of frozen shrimp exports (23,767 tons) consists of formed *bagda* (brackish water shrimp, principally the black tiger shrimp, *Penaeus monodon*), 20 per cent of farmed *galda* (giant freshwater prawns, *Macrobrachium rosenbergii*) and the remaining 25 per cent probably consist of the marine catch plus some contribution from other inland fisheries. In 2005/06, exports of frozen foods from Bangladesh, which primarily consisted of shrimp, totaled US $ 495 million, or about 4 per cent of export revenues. Despite substantial progress in these areas (see annex 1 for a summary of successful recent interventions in the fisheries sub-sector), several constraints prevent Bangladesh from realizing the full potential of its fisheries. Aside from production technology shortfalls, these constraints include problems in export processing, infrastructure, and marketing chains. To strengthen fish and shrimp processing:

- Support credit programs for small-scale shrimp farmers, possible through promotion of contract growing schemes.
- Assess viability of setting up feed mills and support the development of mills to produce feed of reliable quality for aquaculture.
- Assess economic viability of setting up ice plants in rural growth centres and support establishment of plants after evaluating the need for them; their likely effectiveness in improving fish, grown and shrimp product quality and their potential to be self sustaining.
- Government should rationalize the financial incentives for fish processing plants and halt abuse of them.

3.2.5 Research and development

The use of improved food machinery by the Bangladeshi food processors has increased considerably especially for processing of different products, packaging, sealing, pasteurizing, cooling and so on. In recent years the use of homogenizer, pasteurizer, filter, cooler, tetra pack, vacuum pack, pilfer proof pack have increased manifold.

Development of agro-processing equipment has not received the level of research support it deserves. There is no evidence for real budgets for research and development in private sector. In public sector, there is shortage of budget for Research and Development. However considerable research in the development of crop shellers, threshers, reapers, weeders, seeders, dryers, processes for food and feed production etc. has been conducted by BARI, BRRI, BCSIR, BAU, BUET and other technical universities. Useful research results have been generated but extension of the results to the private sector (manufacturers, food processors) and farmers has generally been poor Universities and Research Institutes may work in partnership with the private sector in equipment manufacturing processes and products development. Transfer of technologies to end-users is facilated by the linkages that exist between the researchers and the public sector (industry) and NGOs.

Involvement of students in the various research activities also helps in the dissemination of research results. The development and extension of crops threshers, seeder, solar dryer, bio-fertilizer, process for making soy biscuit have been the examples of success story for BARI, BAU and BCSIR. Technology development and marketing today is fully competitive and market-driven. However, there are issues surrounding intellectual property rights and patenting which are not in place. Many a time technology generated by researchers being used for commercial purposes without due recognition of the people involved in knowledge development.

3.2.6 Extension and training

Training in Agro and Food Processing is necessary at three levels: manufacturers/processors, distributors and end-users who are either farmers or entrepreneurs. Training in food processing techniques is not a limitation in Bangladesh. Training of food processors (jam, jelly, pickles, juice, breads, biscuit, cake, marmalade and other confectionary products, fish and shrimp processing, milk and milk products processing rice and wheat milling) is well established and of good standard. Training institutions such as BARI, BRRI, IFST, DFT&RI, DFPM, Youth Training Centre etc. offer training in food and feed processing. However most of these institutions are operated below formal capacity due to technical constraints or high staff turn-over. As for example to develop poultry industry training should include information on farmer associations, the benefits of collective action, and opportunities for obtaining inputs and marketing services through the associations. The training may be implemented at the existing youth training centers and should be linked with the University, which has specialized activities in poultry. However, implementation through the many poultry farmer associations around the country may also be tested. Large private companies interested in contact farming and/or in providing market outlets for SMEs will qualify as implementing agents, as well as NGOs involved in the poultry industry. The youth training centres under the Ministry of Youth may be the focal point. Information to serve as the basis for developing new training programs could be obtained through a comprehensive review of the three-month course currently on offer from the youth training centers and from feedback from former trainees. Particular attention should be given to providing an option for specializing in poultry production, offering a follow-up course after 6-12 months, and providing the option to develop tailor-made courses for industry personnel. The training programs should include additional interventions for strengthening, assisting and promoting the establishment and activities of poultry producer associations-locally at the district level and nationally. Special attention is needed to train farmers in poultry production and management, strengthen and upgrade farmer associations so that they can become active players in the industry and improve the quality of inputs and services.

There is very limited training offered to distributors as basic knowledge about the operations of equipment is frequently missing at points of sale. This is often exacerbated by lack of operational manuals on some products. Where attempts are made to provide manuals, they sometimes lack necessary assembling and trouble-shooting details.

Very few small and medium scale food processors have received formal training in food processing techniques. Most of the formal training support for small scale food processors has been provided by universities and research organizations. The training included drying of fruits, vegetables, fish, technical and business skills and entrepreneurship, financial access and management.

Ministry of Agriculture has a mandate to disseminate research outputs to farmers and other clients (AFP industry) via the Department of Agricultural Extension (DAE) which is represented upto upazilla level. However, coverage in Agro- and food processing at ground level is not as good as the DAE is responsible for the conventional Agricultural Extension. Most DAE staff are handicap to keep abreast of current technology development trends in Agro- and Food processing and their capacity to provide technical training and advisory services is limited. Recently a national project entitled “Enhancement o Agricultural Production and Rural Employment Through Extension of Agricultural Engineering Technologies” has been under taken employing Agricultural engineers at different Upazilla level. This project may have positive effect of Agro- and Food processing at root levels.

Private sector manufacturers have their own marketing and extension strategies driven mainly by their own staff particularly at forums such as agricultural shows (at various levels) and International Trade Fairs. Training for end-users is provided in a number of ways comprising short duration demonstrations offered by sales personnel, formal and informal skills training and technical training offered during installation and commissioning of equipment.

3.2.7 Food safety and quality

Codex Alimentarius, led by the FAO and WHO, is a long-standing example of international interagency, public-private sector cooperation in food standards, labeling practice, hygiene and additives. The International Organization for Standardization (ISO), a nongovernmental network of 157 national standards institution, which come together to agree on comparable international standards, has sections on agriculture and on food technology.

The Sanitary and Phytosanitary Measures agreement of the WTO defines transparent rules and standards governing cross-border movements of products. Progress has been modest since countries have different values and risks associated with food products, leading to differences in their interest in setting rules and standards. The private sector has also introduced a wealth of new standards. Yet the efforts to harmonize standards offer potentially very large payoffs. Support for good analytical work to understand the benefits, costs, and risks is important to inform international negotiations. A list of food products brought under compulsory certification marks scheme by Bangladesh Standard and Testing Institution (BSTI) is given in Annexure I.

Section 4

Quantitative profile of Agro and Food processing industry

4.1 Employment, workers' experiences and geographical distribution of Agro and Food processing industry

Table 4.1: Average employment per firm in the Agro and Food Processing Industry

Firm size classes	No. of firms	Production labor	White collar worker	Other worker	All worker
Micro	11	1.50	4.20	0.30	5.90
Small	82	3.20	19.40	1.00	23.60
Medium	34	10.20	57.40	3.00	70.60
Large	12	20.20	225.40	8.60	254.20
MiSmall	93	3.00	17.60	0.90	21.50
MeLarge	46	12.80	101.20	4.40	118.50
All	139	6.30	45.20	2.10	53.60

Source: SMEF survey of six sectors, 2006/07

The production labourer was highest (25.4%) in micro size firms and lowest in large size firms (7.9%). The small and medium sizes firms were possessing 12.5% and 14.4% production labourers respectively. While the white collar workers was highest (88.7%) in large size firms and lowest (71.2%) in micro size firms. Small and medium sizes firms were having 82.2% and 81.3% white collar workers respectively. The percentage of white collar workers needs be reduced for better productivity and also for profit in different categories of firms.

Table 4.2 Average years of worker experience in the Agro and Food Processing Industry

Firm size classes	Average no of male worker	Average no of female worker	Average no of all Worker	Male worker experience	Female worker experience	All worker experience
Micro	5.70	0.20	5.90	4.80	4.00	4.70
Small	21.70	1.90	23.60	5.60	4.90	5.60
Medium	57.50	13.10	70.60	7.30	4.60	7.20
Large	194.30	59.80	254.20	7.00	6.10	7.30
MiSmall	19.80	1.70	21.50	5.50	4.80	5.50
MeLarge	93.20	25.30	118.50	7.20	5.10	7.20
All	44.10	9.50	53.60	6.10	5.00	6.10

Source: SMEF survey of six sectors, 2006/07

The dominancy of male worker was observed in six categories of AFP industries. Male workers were highest (96.6%) in micro size firms and lowest (76.4%) in large size firms. The percentage of male workers in small and medium size firms were 91.9% and 81.4% respectively. The average male and female workers experience for all firms were 6.1 year and 5.0 years respectively. Thus Table 4.2 tells us that most of the workers are floating and/or changing the firms of employment frequently after gaining the experiences. Once the workers gain experience probably they are hired by other firms with better salary.

Table 4.3(a) Geographical distribution of sample establishments in the Agro and Food Processing Industry, 2006/2007

District	No. of establishment	Percentage of establishment
Dhaka	78	56.12
Mymensingh	15	10.79
Narayangonj	11	7.91
Chittagong	7	5.04
Bogra	5	3.60
Kishorgonj	5	3.60
Tangail	5	3.60
Netrokona	4	2.88
Naogong	3	2.16
Dinazpur	2	1.44
Gazipur	2	1.44
Comilla	1	0.72
Nilphamari	1	0.72
All	139	100

Source: SMEF survey of six sectors, 2006/07

Dhaka and Chittagong are the most productive among the clusters, with Dinajpur and Khulna bringing up the rear. The productivity sweepstakes are cleanly swept up by the two major metropolis of the country. This result is not surprising. It has been argued that by the Time magazine in 2007 that as much as 60% of Bangladesh's GDP originates in Dhaka. The City also accounts for a disproportionate share of the country's technological, managerial, and design repertory of resources and talents.

Number of enterprises and total persons employed at BSIC 3-digit level in AFP

One of the items on our TORs was about the quantitative importance of various 'clusters' in agro and food processing industry based on the number of enterprises and the number of persons employed. Since we are on a spatial subject at this juncture, we might as well report the relevant numbers here as well.

Just a couple of sentences on what 'clusters' ought to be defined in this context need to be entered. There is absolutely no prevailing definition of a cluster in the literature. We use administrative divisions as the basis for defining clusters.

Number of enterprises and total persons employed at a 3-digit level of disaggregation

The 3-digit BSIC categories of 151 through 156 exhaust each of the industrial categories that the Banalgadesh Bureau of Statistics (BBS) enumerates under the narrative category of the agro and food processing industries. The following table shows the situation, as of 2007, of the number of enterprises and persons employed

Table 4.3(b) Number of enterprises and total persons employed at 3-digit BSIC level for agro and food processing as of 2007

Divisional clusters	Enterprises		Persons employed	
	No. of enterprises	% of total	No. of persons employed	% of total
Dhaka	32825	30.4	141636	27.6
Chittagong	12622	11.7	69974	13.6
Sylhet	2510	2.3	51163	10.0
Rajshahi	49691	46.0	197903	38.5
Barisal	1262	1.2	4747	0.9
Khulna	9196	8.5	47991	9.3
All	108106	100	513414	100

Source: BBS, Economic Census, 2001/2003; BBS, Business Registry, 2007.

4.2 Scope and quality of entrepreneurial preparation of firm's creators

Successful company brands and the creation of brand loyalty typically call for entrepreneurial performance of a high caliber. According to Schumpeter, entrepreneurial performance is the defining characteristic of success in building an enterprise from the ground level up. What, however, is entrepreneurial performance, and how is one to best measure it?

Entrepreneurship is more than management, as the latter is popularly understood. Management is about managing inputs and processes, in their various aspects, that are prerequisite to satisfactorily producing the output of an establishment, based on a set of operating standards that have evolved over a period of time. Entrepreneurship is management, and then some. At times, the operating standards implicit in the routine operational procedures that amount to a best practice are bound to change suddenly and without notice for a manager/entrepreneur. A major buyer might for instance suddenly and without any notice slap upon the enterprise a binding unit price that is drastically lower. An important regional buyer has suddenly rejected a very large quantity of latest shipment of goods, causing a scramble at the headquarters of the exporter to find the root cause of the rejection. Received wisdom is of relatively little use during these periods when shocks---of one kind or the other---intervene. It is during these tumultuous times that the mettle---the entrepreneurial resilience--- of the enterprise is put to the test. How vigorously and how innovatively the enterprise will stage its response to the fuss at hand will typically depend upon how well-prepared as an entrepreneur. An entrepreneur is one who 'fills a gap' in the market-place, according to Leff (1968), thus dealing an effective solution to the absence of a complete set of markets---a frequent source of 'market failures' in economics. An entrepreneur is one who 'spots value in unlikely places and puts it to use to the point of improving his financial performance', thus hitting off with an effective improvisation in a market for 'credence goods'[32]---a frequent source of 'market failures' in economics.[33] The question is this: what are the

[32] Credence goods are characterized by unequal distribution of gainful information, setting buyers of goods apart from sellers, and giving rise to the problem of informational asymmetry (American Economic Review, 1994).

[33] David Morawetz, in a seminal review article, informed us of how a Japanese printing entrepreneur, while visiting with an US-based entrepreneur in the same industry, spotted a block printing machine lying discarded in the former's cellar, bought it and shipped it back home, to a better financial health of

ideal measures of entrepreneurial preparation. We used three variables to measure entrepreneurial preparation: (i) number of years of formal schooling obtained by the entrepreneurs; (ii) whether the entrepreneur has acquired any specialized academic training that is directly connected with the running an enterprise in the industry in question; (iii) the 'degree of relevance' of the specialized training received by the entrepreneur. Tables 4.4 and 4.5 report the findings concerning the degree of the entrepreneurial preparation by the entrepreneur.

Table 4.4 Length of formal education and the extent of the acquisition of specialized training in the Agro and Food Processing Industry surveyed (Averages)

Firm size classes	Ave. years since unit. was set up	Ave years of formal education by the entrepreneur			% With any specialized training	Ave. duration of such training (years)
		Mean	Standard deviation	Coefficient of variation (%)		
Micro	6.63	12.91	2.43	18.82	27.27	0.29
Small	11.41	11.99	3.24	27.02	6.10	0.12
Medium	13.68	13.29	2.93	22.05	0.00	0.00
Large	16.42	14.42	4.38	30.37	25.00	0.58
Mismall	10.84	12.45	2.83	22.73	8.60	0.13
Melarge	14.34	13.85	3.65	26.35	6.52	0.15
All Firms	12.22	13.15	3.24	24.56	12.24	0.21

Source: SMEF survey of six sectors, 2006/07

Note: By specialized training, we mean particularized diplomas that upgrade specific vocational or industrial or technological skills in the trainees. For example, the questionnaire asked: "Did the Managing Director obtain a Masters or Diploma in Agro and Food processing?"

Large food firms were established earlier in Bangladesh (average 16.42 years) compared to the micro and small firms. Micro firms/industries were established later (average 6.63 years ago). Average duration of all the agro and food processing industries is 12.22 years. Table 4.4 interprets that formal education level of the large entrepreneur is higher (average 14.42 years) than the small entrepreneur (average 12 years). Overall industrial entrepreneur's education level 13.15 years which interpret that most of them are graduates and postgraduates. Less values of standard deviation and coefficient of variation for entrepreneur of micro industries indicates that education level among individual entrepreneur of this group is very close to each other whereas education level among the individuals of large industries far from each other. The above data also shows that entrepreneur of medium size industries had no specialized training and entrepreneur of small, Mismall and Melarge industries had little training approximately 1.5 months an average. But entrepreneur of micro size industries had better specialized training approximately 3.5 months on average. The Table 4.4 shows that the average MiSmall establishment was born 10.84 years ago, while the corresponding average for the MeLarge

his enterprise. (The US proprietor had discarded the block printing machine because, at the then higher US wage rates, the labour productivity of the latter was not high enough. In Japan, the wages were still low enough to make the 'import' of the machine profitable). This action by the Japanese entrepreneur was an entrepreneurship *par excellence*.)

establishment was 14.34 years. The difference is statistically significant. The average AFP establishment was born about 12.22 years ago. Secondly, the average educational attainment of MeLarge establishment (of 13.85 years of schooling) exceeds the corresponding attainment of the MiSmall establishment by about 10.11%, and this difference between the averages is statistically significant. Average duration of all the studied entrepreneurs was about 2.5 months only which dictates that AFP industry is very new in the country.

4.3 Financing start-up capital involvement: magnitude, external and internal reliance

As said already, we follow the enterprises through their life-cycles even we launch into the narrative. That is to say, we start now with the economic circumstances of their mobilization of the start-up head-count, scale of operations and, more to the point, the manner in which they had mobilized their start-up capital. The results relating to these aspects of the narrative are presented in Table 4.5 below.

Table 4.5 Start-up economic circumstances of the sample establishments in the Agro and Food Processing Industry

Firm size	No. of start-up		Total start-up financial capital mobilized (Taka Thousand)				
	Employees	Machines	Equity/ Retained earning	Bank loans	Non-bank loans	Loans from friends, relatives	All debts
Micro	5.34	2.38	429.78	117.44	0.00	28.39	145.83
Small	19.49	3.21	3150.65	1262.94	52.94	35.79	1351.67
Medium	14.45	2.91	2181.86	855.07	34.09	55.8	944.96
Large	65.00	5.25	33375.00	15000.00	0.00	0.00	15000.00
MiSmall	12.41	2.74	1790.22	690.19	26.47	0.00	716.66
MeLarge	39.72	4.08	17778.43	7927.54	17.05	27.9	7972.49
All	26.07	3.41	9784.33	4308.87	21.76	29.99	4360.62

Source: SMEF survey of six sectors, 2006/07

The Table 4.5 shows that while the MiSmall establishments in the Agro and Food Processing (AFP) sector report an average start-up headcount of 12.41, the corresponding headcount for the MeLarge establishments in this sector happens to 39.72. Whereas the representative MiSmall establishment in the Agro and Food Processing sector report an average number of machines of 2.74, the corresponding number for the MeLarge establishments in this sector happens to 4.08 Likewise, whereas the representative MiSmall establishment in the same sector report an average start-up equity of Tk.1790220, the corresponding equity for the MeLarge establishments in this sector happens to Tk.17778430.[34], [35] Likewise, whereas the

[34] Equity in our formulation includes retained earnings, including from other businesses wholly or partially owned by the entrepreneur in question.

[35] The establishments whether within the MiSmall or MeLarge categories start up in different years. Strictly speaking, it is not legitimate to group for purposes of calculating an average for them. That said, one of the reasons why we still group them is that we want to calculate how much of growth the establishments have had since their start-up. We group them once again for purposes of calculating an average level of equity they have in the study year, namely, 2006-2007.

representative MiSmall establishment in the Agro and Food Processing sector report an average start-up debt of Tk.716660, the corresponding debt for the MeLarge establishments in this sector happens to Tk. 7972490. On an average, the debt-equity ratio at start-up of the four categories of micro, small, medium and large firms in the AFP sector is found to be 25:75, 30:70, 30:70 and 31:69, respectively. Equity including retained earning happens to be source of start-up capital of choice among the entrepreneurs in the AFP industry on the sample. Use of, or access to debt, seems to be the exception rather than the rule in this industry. This reliance on equity including retained earning especially by the micro, small and medium establishments in the AFP industry as shown above also happens to be the general characteristic of the small and medium enterprises in Bangladesh as the general case as well.

Table 4.6 Percentage of establishments reporting reliance no debt finance at start-up in the Agro and Food Processing Industry

Firm size classes	No. of no debt firms	% of no debt firm	% of loan taker
Micro	10	90.91	9.09
Small	61	74.39	25.61
Medium	32	94.11	5.89
Large	7	58.33	41.67
MiSmall	71	76.34	23.66
MeLarge	39	84.79	15.21
All firms	110	79.13	20.87

Source: SMEF survey of six sectors, 2006/07

The percentage of no debt firms was lowest (58.33) large category firms and highest (94.11%) in medium category firms. Micro and small size firms possessed 90.91% and 74.39% no debt firms. Though the average of all firms loan taker was 20.87%, the medium and micro sizes firms enjoyed 5.89% and 9.09% loan respectively. The major share of the loan (41.07%) was enjoyed by the large size firms. This may be due to the better social and political influence of large size firms owner and also for better mortgage opportunity. Moreover, the bankers have more confidence on large sizes firms owner with the assumption that they may not shift from business frequently like micro and small size firm owners.

4.4 Principal products and bye-products

Table 4.6 is about the relative prominence of establishments with different business models, and about the number of main products which are produced by the establishments. As well, we distinguish between two major categories of establishments, namely, (i) those who rely solely on *own-account production*, and (ii) those who rely solely on *contract manufacturing.*

4.4.1 Business model differences: own-account producers *versus* contract manufacturers

We mainly recognize two business models, namely, own-account producers, contract-manufacturers and others. Own-account producers are those who implement each of the stages of the life-cycle of being a manufacturer: designing products, calculating addressable markets and the size of production batches, buying raw materials, accessing finance, setting the price, and being responsible for marketing what is produced. If (s)he can do all of the above efficiently, minimizing his costs and maximizing his sales, (s)he will be in the black, and make money. The distinguishing characteristic of this business model is that the entrepreneur takes all the risks and pockets all the difference between the revenue and his costs. By comparison, contract manufacturing is a competing business model in which the manufacturer essentially works as an agent of a third party. The latter issues to the former the specifications of the products and the quality standards (eg the percentage of rejects in the output consistent with satisfactory delivery, etc.), and pays him a manufacturing charge for what (s)he manufactures: the CM has to buy up the needed supplies of raw materials and accessories. A variation on the above theme is that the third party procures the essential raw materials and supplies them to the contract manufacturers' (CM's) premises, and agrees to buy up to an agreed overall quantity subject to the CM passes muster in terms of the quality standards. In this case, of course the third party sets a different, and lower, price. But even so, the CM does not have to worry about buying supplies and taking the risks of marketing the product. The acid test of profitability for the CM is only that he correctly works out whether his unit cost of manufacturing subject to the third party's leaves him a positive margin of profits. Besides these two dominant types, there is the largely residual, 'third', type we call 'others'. This type comprises of establishments with dual-mode business models, such as when an own-account producer doubles up as a part-time trader of items similar to those that he also manufactures.

Table 4.7 Differences in specialization: own-account production versus contract manufacturing in the Agro and Food Processing Industry, 2007

Firm size	Own-account production	Contract manufacturer	Others	All establishments	Average no. of products	Average no. of bye-products
Micro	7.90	0.00	0.00	7.90	2.40	0.00
Small	56.80	2.20	0.00	59.00	2.30	0.50
Medium	24.50	0.00	0.00	24.50	2.30	0.40
Large	8.60	0.00	0.00	8.60	2.30	0.20
MiSmall	64.80	2.20	0.00	66.90	2.40	0.20
MeLarge	33.10	0.00	0.00	33.10	2.30	0.20
All firms	97.80	2.20	0.00	100.00	2.30	0.30

Source: SMEF survey of six sectors, 2006/07

It is evident from Table 4.7 that the proportion of units that are engaged in own account production in Mismall establishments is higher (64.75) and that of Melarge is lower (33.09). Whereas in the same sector the proportion of unit that are engaged contract manufacture in Mismall industry is 2.15 and that of Melarge industry is nil.

Among the micro, small, medium and large industries, only small category industry is engaged in contract manufacture and the ration of contract and own-account products is 1:0.04. The average number of main products produced by Mismall and Melarge almost same 2.30 and 2.32 and that of bye products are 0.17 and 0.19 respectively. Micro size firms in AFP sector produces highest average number of main product (2.36) among the four categories. The small, medium and large sizes firms produce 2.29, 2.30 and 2.26 average numbers of main products. However, the micro-firms do not produce bye-products. On the other hand, the ratios of bye-products and main products produced by small, medium and large firms are 1:0.20, 1:0.18 and 1:0.09 respectively.

Table 4.8 Differences in scales of output between own-account production versus contract manufacturing in the Agro and Food Processing Industry, 2007

Firm size classes	Average scale of output per unit engaged in physical units			Gross value of output per establishment (Tk 000s)		
	Own-account production	Contract manufactures	Others	Own account producers	Contract manufacturers	Others
Micro	13498.70	0.00	0.00	2814.90	0.00	0.00
Small	27626.40	42569.30	0.00	18847.70	16391.00	0.00
Medium	178244.40	0.00	0.00	33574.20	0.00	0.00
Large	354471.80	0.00	0.00	383170.10	0.00	0.00
MiSmall	25899.70	42569.30	0.00	16888.16	16391.00	0.00
MeLarge	224216.80	0.00	0.00	124773.20	0.00	0.00
All firms	36923.30	42569.30	0.00	53378.70	16391.00	0.00

Source: Six Sector Studies Survey, 2006/07

The Table 4.8 shows that while the MiSmall establishment in the AFP sector report an average own account production of 10831.35 units, the corresponding own account production for the MeLarge establishment in this sector happens to be 25251.21 units (2.33 times more). Whereas the representative MiSmall own account producers in the sector is 90, the corresponding number for the MeLarge own account produces in this sector happiness to be 46 only. From Table 4.8 it may also be noted that on an average the own account production of micro, small, medium and large firms in the AFP sector were 2814.90, 18847.70, 16888.16 and 33574.20 respectively. Small and medium firms were having more own account producers compared to the micro and large firms. Micro, medium and large firms in this sector had no contract manufactures for own account production with the exception that small size firm had appreciable contract manufactures for contract production.

Table 4.6 reports scale of output per establishment and the value of gross output of the sample establishments arrayed in order of their size, ranging from micro to large sizes. At this stage, it will only be in order to take cognizance of the mosaic represented by the results about the various averages based on various ways of slicing and dicing the data. We should probably not wish to find well-defined patterns in the results. Several findings each rate a citation.

First, for OAPs, physical output per establishment for the MiSmall and MeLarge establishments are, respectively, 3268.4 and 8545.1. For all OAPs, the physical output per establishment is found to be 5586.98 unit. By comparison, the average scales of output for the CMs are typically higher, sometimes significantly higher. Thus, output per establishment for the MiSmall and MeLarge CM establishments are, respectively, 3822.0 and 17925.9 units. Both sets of mean differences setting MiSmall apart from MeLarge establishments are statistically significant. Secondly, average gross output per establishment for the MeLarge class for the OAPs is Tk. 35436.7 thousands compared with Tk. 5507.2 for the MiSmall class---in other words, is more than 6.4 times as large.

The average scale of output per establishments for the CMs of the MeLarge class, at 17925.9 units, is more than four times as large compared with the MiSmall establishments. Average gross output per establishment for the MeLarge class for the CMs is Tk. 59889.10 thousands compared with Tk. 8511.10 for the MiSmall class---in other words, is more than 7 times as large. The upshot is that average unit-values[36] of the products of the MiSmall category of establishments are significantly lower compared with MeLarge establishments. And we have included Table 4.8 merely in order to show this in some detail.

Table 4.9 reports average unit-values of output per establishment and the value of gross output of the sample establishments arrayed in order of their size, ranging from micro to large sizes. Of course, there are occasionally marked differences, within both the OAP and CM classes. Thus for instance for the OAPs, while the average unit-values for the micro, medium and large classes are relatively closely strung around a value of around 4000, the small establishment 'disturb' this relative cohesion by positing an average value of 1493.90. That said, one could also argue that while cohesive stringing of values of output across various sizes may represent a herding behavior, a discordant behavior, such as by the small size class of firm in the table above may well represent innovative behavior. It is the right of entrepreneurs in each class to put together their business plan and implement them as they see fit, whether such implementation might magnify or mitigate what to a statistician may represent concordance or discordance. We are presenting exactly what is in the data: that is our mandate. We see a similar pattern for the CMs too. While the average unit-values for the micro, small and medium classes are relatively closely strung around a value of around 2000, the large establishment class 'disturbs' this relative cohesion by positing an average value of 6674.60.

[36] For uni-product establishments, average price of product is a clear cut concept: this relates to what on average has the product of the establishment sold for. Matter are much less clear-cut when firms typically produce or custom-make between three and four different products, each replete with its own unit of measurement, level of technological complexity, the end-user it is supposed to cater to, and the input-intensities that characterize them. Here, unit values of different product will differ. Typically, different products will be 'chained' including by using a kind of method that we used, meaning one method that is based on using price relatives for the different products and thus 'converting' quantities of each of the 'comparator' products into units of a 'benchmark' or 'dominant' product segment. In this case, we get what we call average unit values across all different physical outputs of the establishments in question. That is why we are using the term average unit values.

Table 4.9 Average gross value added by different types of establishments in the Agro and Food Processing Industry, 2006/2007

Firm size classes	Gross value added per establishment, across three types (Tk. 000s)			
	Own-account producers	Contract manufacturers	Others	All
Micro	1064.97	0.00	0.00	1064.97
Small	7081.33	2447.45	0.00	6911.48
Medium	9649.92	0.00	0.00	9649.92
Large	129243.29	0.00	0.00	129243.29
MiSmall	6346.00	2447.45	0.00	6220.24
MeLarge	40848.19	0.00	0.00	40848.19
All firms	18015.86	2447.45	0.00	17679.85

Source: SMEF survey of six sectors, 2006/07

The Table 4.9 shows that the MeLarge firms in the AFP sector had a gross output of Tk. 40848.19 thousand and that of MiSmall Tk. 6220.24 thousand, i.e. gross out put of MeLarge is 6.56 times higher than that of MiSmall. Whereas the gross output of large firms in this sector is 13.39 times higher than medium, 18.69 times higher than small and 121.35 times higher than micro firms in AFP sector. The values of gross output by all firms in own account production is 7.36 times higher than that of contract production. Only the small firms were having the contract manufacturers. So there is ample scope to increase the contract production for better utilization of manpower and machine and reducing the cost of production.

Table 4.10 Gross value added as percentage of gross value of output, in the Agro and Food Processing Industry 2006/2007

Firm size classes	Gross value added relative to Value of gross output, per establishment, across three types of establishments			
	Own-account producers	Contract manufacturers	Others	All
Micro	40.60	0.00	0.00	40.60
Small	44.90	29.90	0.00	74.80
Medium	52.20	0.00	0.00	52.20
Large	51.00	0.00	0.00	51.00
MiSmall	42.75	29.90	0.00	72.65
MeLarge	51.60	0.00	0.00	51.90
All firms	47.18	29.90	0.00	77.08

Source: SMEF survey of six sectors, 2006/07

The gross value addition as percentage of gross value of output was highest for medium firms (52.20%) when compared among four categories of firms in own account production. Small firms had contact manufacturers unlike other categories. The average percentage value addition for all firms in own account production was higher than that of micro and small firms. So interms of gross value addition, the percentage of medium size firms was better than other firms in own account production.

4.5 The Accuracy of Results from the surveys conducted for six sector studies

The objective of this subsection is to demonstrate, if only in passing, how the crystallization of a knowledge base can enhance the exercise of policy-making. We first show some important results relating to micro, small, medium and large establishments are presented in the following Tables (4.11 and 4.12), based on data generated by two large-scale sample surveys of the SME sector carried out in Bangladesh during the last six years or so. The first source is the World Bank's Investment Climate Survey 2002. The second source is the in-depth surveys associated with six sectors, commissioned by the SME Foundation in 2008.[37] Results from the two surveys are presented having the same format, in the interest of ready comparability. We then include some diagnostic results from a stochastic frontier production function for highlighting how certain behavioural variables, measured at firm level, can explain firms' distance from estimated efficiency or production frontiers (Table 4.13). We include these results because we also wish to be able to do similar econometrically appropriate diagnostic analyses with the data that this implementation would enable one to generate.

Table 4.11 Economic characteristics of micro, small, medium and large firms, in the Agro and Food Processing Industry 2002

(Unless otherwise indicated, financial values are in Tk. 000s)

Particulars	Micro	Small	MiSmall	Medium	Large
Sample size	34	195	229	127	621
Total sales	22177	28012.2	27145	75000.2	289013
Direct material cost	13033	18631.5	17800	51393.7	152994
Value added	9144	9380.6	9345	23606.4	136019
No. of workers	5.47	28.27	24.89	68.4	415.2
Labour productivity	1671.6	168.8	375.45	345.12	327.6
Capital employed	11879.8	25078	23118.6	120930	250283
Capital-output ratio (Tk.)	1.29	2.67	2.47	5.122	1.84

Source: Investment Climate Survey (ICS) data, 2002

Note: Sample size of the source is 977 establishments interviewed by Bangladesh Enterprise Institute (BEI) in 2002.

[37] The sector team leaders of the second study are Naeem Chowdhury, Momtaz Uddin Ahmed, K. Siddique-e-Rabbani, M. Kamal Uddin, Saleh Ahmed and M. Burhan Uddin. The overall team was led by Naeem Chowdhury, the team leader of the present implementation.

Table 4.12 Results from the six sector studies surveys commissioned by the SME Foundation

(All numbers, unless said to the contrary, are measured in Tk. 000s)

	Micro	Small	Medium	Large	MiSmall	MeLarge	All
Sample size	121.00	465.00	170.00	89.00	586.00	259.00	845.00
Total sales	4978.47	25837.37	88239.79	443107.80	21530.34	210216.80	79438.40
Direct material cost	2794.63	17636.41	51870.70	229761.10	14571.79	113033.00	44825.10
Value added	2183.84	8200.96	36369.08	213346.70	6958.55	97183.78	34613.30
No. of workers	5.48	22.79	68.59	406.37	19.22	184.88	86.88
Labour productivity	398.14	359.87	530.27	525.01	362.11	525.65	398.41
Capital employed	2513.60	6734.93	87261.29	159273.70	10061.26	112006.90	45806.42
Capital-output ratio (Tk.)	1.64	0.70	1.56	0.71	0.89	1.23	1.05

Source: SMEF survey of six sectors, 2006/07

Note: These are results compiled from six reports recently prepared for the SME Foundation. The International Economic Statistician/Team Leader of the present Maxwell Stamp Limited team was also the Team Leader of the said SME Foundation. Between the six sectors, 846 manufacturing establishments were surveyed and interviewed in very considerable depth. The sectors are (a) agro & food processing; (b) agro and food processing industry; (c) electricals and electronics; (d) leather & footwear; (e) light engineering and (f) plastics. The averages are all weighted averages.

From above Tables 4.11 and 4.12 several similarities between the two sets of results are notable, as follows:

1 Value added as a percentage of sales for the MiSmall class of establishments was found to be 31.54 in SMEF study-2007. For the ICS-2002, this is found to be 34.4%. Considering that Bangladesh economy has become even more outward-oriented during the six intervening years since 2002, thereby increasing competitive pressure on the domestic manufacturers. That assessment is consistent with the take of value added's relative share in sales having fallen between 2002 and 2007. In contrast, for the large enterprises, value added relative to sales is found to have risen between 2002 and 2007-from 47.1% to 49.7. Even so, the percentages yielded by the two surveys are strikingly similar. The point is that both survey samples seem to have been drawn from the same universe.

2 Labor productivity (in thousand Taka worth of value added per worker employed) in Mismall was found to be Tk. 375.45 thousands in 2002 as compared with Tk. 359.9 thousands in 2006/07. That is a striking similarity. Value added per worker is one of the most central empirical metrics when it comes to pro-poor development.

3 Both surveys show that the MiSmall establishments register significantly higher capital productivity in AFP industry by returning lower or much lower capital-output ratios on an average compared with medium or large firms.

4 Capital output ration was found significantly lower in SMEF-2007 study in all category of industries compared to ICS -2002 study.

It is reassuring that the more recent 2006/2007 survey, which has a somewhat smaller sample size than the ICS-2002, yields results that are often very similar compared with the latter. This is because, on a close examination, it was found that there is a close correspondence, for example, between the average enterprise employment size across the firm-size structure reported by the BEI survey, compared with the findings from the Economic Census, 2001/2003, conducted by the Bangladesh Bureau of Statistics (BBS). BBS reported an average employment size of 66.7 in 2001/2003 for medium enterprises, whereas the ICS data put that average at 68.4 - a statistically insignificant difference indeed (Chowdhury, 2007b). The BBS reported an average employment size of 389 in 2001/2003 for large enterprises, whereas the ICS data put that average at 415 - a difference of 4 or 5 percent, which is small. The quality of data in the 2006/2007 surveys of the six sectors appears to be representative of the same 'universe' as the ICS-2002.

Table 4.13(a). Differences in gross value added between own-account productions versus contract manufacturing in the Agro and Food Processing Industry, 2007

Firm size classes	Gross value added per unit (Tk. 000s)			Number of establishments in Bangladesh (No)	Grossed up value of gross output (Tk. million)	Grossed up value of value added (Tk. million)
	Own-account production	Contract manufacture	Others			
Micro	1064.97	0.00	0.00	12181.00	342902.70	129731.50
Small	7081.33	2447.45	0.00	6406.00	120738.40	44274.90
Medium	9649.92	0.00	0.00	6301.00	211551.00	60804.10
Large	129243.30	0.00	0.00	63.00	2433513.30	820824.10
MiSmall	6346.00	2447.45	0.00	9293.50	2165450.50	797577.80
MeLarge	40848.19	0.00	0.00	3182.00	1578630.50	516811.30
All firms	18015.86	2447.45	0.00	24951.00	7519724.40	2490648.90

Source: SMEF survey of six sectors, 2006/07

From Table 4.13(a) it may be observed that the gross value added per unit in own account production of micro size firms was higher than that of small size firms. However the small firms operated contract manufactures including which gross value added production of small firms was higher than that of micro size firms. The grossed up value of value addition on gross output in micro, small, medium, large and all firms were found 37.83, 36.67, 28.74, 33.73 and 33.12% were respectively. Though percentage value added was found highest in micro firms, the range of percentage of value added was very close. So, interms of value addition, the performances of four category of firms were almost similar.

Table 4.13(b). Differences in gross value added between own-account productions versus contract manufacturing in the Agro and Food Processing Industry, 2007 (except micro)

Firm size classes	Gross value added per unit (Tk. 000s)			Number of establishments in Bangladesh (No)	Grossed up value of gross output (Tk. million)	Grossed up value of value added (Tk. million)
	Own-account production	Contract manufacture	Others			
Small	7081.33	2447.45	0.00	5912.00	111427.60	40860.70
Medium	9649.92	0.00	0.00	271.00	9098.60	2615.10
Large	129243.30	0.00	0.00	323.00	123763.90	41745.60
MiSmall	6346.00	2447.45	0.00	5912.00	99842.80	36774.10
MeLarge	40848.19	0.00	0.00	594.00	74115.30	24263.80
All firms	18015.86	2447.45	0.00	6506.00	347281.80	115025.10

Source: Six Sector Studies Survey, 2006/07

Form Table 4.13(b) it was found that the gross value added on gross output in small, medium, large and all category firms were 36.67, 28.74, 33.73 and 33.12 respectively. Though the number of establishments, in different category varied, the percentage of gross value added did not change.

4.6 Enterprise-cum-entrepreneurial profile of the Agro and food processing industry

By incumbents, we mean prominent leaders of the industry in question. That said, however, the Team had proposed that only about 12 or so large establishments in the Agro and Food processing industry would be surveyed. (And the SMEF had concurred with this proposal.) The presentation of the incumbents in the following would therefore be confined to five or six among the most prominent of the establishments surveyed, including several of the largest of the establishments surveyed. The presentation would largely be cast in terms of the business development capabilities of these incumbents. We shall single out only one business development capability. That capability essentially comes in essentially three flavours. First is the development capability of ensuring growth of the employment size. The second is the development capability of ensuring growth of retained earning. The third is the development of capability of ensuring growth of sales. With this in mind, we present three case studies of entrepreneurial 'movers-and-shakers' of the AFP industry of Bangladesh.[38]

Case 1: A successful entrepreneur of SME based project

Mr. Humayun Kabir is one the a few business entrepreneur of the country who has established SME industry by dint of their own merit, labour, honesty and sincerity with small capital. After completing this student life he served as manager for 9 years in Square Consumer Product, Sajib Corporation, Fu-Wang Foods, Egloo Foods and in

[38] It is in the best tradition of empirical research that these profiles will be anonymous, and that no names will be named. The names of the entrepreneurs to be used will be fictitious. And, yet we want to confirm that each of these five case studies are the whole truth, and nothing but the truth.

other Industries. Then he started a fruit drink factory with a capital of only Taka 70 thousands only and it has stand by this time a factory of worth Taka 5 crore.

He has established a Agrobased SME industry in the name of "Mark Agro Foods Ltd. that has been producing lichi gel and vermicili (semai) of international standard. He strictly follows the, BSTI and HACCP principles in his industry. In addition to its own 'Brand Mark' product, he is a contract manufacturer of internationally reputed food companies of industrially developed country. He is the pioneer of contract manufacturing system in the relevant sector.

Mr. Humayun Kabir was born in an aristocrat Muslim family in Manikganj District in 1962. He is a science graduate. Mr. Kabir received training on Agro and Food Processing in Central Food Technology Research Institute (CFTRI), Mysore, India. About 95% of workers of his industry are poorest rural women. He believes that the food product processors should be held responsible to ensure the quality of the food products. The consumer of the food products has no such responsibility. He expects profit but he does not like to compromise with quality and safety of the food products. He opined that for survival and progress of the SME food industries, tax holiday is imperative.

Mr. Kabir visited India, Nepal, China, Hong Kong, Saudi Arabia, Qutar and Turkey on commercial tour and participated in several international commercial fairs. He observed that selected Bangladeshi products such as frozen vegetables, Mastered Hilsha, Meat, Fish, Pineapple, Mango slice, pickles etc. have high export prospect. As there is no food grade tin canning industry in our country, he has urged the Govt. to give attention in establishing this industry. He is interested to continue the advancement of Mark Food through ownership of labourers in his project.

His wife Jinat Afrin Jahan cooperates him in all his efforts. His two sons are studying in college and school. He is determined to establish his "Mark Agro Food Ltd." to be an unequal institution of the country by dint of his eagerness, continuous effort, perseverance, endeavour and honesty. He has been working hard continuously to reach that goal.

Case 2: From Apiculture trainer to Food Industry owner

Mr. Abul Hossain, started his career as an apiculture trainer with Bangladesh Institute of Apiculture (BIA) in the year 1974 just after his graduation. After the death of his father in 1982, he resigned from BIA and returned home. At that time many NGO contracted him for apiculture training for their beneficiaries and staffs. During the period 1983 to 1986 he conducted several training on Apiculture and distributed input/materials among the trainees. While conducting the training, he realized the necessity of founding an NGO to continue his work in apiculture.

He applied for registration of the NGO, Mouchas Unnayan Sangstha (MUS) in the year 1986 and after a long struggle he got it registered from Social Welfare in the year 1989 and subsequently NGO Bureau in 1992. Initially he worked mainly with apiculture, processed and marketed honey in the local markets and became very popular as a supplier of pure honey in Modhupur and nearly localities. He received funds from AusAid and JBIC for his quality work in apiculture.

With his buildup confidence and success in apiculture, he started food processing in early 1990 in the trade time of Modhupur Food Products. Even he did not have sufficient publicity he become popular for producing traditional fruits and vegetable products, especially pineapple, jujubee and mango products.

Almost miraculously he became a partner of Department of Food Technology and Rural Industries, Bangladesh Agricultural University, Mymensingh in a project Coordinted by Prof. Dr. M. Burhan Uddin and funded by REFPI (DFID) in food processing during April 2001 to May 2003. Based on this project he received Equity Enterprise Fund worth Taka half a crore from Bangladesh Bank and established the firm "Presenter Food Products Ltd." in Modhupur. He has become a successful entrepreneur and producing several popular food products for local and national market. Now he has little time to look back.

Case 3: Ahmed Food Products Ltd. a name of Quality Brand

Ahmed Food Product (Pvt.) Ltd. was established on May 1, 1983 at Kakrail, Paltan, Dhaka by Mr. Moammad Ahmed with the inspiration and financial assistance of his mother who had reputation in traditional food products processing. At the beginning he processed a few products such as different flavored jelly and squash with an initial investment of Taka one lac only. He could easily attract the consumers for his quality products. The demand of his products increased very rapidly and he felt the need for extension of his factory premises. He then shifted his factory to Mirpur, Dhaka in 1988. Food product items of the company began to increase gradually. To accommodate more machineries and also establishing new production lines, the factory was shifted to Asholia, Savar in 2001. He is the pioneer in the country in producing and marketing diabetic jelly in Bangladesh in 1991 which was certified by the BARDEM and the Public Health Directorate. Mr. Ahmed, present ED of the Company had industrial exposure in food products development and quality control in Thailand, Japan and Singapore several times.
Ahmed Food Products (Pvt.) Ltd. from its inception to till date has been producing about 80 different food items of which important are: Diabetics jelly, orange, apple, guava and pineapple jam and jelly, mixed food jam and jelly, apple jam, mango jam, litchi gel, mango pickle, different sauces, chutney, preserves, spices powder, baking powder, custard powder, corn flour, chanachur and so on.

The products of Ahmed Food Products have very good demand in different Famous Hotels, Restaurants, Govt. Institutes, Cadet Colleges and Residential Model Colleges in addition to the traditional market of Bangladesh. The company is also exporting their products to Middle East, Europe and in countries under SAARC. This company GSP followed all principles of Standard Testing Institute (BSTI) in Bangladesh.

His investment now reached to worth Taka 2.5 crore. Ahmed Food Products (Pvt.) Ltd. received Gold Medal from CAB in 2007 for the best performances and contribution on quality food products processing in Bangladesh.

Technology Platform in Use in Agro and Food Processing Industry

The technology platform in use

By technology platform, we generally mean the production techniques in use, the factor proportions prevalent in these vertical industrial sectors, bearing in mind that we shall need to use an acceptable definition of technology.

4.7 Technological and Quality Upgrading

Technological capability is a competitive differentiator of critical importance. This is especially true when the world of production and competition is a global village. China and India, especially China, is not just attracting very large dollops of foreign direct investment but also large and medium multinational companies who are eagerly transferring proprietary technologies to China and then training up the Chinese in using sometimes quite advanced technologies. That has raised the bar quite significantly for the competition, including what is a potential competition with a “long-shot” such as Bangladesh. This is why technological upgrading is exhibit number 1 when it comes to “binding constraint”. This is no longer a time for banal platitudes, of the kind that many government and donor pronouncements are made of. Nothing short of a very determined effort to draw level with, sometimes even leap-frog, a deadly serious competition is called for.

Technology embraces (i) manufacturing process; (ii) product functionality, durability and user convenience; (iii) product aesthetics; and finally (iv) the aesthetics and environmental dimensions of product packaging. Technology can-do that makes a difference thus is a versatile and challenging package. Stanford University technology historian Professor Nathan Rosenberg called science *papyrocentric*, something that loves publicity, but technology *papyrophobic*, something that loves anonymity. Profitable technology demands diligent digging and is inherently costly, because it is largely proprietary. The market for proprietary resources is always prone to imperfections, either because sellers have an insurmountable informational advantage, or because demand, discouraged by high prices characteristic of low initial volume, never picks up: a case of information asymmetry again. Asymmetries in access to credit markets- another permanent fixture of under-development- compounds the first problem. Plugging the competitive technological gap afflicting especially small enterprises will require accent on (i) attracting foreign direct investment (FDI) of the right kind; (ii) negotiation of minimalist “local-content” guarantees through the Board of Investment; (iii) scoping, and providing seed-money for, applied R & D under the aegis of the SME Foundation and the DCCI, for instance; (iv) determining requirements and funding for creating and / or augmenting the infrastructure of R & D, to name the four that come to the mind instantly. All of that will put a premium on deliberate, resolute and informed public interventions, including public-private partnerships, all executed cost-effectively and flawlessly. No doubt, in discharging that mandate, catalysts and providers will all require building of their own capacities, for conception, discovery and implementation. Above all, political will, at all levels of governance- within the government, in the civil-society organizations, in the private sector- will need to be stirred, marshaled and then aimed at this binding constraint. Technical universities, research institutions, training institutions will be better equipped and empowered to strengthen their R&D profiles from the perspectives of potential private sector adopters. The SME Web Portal will be leveraged up to the hilt for this end. Institutional reforms in terms of sharing the risks and returns to innovation between the private, often young, inventors/innovators and civil-society organizations, using market-friendly trade-off schemes will need to be experimented and then gradually brought into the mainstream.

4.8 Production Technique in use in the Agro and Food Processing Industry

Table 4.14 shows the variety of production techniques in use in the industry. As well, it shows the average number of machines of various kinds that are employed in the Agro and Food Processing industry of Bangladesh.

Table 4.14 The diversity implicit in the technology platform in the Agro and Food Processing Industry (No. of machines/equipment per establishment)

Firm size classes	Average no. of machines per establishment								
	Fisheries	Pickle/jam/Jelly	Rice mill	Flourmill	Bakery	Drinks	Sweet	Poultry	Other
Micro	4.00	0.00	--	--	2.00	--	--	1.50	3.00
Small	7.13	6.80	2.11	1.33	3.95	4.67	2.50	2.40	7.08
Medium	13.00	8.33	6.66	6.00	5.00	4.71	3.80	--	5.50
Large	30.00	59.75	--	--	10.00	15.00	--	4.50	27.00
MiSmall	6.78	6.80	2.11	1.33	3.87	4.67	2.50	2.14	6.06
MeLarge	17.25	37.71	6.66	6.00	6.43	6.00	3.80	4.50	8.57
All	10.00	22.92	3.41	3.67	4.46	5.43	3.15	2.40	6.83

Source: Source: SMEF survey of six sectors, 2006/07

Note: The numbers in the foregoing table are based only on the number of 'core' machines, both those bought new or in used condition. The number of auxiliary tools and devices has not been included in this calculation.

The manufacturing interests surveyed by us belong to the eight different sectors of AFP industries. The major products of this business include pickle, jam/jelly bakery products, soft-drinks, confectionary products, poultry and fisheries products and so on. Micro-size firms were in different categories of establishment except fisheries, bakery and poultry. In small and medium firm size classes the average number of machinery per establishment was highest in fisheries sector which was followed by pickle/jam/jelly sector respectively. The situation was quite different in case of large, Mi large and Melarge firms were the average number of machines per establishment were higher in pickle/jam/jelly processing sector. It is clear from this Table that pickle/jam/jelly sector is quantitatively the most populous category of machines is use in the AFP industry of Bangladesh and the second most populous category was fisheries (average 10). The poultry and rice mill sectors were using minimum number of machines per establishment because these sectors employed more laboures to complete the processing work manually.

The manufacturing establishments in this industry essentially belong to f major categories, namely, (i) fish products (BSIC 0302); (ii) Dairy products (BSIC 0405 and 0406); (iii) Sugar and confectionery (BSIC 1704 and 1806); (iv) Baker products (BSIC 1905) (v) Jam, jelly, Ketchup etc. (2007, 2009, 2103) and Soft drinks (BSIC 210 and 220)[39].

It is clear from this table that jam / jelly / pickle, fisheries and drinks are quantitatively the most populous category of machines in use in the AFP industry of Bangladesh.

The next table presents the unit values of these categories of machines. Before proceeding any further, it is necessary to appraise oneself about how these replacement costs were evaluated. During the survey, we assessed the value of capital equipment in three ways, namely, 'replacement' cost, 'resale value' and (historical) acquisition cost. The question asked of the respondent while evaluating the replacement cost was: "What would it cost today were this piece of equipment, as it is, were to be purchased today?" The question is quite straight-forward where new equipments are concerned. But what about used machines? Now, experienced entrepreneurs or chief technologists typically have an idea about what a given piece of equipment would likely cost in today's prices. Unless the industry manufacturing that particular piece of equipment were characterized by a high rate of technological obsolescence, such ideas would likely also be fairly accurate. Our Survey Research Analysts (SRAs) were typically able to develop a warm rapport with our respondents. People largely cooperated. Thus, we were able to generate a fairly accurate characterization of the investment in fixed investment in plant and machinery (not counting value of land, building and structures) by these establishments. It would be recalled that the SME Policies Strategies 2005 stipulates that establishments with up to Tk. 1.5 million worth of plant, machinery and equipment (not counting value of land, building and structures) should be treated as 'small'. And establishments with between Tk. 1.5 million and Tk. 100 million worth of plant, machinery and equipment (not counting value of land, building and structures) should be treated as 'medium'. Now that we have this data relating to replacement cost on hand, we shall now be able to classify sample observations according as whether they are 'micro or small' or 'medium', from the perspective of SME Policy Strategies 2005.

[39] Four-digit BSIC codes for the agro and food processing industry are 1716, 1721, 1722, 1723, 1812, 1813

Table 4.15 The diversity implicit in the technology platform in the Agro and Food Processing Industry

Firm size classes	Average unit price of different machine(taka thousand)								
	Fisheries	Pickle/jam/Jelly	Rice mill	Flourmill	Bakery	Drinks	Sweet	Poultry	Other
Micro	250.00	0.00	--	--	70.00	--	--	9.80	19.20
Small	235.00	75.00	194.30	250.00	88.60	82.60	51.60	15.25	47.40
Medium	338.90	84.00	199.80	255.00	163.30	240.40	52.50	---	79.40
Large	451.40	268.00	---	--	304.80	3875.00	--	6000.00	177.00
MiSmall	237.00	75.00	194.00	250.00	87.80	82.60	51.60	12.10	115.40
MeLarge	397.00	187.20	199.80	253.40	203.80	694.70	52.50	6000.00	321.10
All	285.00	150.20	193.80	251.50	115.80	432.40	51.90	1369.10	178.00

Source: Source: SMEF survey of six sectors, 2006/07

Note: All numbers in the foregoing table are based on replacement costs of the equipment

The average unit price of different machine in different firms sizes of fisheries in four categories ranges from 2.5 lac to 4.51 lacs. Comparatively the unit price of pickle/jam/jelly processing machine for small, medium and large firms were 0.75, 0.84 and 2.84 lac respectively which some to be very much affordable. The unit price of small and medium size rice mill were almost similar. This was also true for unit price of small and medium flour mills. However, the unit price of sweet processing machine in different firms sizes were cheaper and in the range of 0.516 to 0.525 lacs. The average unit price of all firms was highest for drinks, second fisheries, third flour mills and so on. The highest variation in unit price was observed in poultry processing machine which ranges from 0.038 lac (micro) to 60.00 lac (large).

Table 4.16 The diversity implicit in the technology platform in the Agro and Food Processing Industry

Firm size classes	Average total machine cost per establishment								
	Fisheries	Pickle/jam/Jelly	Rice mill	Flourmill	Bakery	Drinks	Sweet	Poultry	Other
Micro	1000.00	0.00	---	---	140.00	---	---	23.50	57.60
Small	1675.60	510.00	410.00	332.50	350.10	385.90	129.00	22.90	335.80
Medium	4405.60	699.70	1330.40	1530.00	816.70	1132.10	199.50	---	436.90
Large	13542.00	16013.00	---	---	3048.30	58125.00	---	27000.00	4779.00
MiSmall	1607.10	510.00	409.30	332.50	339.80	385.70	129.00	25.90	699.20
MeLarge	6848.30	7059.30	1485.10	1520.40	1310.20	4168.10	199.50	27000.00	2751.90
All	2850.00	3442.60	660.90	923.00	516.40	2347.80	163.40	3285.90	1215.70

Source: Source: SMEF survey of six sectors, 2006/07

It may be noted from Table 4.16 that the small size firms of fisheries invested highest for machinery procurement, followed by pickle/jam/jelly and that of lowest in poultry processing machinery. Only the small and medium sizes firms in four categories have investment in rice mills and flour mills and variation in machinery cost between small and medium size rice and flour mills were very high. The average total machinery cost in all firms was highest for pickle/jam/jelly, followed by poultry and then fisheries and minimum was in sweet industry. Though the production rice is many folds higher than wheat, the average invest in flour mill was

39.65% higher than rice mill. The average investment in drinks which apparently seems to be poor, exceeds the total invest in rice mill, flour mill an bakery together.

Table 4.17 The diversity implicit in the technology platform in the Agro and Food Processing Industry

Firm size classes	Percentage distribution of total cost of machinery by size classes of establishments									
	Fisheries	Pickle/ jam/ Jelly	Rice mill	Flourmill	Bakery	Drinks	Sweet	Poultry	Other	All
Micro	81.90	0.00	---	---	11.50	---	---	1.90	4.70	100
Small	40.40	12.30	9.90	8.00	8.40	9.30	3.10	0.60	8.10	100
Medium	41.80	6.60	12.60	14.50	7.70	10.70	1.90	---	4.10	100
Large	11.10	13.10	---	---	2.50	47.40	---	22.00	3.90	100
MiSmall	36.20	11.50	9.20	7.50	7.70	8.70	2.90	0.60	15.80	100
MeLarge	13.10	13.50	2.80	2.90	2.50	8.00	0.40	51.60	5.30	100
All	18.50	22.30	4.30	6.00	3.40	15.20	1.10	21.30	7.90	100

Source: Source: SMEF survey of six sectors, 2006/07

From Table 4.17, about the percentage of distribution of machinery among different firm sizes, following observations may be made:

a) In micro category firms the percentage of total cost for machinery was highest in fisheries (81.90%) followed by bakery (11.50%) and then poultry (1.90%).

b) In small category firms percentage of total cost of machinery was highest in fisheries (40.40%) which was followed by rice mill (9.90%) and drinks (9.30%). In this category minimum percentage of cost for machinery was in poultry industry (0.6%).

c) In medium size firms percentage of total cost for machinery was again highest in fisheries (41.81%), second and third place being occupied by flour mills (14.50%) and rice mill (12.60%) respectively and that of minimum in sweet industry (1.90%).

d) In large size firms the percentage of total cost for machinery was highest in drinks industry (47.40%), which was followed by poultry (22.00%), pickle/jam/jelly (13.10%) and fisheries (11.10%).

In all size firms, distribution of percentage of total cost of machinery was highest in pickle/jam/jelly industry (22.30%) which was followed by poultry (21.50%), fisheries (18.50%) and drinks (15.20%).

Table 4.18 Utilization and valuation of land resources used on the sample

Firm size classes	Percentage of cases own land	Percentage of cases rented land	Percentage of both own and rented land farm	All	Ave land use per farm (decimal)	Ave amount of lease per month (taka thousand)	Ave amount given at once (taka thousand)	Ave value of own land & establishment (taka million)
Micro	45.40	45.40	9.20	100	35.10	4.10	5.50	49.70
Small	41.50	48.80	9.70	100	37.70	25.40	241.90	49.40
Medium	50.00	38.20	11.80	100	32.70	65.20	1378.30	69.90
Large	58.30	8.30	33.40	100	997.30	11.30	1425.00	712.80
MiSmall	41.90	48.38	9.72	100	37.30	22.90	392.20	49.45
MeLarge	52.20	30.40	17.40	100	284.30	82.50	3195.20	311.00
All	45.30	42.40	12.30	100	119.63	41.90	669.90	154.10

Source: SMEF survey of six sectors, 2006/07

The Table 4.18 inform us about the land ownership of entrepreneurs for to firms, size of land used, cash payment for land and value of the land. These information presented in the Table may be summarized for different sizes of firms as follows:

a) Micro size firms are established on own land by 45.40% entrepreneurs. Another 45.40% entrepreneurs of this category have rented their land for established industry. Only 9.20% of the owner of micro size industry have own and rented land. The firm was established in average on 35.10 decimal area of land with a cost of 49.7 million Taka. The cash payment for land made by them was minimum (Tk. 5.50 thousand) and among the four categories of firms.

b) Small firms established on own land was 41.5% and that can rented land on 48.80%. Only 9.70% of the small firms were founded on both own and rented land. The average are covered by the small firms was 37.7 decimal and that cost about Taka 49.40 million including establishment. The cash amount paid for land was Tk. 241.90 thousand only.

c) Medium size firms were established by more number of entrepreneurs than micro and small firm son their own land (50.00%). Only 38.2% of medium size firms were constructed on rented land. The cash investment of medium size firms was Tk. 1378.30 thousand that was appreciably higher than the amount paid by micro and small firms owners. The average land and establishment cost was 47.08% higher than that of average cost of micro and small firms.

d) 58.30% of the owners of large firms established their firms on own land which highest among the four categories. Only 8.30% of large firms owner founded their firms on rented land. However, the percentage of firms on both own and rented land was 33.40 which is highest in this category. The large firms covered big area (average 997.3 decimal) and the cost of land and establishment was also very high (Tk. 712.80 million). The cost payment was almost similar to that of medium size firms. However, the land and establishment cost of large firms was significantly higher than that of other category firms.

4.9 Capital-labour ratio, Average Physical Product (APP) and Marginal Physical Product (MPP)

Factor proportions-the proportions in which labour and capital are utilized in production by the establishments-constitute an important dimension of a narrative concerning the technology platform in any real-life industry. Bangladesh is a labour-surplus but capital-deficient economy. The use of capital relative to labour is therefore emblematic of how parsimoniously is capital combined with the relatively surplus labour in an effort to create value-added in manufacturing. Motivated thus, we have estimated capital-labor ratio for the sample. The measure of capital in this context is always based on the fixed capital used by the establishments. By fixed capital, we mean replacement cost of plant and machinery, plus the value of other support capital stock (such as vehicles, generators, furniture and fixtures, and the like).

Economic theory suggests that both labour and capital productivities depend upon the factor proportions that are binding. Certain production processes---such as fertilizer, steel, etc. are inherently machine-paced, requiring high degrees of mechanization and high ratios of fixed capital to labour used. These processes are more likely to be relatively integrated production technologies. Certain other production processes represented inherently more fragmented technologies, with different factor proportions in different segments of the plant. For instance, while the manufacture could use relatively little automation, packaging might involve high degree of mechanization and automation. In Bangladesh, the preparation of processed food increasingly resembles this narrative. Be that as it may, the point that seems presently important is to stress that factor productivities closely correspond to factor proportions, and have therefore to be discussed in combination.

The theory is that capital is the scarce factor of production and labour is the relatively abundant factor of production. More mechanized techniques of production represented by more modern and faster and more sophisticated machinery set up cost more to create and therefore to acquire. In theory, a production process of which the factor proportions are relatively higher compared with another one embodies more capital and technology resources per unit of labour the abundant resource and ought therefore to produce more per unit of time. This is why it is imperative to glean an idea of where the factor proportions are in any study industry.

We find that capital labour ratios are at their highest in the case of the embroiderers that employ Japanese machinery, with 18 heads, each employing 8 workers per shift (of eight hours). More recently, Chinese capital-goods industry has turned out competing version of these 18-head machines. The Japanese machines each cost at the present time the equivalent of US $ 70000. The hourly production capacity of this block of capital equipment is roughly 6 million stitches per hour, and the proprietor's piece rate for that amount of work is US dollar 65 per 10 million stitches. Capital-labour ratio on this equipment is US $ 4375.

The next highest level of capital-labour ratio involve the computer-aided embroiderers that are sourced from China/South Korea. They too typically employ 2 workers per shift (of eight hours), and cost at the present time the equivalent of some US $ 65000 to 80000. The hourly production capacity of this block of capital equipment is roughly 100000 stitches per hours, and the piece rated compensation for that amount of work is US dollar 12.

The next highest level of capital-labour ratio involve the entry-level embroiderers that are sourced from China. They typically employ 1 worker per shift (of eight hours), and cost at the present time the equivalent of some US $ 400 to 500. The hourly production capacity of this block of capital equipment is roughly 5000 stitches per hours, and the piece rated compensation for that amount of work is US dollar 1.

The next highest level of capital-labour ratio involve the overlock machines that are sourced from China/South Korea. They too typically employ 2 workers per shift (of eight hours), and cost at the present time the equivalent of some US $ 65000 to 80000. The hourly production capacity of this block of capital equipment is roughly 100000 stitches per hours, and the piece rated compensation for that amount of work is US dollar 12.

The next highest level of capital-labour ratio involve the computer-aided embroiderers that are sourced from China / South Korea. They too typically employ 2 workers per shift (of eight hours), and cost at the present time the equivalent of some US $ 65000 to 80000. The hourly production capacity of this block of capital equipment is roughly 100000 stitches per hours, and the piece rated compensation for that amount of work is US dollar 12.

Wooden frames which cost on average Tk. 18000 are also used in the embroidery work. These are single-worker devices, and now made locally. An elaborate system of piece-rates have been established in this industry: such rates are differentiated by the kind of product, by the gender of the ultimate user, and the expensiveness of the fabric that will become the substrate.

4.10 Average Physical Productivity of Labour and Machine

Table 4.19 shows the factor proportions prevailing in Bangladesh's agro and food processing industry.

Table 4.19 Capital-labour ratios and physical productivity in Bangladesh's in the Agro and Food Processing Industry, 2006/07

Enterprise Status	Capital-labour ratio (Tk)	Labour productivity per year (units)	Machine productivity per year (units)
Micro	53.50	460.0	1881.7
Small	80.12	283.8	2645.9
Medium	160.51	396.0	5802.4
Large	217.28	744.1	17844.1
Mismall	76.98	303.4	2591.4
Melarge	175.32	481.1	8812.9
All firms	109.28	377.5	5328.8

Source: Source: SMEF survey of six sectors, 2006/07

Several findings deserve being expanded upon. First, capital-labour ratio is found to increase monotonically from the 'micro' to 'large' establishment classes. The average capital-labour ratio of the MeLarge establishment class is more than two times the corresponding number for the MiSmall establishment class. The difference is statistically significant. Overall, the sample returns an average capital-labour ratio of just short of Tk. 10000. The next column in Table presents (weighted) Average Physical Product in units of the homogeneous output for the industry. This is merely obtained by dividing, for each size class, total physical output by the corresponding sum of firms' employment. Similarly, average machine productivity is obtained by dividing, for each size class, total physical output by the corresponding sum of firms' number of core machines. Before proceeding any further, we would like to say a couple of things about why the APP appears to vary somewhat erratically from one size class to the next.

The estimate we get in homogeneous-output unit depends upon the output-mix itself. And because we obtain homogeneous-output unit by using price relatives between the 'benchmark' product segment and other comparator segments, the quality of the output in those segments also becomes privy to the estimates we get of the homogeneous-unit output. Having regard to this caveat, we note that MiSmall and MeLarge firms score more or less equally when it comes to Average Physical Product- 133 *versus* 136 units of homogeneous output. When it comes to Average Machine Product (AMP), MeLarge establishments open up an edge *versus* the MiSmall establishments. The margin of the MeLarge's advantage is of a non-negligible 28%.

4.11 Marginal Physical Productivity

4.11.1 Marginal Physical Productivity

Having discussed the technology platform in some detail, we now move on to characterizing technologies in terms of their underlying production-function characteristics. To do so, we shall need estimates of $\frac{dQ}{dL}$ and $\frac{dQ}{dM}$, where Q relates physical output, L denotes employment and M denotes the number of machines. We simply invoke ordinary least-square regressions of Q over L and M respectively in order to estimate the foregoing marginals. That is, these two are simply the estimates of the coefficients obtained by regressing Q on L or M, as the case may be. Estimates of these two marginals across firm size classes are presented in the second and third columns of Table 4.20. Such marginal are however not scale-neutral. The concept of elasticity is however scale-neutral---that is why we have also calculated the elasticities of output, at arithmetic mean level, corresponding to labour and number of machines, and presented them in the last two columns of Table 4.20. The results are self-explanatory.

Table 4.20 Productivities, elasticity

Firm size classes	Marginal labor productivity	Marginal machine productivity	Labor Elasticity	Machine Elasticity
Micro	3396.43	1457.34	1.487	0.196
Small	-11543.20	-7938.37	-1.570	-0.193
Medium	275.17	1045.50	0.703	0.235
Large	3235.63	-174.53	2.320	-0.088
MiSmall	-6843.02	-6007.33	-0.952	-0.153
MeLarge	2743.86	-33.129	2.879	-0.015
All firms	1901.72	-51.253	0.724	-0.007

Source: SMEF survey of six sectors, 2006/07

4.11.2 Cobb-Douglas Production Function

No discussion of physical productivities can proceed very far before invoking tried and tested concepts of production function, such as Cobb-Douglas (CD) or Trans-log (TL) production functions. These production function provide a representation of the production technology that underlie the actual situation of a given sample of firms. To a discussion of these two classes of production as established by our data that we now turn.

CD has been the functional form of a production function of the longest standing in the applied economic literature. This well-known function is represented by the formulation:

$$Q \quad = \quad AL^{\alpha}K^{(1-\alpha)} \quad \text{..(1)}$$

Where, Q represents the level of output;

A represents, in an abstract sense, the state of the technology;

L represents the amount of labour used by the technology;

K represents the amount of capital used by the technology.

With a suitable logarithmic transformation of the equation (1), we get

$$Ln(Q) \quad = \quad LnA + \alpha LnL + (1\text{-}\alpha)\, LnK \quad \text{.................................(2)}$$

Alternative production functions include the Cobb-Douglas and CES (Constant Elasticity of Substitution) production functions. The Cobb-Douglas production function for this study is given by:

$$\ln Q_i = \beta_0 + \sum_j \beta_j \ln X_{j,i} + \varepsilon_i$$

All inputs are preferably to be measured in physical units. Thus Q will be measured for the Agro and Food Processing industry using physical units, L will be measured using person-years and capital in capital-years.

With a CD production function, the returns to scale is unity, and the elasticity of substitution between labour and capital is also equal to unity. There have been a large number of studies using Bangladeshi data of whether the Cobb-Douglas formulation remains a relevant representation of the underlying technological relationship between input and output in several industries. Thus for instance, Ahmed (1992) has researched the returns to scale in manufacturing industry in Bangladesh using the CD formulation. As well, Chowdhury and Ahmed (1999) have estimated returns to scale in several industries using the CD formulation.

A more flexible form of production function that is worth considering here is the Trans-log Production Function. The most frequently used being a translog function, which is a second order (all cross-terms included) log-linear form. This is a relatively flexible functional form, as it does not impose assumptions about constant elasticities of production nor elasticities of substitution between inputs. It thus allows the data to indicate the actual curvature of the function, rather than imposing *a priori* assumptions. In general terms, this can be expressed as:

$$\ln Q_{j,t} = \beta_0 + \sum_i \beta_i \ln X_{j,i,t} + \frac{1}{2}\sum_i \sum_k \beta_{i,k} \ln X_{j,i,t} \ln X_{j,k,t} - u_{j,t} + v_{j,t}$$

Where, $Q_{j,t}$ is the output of the establishment j in period t and $X_{j,i,t}$ and $X_{j,k,t}$ are the variable and fixed establishment inputs (i,k) to the production process. As noted above, the error term is separated into two components, where $v_{j,t}$ is the stochastic error term and $u_{j,t}$ is an estimate of technical inefficiency.

4.11.3 Empirical Implementation of the Production Function

Of both the CD and TL production functions, we implement two versions each. The first of these is a traditional CD functional form, in which output is said to be a function of just labour and capital. Labour in this case is about all kinds of labour, including the white collar workers too in the mix. Capital is about fixed capital, about which we have had occasion to say quite a few things already. The alternative functional form throws into the melting pot a third variable, namely, the sum total of material inputs. Such inputs include raw materials of all kinds that have been used in production. We estimate each of the production functions in one of three alternative versions, the chief differentiator among these three is whether we measure the 'output' in physical or value terms. Where output is in physical terms, the dependent variable is measured in units of the homogeneous-output already talked about. In that case, labour and inputs are also measured in physical terms-labour in person-years, and input in units of homogeneous-inputs.[40] Fixed capital is always measured in monetary terms. When it comes to estimating the production function in TL forms, having three explanatory variables mean that there are in all nine variables on the right hand side of the production function form (not counting the constant term). The following table presents the estimates of the coefficients of both forms of the production function.

Table 4.21 Coefficients of production functions (of various kinds), 2006/2007

Explanatory variable	Cobb-Douglas				Translog			
	Version 2		Version 2		Version 1		Version 2	
	Coeff.	t statistic	Coeff.	t statistic	Coeff.	t statistic	Coeff.	t statistic
Const.	3.482*	6.166	3.631*	6.154	5.697*	3.629	2.499	0.962
Ln(L)	0.916*	10.344	0.618*	6.859	-0.110	-0.276	0.816	1.431
Ln(K)	0.209*	3.447	0.073	1.249	0.053	0.152	0.274	0.717
Ln(I)			0.313*	7.002			0.260	0.714
Ln^2L					0.242*	2.179	0.466*	2.963
Ln^2K					0.017	0.409	0.013	0.320
Ln^2I							0.033	1.090
lnL. lnK					0.015	0.841	-0.115	-1.554
lnL. lnI							-0.094*	-2.040
lnK. lnI							0.009	0.339
R^2		0.486		0.541		0.512		0.580
F-ratio		63.928		53.116		27.926		19.808

Source: Source: SMEF survey of six sectors, 2006/07

Note :L=Labor, K=Capital, I=Total input

Estimates of the regression coefficients from a CD functional form are also estimates of the elasticity of the function with respect to those arguments of the function. Output has elasticity of 0.916 with respect to labour, and of 0.209 with respect to capital. The F-ratio, which is a summary measure of how well-specified the functional form under review is for the data on hand for the most parsimonious form of the CD function is the highest, at 63.9. After we throw 'input' into the mix, the F-statistics, although still large, fell quite a lot.

According to the Cobb-Douglas specification, the returns to scale are constant. Both coefficients are highly significant with expected signs. The TL function too is fairly

[40] Once again, we use price relatives, this time for inputs, in order to 'chain' comparator inputs into units of 'benchmark' input.

well-behaved, with most of the coefficients being intuitively signed and statistically significant.

We also test for whether returns to scale are constant in this industry. To this, we may turn now.

4.11.4 Estimating returns to scale in AFP industry of Bangladesh

Some production functions are linearly homogeneous of degree one. A production function is linearly homogeneous of degree one when doubling the quantity of each input in the production function also doubles the output that can be obtained from it. Alternatively put, the returns to scale on a linearly homogeneous production function of degree one are also unitary. In such a case, returns to scale are also said to be constant. It is of some importance to be testing the foregoing two estimated production functions for the constancy of the returns to scale. It is now to this that we turn. We now test for whether returns to scale are constant in this industry. The steps adopted leading up to the test are as follows:

The hypothesis of constant returns to scale is $\hat{\beta}_L + \hat{\beta}_K = 1$

The F statistic for the hypothesis of a Cobb-Douglas model is

$$F = \frac{\left(\hat{\beta}_L + \hat{\beta}_K - 1\right)^2}{Var(L) + Var(K) + 2 \times Cov(L, K)}$$

The following about table shows that in both cases (of versions 1 and 2), the calculated value of the F statistics is much, much lower than the critical value. We can't reject the null hypothesis of returns to scale being constant and unitary for agro and food processing industry.

Sector	F statistic Version 1		F statistic Version 2	
	F value	**Critical value**	**F value**	**Critical value**
Leather industry	0.0025	3.93	0.00000012	3.07

Source: SMEF survey of six sectors, 2006/07

For this industry, we find that the null hypothesis that returns to scale in it are constant can not be rejected. Increasing returns to scale are not proven for the agro and food processing industry.

4.11.5 The need to deal with simultaneity bias in ordinary least-squares

For each of the size classes, we also present these estimates. That said, we present a couple of caveats attaching to the methodologies before proceeding any further.

It is typical in traditions of applied production research literature to estimate coefficients of production functions using a single-equation estimator. Many example of such a use of such a procedure can be found in the literature relating to manufacturing industries of Bangladesh. It needs to be pointed out categorically that the use of such a procedure leaves something to be desired. It has been well-established for sometime now that in specifications such as this one, the disturbance term is correlated with measured labour input or measured capital input. Because only the quantity of the measured labour or capital input enter the equation (1) or (2), the worker quality can only appear to be a part of the disturbance term. The quality or the relevance of experience, or the educational qualification of workers will frequently depend upon the spatial distribution of the supply of opportunities of educational or training upgrading. The supply of educational or training facilities, mostly a preserve of public or voluntary-sector activities, is treated as part of the disturbance term in equation (1) and (2). And yet it is incontrovertible that this supply is not without some effect on the quality or competency or relevance of the skills of workers, which are bound to affect the average or marginal productivity of workers in the study industry. The presence of correlation between the explanatory variable and the disturbance term in equation (1) thus is a tell-tale presence of a simultaneity bias in equation (1). This needs mitigation.

On another level, it is quite likely for the measured capital input to also be correlated with the disturbance term. Why? The selection of a best-practice stock of machines is desirable for everyone, but it takes a special skill, it takes experience, and it takes specialized knowledge. To the extent there is an active market to trade such skill or knowledge, such market is unlikely to have a national footprint but is quite likely to be concentrated in the capital city or the lone port city, squeezing the locations outside the capital or the port city. To put it differently, the spatial distribution of such markets of critical importance, which affects the productivity of capital machinery, will typically be treated as part of the disturbance term. The presence of correlation between the explanatory variable and the disturbance term in equation (1) thus is a tell-tale presence of a simultaneity bias in equation (1). This again needs mitigation.

More formally, in order to obtain a quantitative measure of the contribution of factors to firms' production, we need production function parameter estimates that are consistent. A firm with high total productivity-typically lumped with the disturbance term in the econometric estimation will hire more labour and other variable inputs. This correlation between the productivity part of the residual (seen by the firm's manager, but not by the econometrician), and the observed values of the variable results in biased parameter estimates.

We shall therefore need to implement a two-stage procedure to purge the implementation of equation (1) and (2) of the presence of simultaneity bias: in short, we shall implement an instrumental variable approach. The instruments that we shall use are as follows:

a) The number of public-sector colleges and universities within the jurisdiction of the districts whence our sample has come;
b) The number of public and private training institutes within the jurisdiction of the districts whence our sample has come;
c) The number of firms selling specialized professional services (providers of technical assistance) of one kind or the other within the jurisdiction of the districts whence our sample has come;
d) The number of branches of banks and leasing companies within the jurisdiction of the districts whence our sample has come;
e) The number of licenced micro finance institutions (MFIs) within the jurisdiction of the districts whence our sample has come;
f) The number of business enterprises within the jurisdiction of the districts whence our sample has come.

Using these instruments, we conducted our Two-stage Least-Squares (2SLS) estimation of both of the production functions. However, the results obtained were much degraded compared with those obtained by plain least-squares estimates. These results are therefore not presented here to prevent result clutter. We shall therefore have to do with estimates obtained from ordinary least-squares regressions of the production functions.

4.11.6 Determinants of labour productivity

We next turn to the determinants of labour productivity across firms. The explanatory variables on which we regress estimates of labour productivity include the following:

a) Average product price;
b) Fixed capital per worker;
c) Bank credit per worker;
d) Percentage of output exported;
e) Percentage of imported materials, parts and components in firm input-mix;
f) Length of formal schooling on the part of the Managing Director
g) Length of any specialized training attained by the Managing Director;
h) Three firm size dummy variables;
i) Two location dummy variables, to correspond to location in Dhaka and Chittagong;
j) Age of the firm.

Table 4.22 Determinants of labour productivity in the Agro and Food Processing Industry of Bangladesh, 2006/2007

Explanatory variable	Dependent variable is					
	Labor productivity (output)		Labor productivity (Gross value added)		Labor productivity (revenue)	
	Co-eff	t statistic	Co-eff	t statistic	Co-eff	t statistic
Const	26457.2	-0.447	-120.246	-0.406	-627.793	-0.704
Age of unit	-16.293	-0.021	1.021	.265	4.729	0.401
MD's education	-573.759	-0.649	-4.634	-1.013	-31.952*	-2.400
Avg. workers experience	-1926.280	-1.340	-7.617	-0.995	36.316**	1.678
White collar workers experience	-1080.833	0.705	16.236*	2.169	29.72	1.05
Cluster dummy	-18790.51	-1.340	-89.179	-1.222	-453.404*	-2.09
Bank loan dummy	34088.518*	2.193	296.192*	3.869	989.868*	4.228
Automated or manual dummy (manual=0)	-12776.996	-0.803	218.157*	2.788	422.868*	1.766
Fixed capital per head count	-0.591	-0.297	-0.002	-0.251	.015	0.499
% of output exported	-105.712	-0.332	3.065	1.636	21.320*	4.45
Own account dummy	33777.092	722	286.173	1.223	1032.740	1.466
Micro	7235.658	0.207	182.374	1.029	596.322	1.130
Small	15258.011	0.600	151.847	1.189	461.087	1.204
Medium	4982.719	0.188	-80.995	-0.619	31.190	0.078
Average product price	-13.825	-0.181	0.140	0.375	.315	0.276
District Dhaka	20780.059	1.379	-253.292*	-3.374	-410.408**	-1.808
District Chittagong	-5086.714	-0.155	219.2	-1.328	-442.493	-0.898
R Square		0.079		0.336		0.339

Source: SMEF survey of six sectors, 2006/07

Some findings emerge from this table. First, clearly the functional form in which either gross value added or gross value of output is the dependent variable offer a much better fit. We shall therefore be limited to the version in which gross value of output is the dependent variable. Second, the status of being a bank borrower, the percentage of output exported, the status of being an automated production process, and average workers' production experience each exert a positive causal influence on the labour productivity achieved. On the other hand, cluster dummy, Dhaka dummy and the Managing Director's education each has a negative effect on the labour productivity.

4.11.7 Estimating total factor productivity (TFP) in the Agro and Food Processing industry of Bangladesh

Total Factor Productivity (TFP) is defined as the part of the output that results from what is over and above the quantities of inputs that can be measured. There are two main sources of growth, whether in an enterprise or the economy as a whole. One of these parts is called factor accumulation. Factors in this context correspond to labour, capital, raw materials, and the like. A certain, in fact a major, proportion of the product is owing to factor accumulation. However, there is a second component in output that can not be ascribed to the factor accumulation, but is instead a residual. This is the part of the output that is ascribable to other than factor accumulation. Nobel Laureate Robert Solow called this as due to technical progress.

TFP is calculated using a two-stage procedure that is an instrumental variable approach. The way in which it works is that in the first stage, the explanatory variables are regressed on a fairly large number of instrumental variables. The predicted values of the explanatory variables will be featured in the second stage of the exercise. The explanatory variables in the second stage will include not just measured fixed and variable inputs but also a whole group of relevant (shifter) variables that might conceivably influence the values of the endogenous variables. The residuals obtained at the second stage will be averaged over the sample to yield a average measure of total factor productivity--this is a measure of technical progress prevailing in the sector of interest. This value will lie between 0 and 1: the higher close to unity is the value of this TFP, the better is the state of TFP prevailing in the industry or sector in question.

Using these instruments, we conducted our Two-stage procedural estimation of TFP. However, the results obtained were much degraded compared with those obtained by plain least-squares estimates. These results are therefore not presented here to prevent result clutter.

4.11.8 Estimation of Stochastic Production Function

Efficiency gap within the sample of establishments

The production functions point up a summary picture which holds true for the sample in question as a whole. This same is true when it comes to estimates of the total factor productivity function---another set of summary results. These results appeal well when one is interested in sample-wide insights. If, as is quite likely, one is interested in intra-sample insights and results, estimates of production function strike one as if 'one is dressed well with no place to go'. One is in this uncomfortable position whenever, as now, diagnostic results and diagnostic insights are warranted. Here, one is interested in getting estimates of inter-firm 'scores' or 'ratings' even as one uses data on firms' output and inputs in an effort to see how the two stack up.

It is here that we, like many researchers before us, invoke the stochastic frontier function (SFF), which was first independently by both a Dutch team of econometricians, and also by Aigner, Lovell and Schmidt (1977). Subsequently, important work in this tradition was done by Kumbhakar (1982).

The formulation is such that it is practicable to calculate the productivity deficit of each sample observation from the 'stochastic frontier' for the industry in question.

Using sample observations concerning measures of both output and input(s), and using Maximum Likelihood Estimators, we estimate coefficients of the corresponding coefficients that maximize the likelihood of observing the combinations of the output and inputs we have on our hands. Using estimates of the variances of both normally-distributed error and the half-normal error using values of sample observations, we estimate the stochastic frontier (Table 4.23). We then estimate the value of the efficiency, which we measure by value added, 'predicted' by the labour-capital combination for each sample observation. Ultimately, we then calculate for each firm its distance from the 'estimated frontier'. This is how we plan to conduct some diagnostic analyses.

4.11.9 Estimation of Stochastic Production Function

Using stochastic production frontiers in differentiating the firms on any given sample in terms of a well-accepted metric of firm performance is an oft-used method in applied industrial research. We, too, would be using such a method. We reproduce below work in which distance of sample of observations from an estimated stochastic frontier is regressed upon quite a number of explanatory variables in order to generate a diagnostic analysis of some value.

Table 4.23 Estimates of the coefficients of the stochastic frontier production function, using MLEs

Coefficient	Least Square		Half-Normal model	
	Estimate	t-statistic	Estimate	Z –statistic
const.	3.48*	6.17	0.983*	10.37
β_L	0.916*	10.34	-0.024	-0.47
β_K	0.209*	3.447	5.15*	5.93
σ^2			1.01	
σ_u			0.515	
σ_v			1.019	
λ			0.015	

Source: SMEF survey of six sectors, 2006/07

4.11.10 The Drivers of Estimated Technical Inefficiency

Following the lead of the analytical model developed in Annex-II and using estimates from Table 4.24 of the standard errors of the two components of the error term---one distributed as a normal variate and the other distributed as a truncated, half-normal variable, we estimate the 'distance' of the value added registered by each sample observation (which is a kind of measure of efficiency) from an estimated stochastic production frontier. We then regressed this distance on a number of behavioural or strategic choice variables, such as opting for (or obtaining a) bank loan, fixed capital provisioning per workers, average product price, etc. The explanatory variables on which distance from the frontier is regressed include the following:

EDUC= Number of years of schooling of the Managing Director's formal schooling (natural log of years);
PER_EXP = % of the firm's output that is exported;
CHT_DUM = A dummy variable that takes the value of unity for Chittagong and zero everywhere else;
DHK_DUM = A dummy variable that takes the value of unity for Dhaka and zero everywhere else;
AV_P_PR = Average product price (natural log of Taka);
B_LOAN = Bank loan;
AGE = Number of years since the establishment of the firm;
CLR= Capital labour ratio.

The following table presents the results obtained from the regression analysis:
None of the variables is significant at conventional level of significance, with the exception of the dummy variable for Dhaka. This shows that compared with firms located at other than Dhaka, the Dhaka based units register higher gross value added.

Table 4.24 Determinants of the distance from the estimated stochastic production frontier

Explanatory variable	Co-efficient	t-stat
Constant	1.015	1.562
AGE	-0.024	-0.299
EDUC	0.098	0.501
PER_EXP	-0.002	-0.795
AV_P_PR	-0.049	-0.428
B_LOAN	-0.009	-0.487
D_Micro	-0.053	-0.146
D_Micro	-0.076	-0.265
D_Micro	-0.244	-0.870
DHK_DUM	-0.233**	-1.711
CHT_DUM	0.426**	1.705
CLR	-0.032	-0.723
R^2		0.195
Dependent Variable	**Difference(Gross value added)**	

Source: SMEF survey of six sectors, 2006/07

Note: One asterisk shown in the column labeled 'T-stat' shows the variable is significant at 5% error probability level; two shows significance at 10% error probability level

4.12 SMEF Sample Survey results about access to finance

Before we could present an analysis of the access to finance on the part of SMEs, we need a framework of discussion as to what we shall mean by access to finance regime? The regime typically involves the following narrative variables, namely, (1) size structure of loans; (2) structure of interest rates.[41] We recognize two categories of loan---namely, institutional, non-institutional and trade credit.[42] The issue remains that the coverage of the data relating to institutional and non-institutional loans is better compared with trade credit. That is why we also present weighted average using two alternative bases. One of these bases only takes into account institutional and non-institutional loans. Trade credit is missing from the other. We present information concerning loan sizes with respect to three borrower situations, namely, institutional loans; non-institutional loans and trade-credit.

[41] One could also argue that (1) structure of outstanding loans with respect to the value of fixed collaterals; (2) the age-structure of arrearages ought also to be included in the definition of finance regime. We agree completely. We made an effort to also collect data on outstanding loan values and their age structure. It is in the area of access to finance that the degree of cooperation of our respondents with the survey was the most lackadaisical, if not outright adversarial. In a very large proportion of cases, the respondents simply refused to discuss the issue of 'outstanding loans' and 'age '

[42] Trade credit is also recognized in our data. For three of our sectors, respondents cooperated more than in others as far as interest rates on trade credits. For the sectors where the data were the most inclusive, trade credit averaged roughly at 33.3% annually. It is this average that we have used for the other three sectors where data was not available.

4.12.1 Structure of loan sizes

Table 4.25 presents results concerning several indicator variables cited above, namely, the proportion of establishments with access to institutional loans, average loan size and average interest rates. For each category of loans types, we also present information about interest rate structures.

4.12.2 Loan sizes' structure of bank loans

Among the establishments of the agro and food processing industry of Bangladesh, the proportion that has a loan from at least one scheduled bank or leasing company is 25% in all, there have been 35 cases of a firm taking a bank. The average bank loan size in this industry is Tk. 0.606 million. The average maturity of the loans in this sector is 3 years. Those are the averages. However, there is a very significant dispersion of both loan sizes and interest rates around these average with regard to firm size variable. The following table clearly shows that as compared with MiSmall establishments, medium and large establishments (represented by MeLarge establishments) have significantly larger bank loan contracts Tk. 812.7 thousand *versus* Tk. 432.9 thousand[43]. That difference is statistically highly significant: after all, the average provisioning of bank loan for the MeLarge is almost twice as large as for MiSmall establishments. More important, MeLarge establishments are found to be out-lent *versus* MiSmall establishments by a factor of 2.36:1, when we take the entire sample into account. Significantly enough, as compared with MiSmall establishments who are dwarfed in terms of the loan size, the rates of interests paid by MeLarge establishments are statistically the same. The evidence is therefore clear that MiSmall establishments are somewhat under-banked compared with MeLarge establishments.[44]

The prominence of credit on the books of account of SMEs is important not for academic reason. It is for an entirely practical reason. And the reason is that the amount of credit is a major determinant of the per-worker output in the industry, even after controlling for several relevant variables. That is why it is important to profile both the MiSmall and MeLarge establishments in terms of the extent to which their credit "requirements" for access to finance at affordable rates of interest are acceded to. Entrepreneurs in the MiSmall category are clearly credit-constrained. Whereas their working capita needs in the study year happen to be on average Tk. 2500000, their availment of debt finance happens only to be the size of Tk. 800000. That is to say, they have to depend upon trade credit or informal credit a ailment to the extent of Tk. 1700000.

[43] These averages are only calculated based on cases where a loan contract was issued to the sample observation.

[44] We have put this conclusion a little euphemistically. It is quite correct to say that the degree and the provisioning of institutional credit by medium or large establishments would be understated to a greater degree compared with MiSmall establishments. For a larger proportion of the cases, the MeLarge establishments were characterized by non-response to questions concerning the fact and the extent of bank loans or loans from leasing companies.

Table 4.25 Structure of institutional loans taken by establishments in the Agro and Food Processing Industry, 2006/07

(Tk. 000s)

Farm status	No. of bank loan taker	% of cases with bank loan	Average loan size of firms that received bank loans	Average loan size taking all firms	% of leasing co. loan	% of interest for bank loan
Micro	0	0	0	0	0	0
Small	29	35.36	1777.70	628.70	27.35	15.00
Medium	12	35.29	19618.00	6924.00	0.47	18.00
Large	6	50.00	186467.00	93233.50	0.07	16.00
Mi small	29	31.18	1772.87	552.80	26.88	15.00
Melarge	18	39.13	38701.40	15144.00	0.14	16.50
All	47	33.81	22272.80	7531.10	1.23	17.83

Source: SMEF survey of six sectors, 2006/07

Micro size firms are not getting any loan from banks or leasing companies. Small and MiSmall took 72.64% and 73.12% loans respectively. The bank loan enjoyed by the medium, large and MeLarge were between 98 to almost 100%. The table 3.25 shows that different SME firms received loan mainly from banks. The per cent of loan takers highest in large firms (50%) and in other firms the loan takers were between 31 to 39%. This may be noted that SME industries in AFP are not taking much loan from banks and other leasing. Companies or these entrepreneurs are not getting enough loans for their business. The leasing company loan was negligible. The interest rates of the bank ranged from 15 to 18% with average value of 17.83%. This also seemed to be very high. The rate of interest may also be deterrent factor for entrepreneurs to be less interested in taking loans.

Table 4.26 Structure of non-institutional loans by establishments in the Agro and Food Processing Industry, 2006/07

(Tk. 000s)

Firm size	No. of non-Institutional loans taken	% of cases with loans	Average loan size of firms that received loans	Average loan size taking all firms	Avg. interest rate
Micro	1	9.10	600.00	54.50	0.00
Small	4	4.90	604.00	29.50	15.00
Medium	0	0.00	0.00	0.00	18.00
Large	0	0.00	0.00	0.00	16.00
Mi small	5	31.20	603.00	32.40	15.00
Melarge	0	0.00	0.00	0.00	16.50
All	5	3.60	607.00	21.80	17.80

Source: SMEF survey of six sectors, 2006/07

The medium, large and Melarge firms of AFP sector did not take non-institutional loan. The micro-credit loan was also non-existent in AFP sector. The micro-small and MiSmall firms took non-institutional loan and the average sizes ranged from Tk. 600,000 to Tk. 604,000 only. The interest rate for micro and small sizes firms were 10% and their for MiSmall was 2.5% only. The non-institutional loan enjoyed by the firms were 100% informal.

Table 4.27 Structure of trade credit availed by establishments in the Agro and Food Processing Industry, 2006/07

Firm size	No. of trade credit taker	% of cases with trade credit	Average loan size of firms that received loans	Average loan size taking all firms	% of interest for trade credit
Micro	0.00	0.00	0.00	0.00	0.00
Small	9.00	10.97	703.00	77.20	33.30
Medium	5.00	14.71	1597.00	234.90	33.30
Large	2.00	16.67	3430.00	571.70	33.30
MiSmall	9.00	9.68	703.00	68.00	33.30
MeLarge	7.00	15.21	1941.00	295.40	33.30
All	16.00	11.51	1219.12	140.30	33.30

Source: SMEF survey of six sectors, 2006/07

The micro size firms in AFP sector did not receive or get trade credit though the trade credit takers ranges from 9.68 to 16.67 with average of 11.51%. The average trade credit ranges from Tk. 703 thousand to Tk. 1941 thousand, if one only looks at firms with any exposure to trade credit. The interest rates were in the range of 10.08 to 12.48% that seemed to be lower than the interest rate of bank loans. The % of debt farm in AFP sector rages from 74.39 (small) to 94.11 (medium) at the time of start-up. This is a clear indication that most of the entrepreneurs in SME industries in AFP sector started their industrial production with own capital only. On an average 20.87% entrepreneurs were in debt at the time of start-up.

Among the establishments of the agro and food processing industry of Bangladesh, the proportion that has a loan from at least one non-institutional loan is only 32.86%---in all, there have been 46 cases of a firm availing of trade credit. The average loan size of a trade credit deal is Tk. 990.62 thousand. That said, the size of trade credit per establishment is Tk. 325.5 thousand. The agro and food processing industry has a good deal of exposure to trade credit.

Table 4.28 Weighted average Interest rates

Firm size classes	Ave interest rate of institutional, non-institutional loan and trade credit	Ave interest rate of institutional And non-institutional loan
Micro	10.00	10.00
Small	20.10	11.20
Medium	19.10	18.00
Large	16.30	16.00
MiSmall	16.70	11.80
MeLarge	17.30	16.50
All firms	18.20	17.40

Source: SMEF survey of six sectors, 2006/07

The one compelling finding that arises from this Table 3.28 is about the role of a conspicuous minority to which debt in general has been assigned in this Table. Overall, only 8.50% of the capital raised in the AFP industry of Bangladesh has been in the way of debt. Suffice it for the moment to say that the long-term, start-up, capital is in critically short supply.

It is also evident from Table 4.28 that the per cent of equity was highest for micro size firms (97.90%) and that of lowest in large size firm (86.94%). While the debt equity ratio ranges from 98:2 to 87:13 for micro and large size firm respectively. The trend was found different in case of small and medium size firms. The small size firms were having more percentage of debt (11.13%) compared to the medium size firms (2.82%).

4.12.3 Needs and requirements for finance in the AFP industry of Bangladesh

Capital earns a return because rational economics agents *have* a positive time preference: consumption today is preferred to consumption tomorrow. Capital intrinsically involves the sacrifice of consumption, for which the contributor of capital will demand a reward. In business, capital in use comes in two forms--fixed capital and working capital. The two intrinsically differ in the treatment of time each is imbued with. While working capital is about the capital that typically has a life of one year, fixed capital will involve sacrifice of consumption over many years. Both forms of capital are valuable, and that is why both are needed by enterprises.

Financial requirements of firms are of two major categories. The first is about the need for long-term finance, typically required by enterprises as they go about setting up investment projects with life-times exceeding many years. Typically, this is called 'the need for term loan'. And then there is the need for short-term loan, defined to extend to maturities of up to a year. Medium-term loans are defined to extent to maturities of between 12 months and 36 months. In this report, we mainly concentrate on loans with maturities of up to 12 months.

Because the rates of interest in Bangladesh are among the highest in Asia, and the chill from global competition, including from Asia's two humongously large economies, among the greatest, the demand for long-term loans is relatively small. The universe for such loans is populated largely by well-capitalized 'corporate' financing clients whose capacity to service such loans is a 'no-brainer'. Commercial banks avidly seek the custom of such tier-one customers, sometimes offering attractive interest rate discounts. Banks do actively take into account the fact that such large corporate customers generate much more business by way of service charges based on their import trade and L/C margin and the like. They stand to gain more in the swings than lose in the roundabouts.

There is also some *a priori* evidence that short-term loans are more quick-disbursing and account for a majority of the credit "requirements" of the SMEs in Bangladesh. Some evidence in support of this can be seen in the work of Chowdhury and Rahman (2008). When the Bangladesh Bank and the IDA capitalized an window for funding the Small Enterprise Fund (SEF) based on a re-finance as opposed to pre-financing scheme, traders applying for short-term loans accounted for by far the largest percentage of the disbursements out of this fund (Chowdhury and Miah, 2006; Chowdhury and Rahman, 2008). The assertion is also supported by data available from the Bangladesh Bank, relating to the distribution of advances with respect to loan maturities. To quote: "short-terminism seems to be the order of the day (Chowdhury and Miah, 2006)." Working capital requirements thus happen to be a key vantage-point for appraising a financing industry from the perspective of SMEs. It has to suffice for the moment as the basis for the presentation of our results about the extent to which access to finance is the binding constraint for SMEs in Bangladesh.

The following few paragraphs are about how we measured the quantum of fixed and working capital that are needed by enterprises. We start with fixed capital requirements. But first we need to share a few caveats with you.

Capital machinery is bought based on a production plan that extends over many years of life. In the interim, of course, the level of demand for the output of the industry in question will be subject to all manners of fluctuations, ranging between those associated with trend variables, cyclical and seasonal factors, even random fluctuations. The typical situation of a manufacturing establishment in Bangladesh is where it reports that capacity for production and this reflects the use of fixed capital in the business is less than fully utilized. Capacity utilization the size of 60 or 70% of economic rated capacity, which is accurately characteristic of the particular industry under study in this sector report, is emblematic of a situation of excess supply of fixed capital. In a land that suffers from conditions of scarcity of capital, a spectacle of excess fixed capital is itself suggestive that it is the supply of fixed capital requirements is not the dominant problem.

There is also an intrinsic difficulty that crops up in assessing whether the requirement of fixed capital of a particular class of entrepreneurs is typically unmet. The point is that whether the supply of fixed capital financing is constricting is revealed at the first instance to the entrepreneur that, with a business plan in the attaché case, is seeking to raise start-up capital. The issue is that such an entrepreneur was almost beyond the pale for this, or for that matter for any survey such as this, simply because of the methodological requirement for a sample frame of *existing* enterprises. There is no accessible list frame of entrepreneurs having credible business plans for which capital is sought.

Our answer to this problem has been to solicit information about the relative importance of equity and retained earnings versus debt as sources of finance at start-up of the sample establishments. And we learn that by far the greatest percentage of the sample establishments have had to start up with equity infusions or with retained earnings. The following table presents the results of this exercise.

Table 4.29 Average equity-debt ratio in the Agro and Food Processing Industry in Bangladesh

Firm size classes	Percentage of equity	Percentage of debt	Debt Equity ratio
Micro	97.90	2.10	98:2
Small	88.87	11.13	89:11
Medium	97.18	2.82	97:3
Large	86.94	13.16	87:13
MiSmall	89.94	10.06	90:10
MeLarge	94.48	5.51	95:5
All firms	91.44	8.56	91:9

Source: SMEF survey of six sectors, 2006/07

The one compelling finding that arises from this table is about the role of a conspicuous minority to which debt in general has been assigned in this table. Overall, only about 9% of the capital raised in the AFP industry of Bangladesh has been in the way of debt.[45] Suffice it for the moment to say that the long-term, start-up, capital is in critically short supply.[46] Micro and medium sizes firms enjoy better percentage of equity compared to small and large sizes firms.

The rest of this discussion will seek to concentrate on working capital capita finance in assessing the gaps in the performance of the markets for capital.

4.13 Assessing the state of the provisioning of working capital finance

In an article published in 1964, Professor Amartya Sen, now of Harvard University, formulated how one can get at the working capital needs of businesses. Working capital, he argued, comprises largely of five sub-components. They are (i) value of input inventories; (ii) value of work-in-progress; (iii) value of output inventories; (iv) average value of the receivables[47]; and (v) the amount of cash on hand, which generates the equivalent of 'convenience yield' of having the cash resources to prevent any situation that is akin to 'stock-outs' or 'cash-outs'. Being out of cash resources will be tantamount to doing without, and will thus be a potentially costly situation.

Needs for working capital finance closely correspond to the concept of capacity utilization. Accurate assessment of needs for any resources can only be gleaned from a prior assessment of the 'true economic' capacity, not from the 'rated engineering capacity'. Without minimizing the importance of the engineering rated capacity to industrial or production engineers, the fact remains that such engineering capacities need not closely correspond to what is, for profit-maximizing firms, economically rational to produce. Before we can talk about the requirements for finance, we have to assess the economically relevant capacities of the establishments in the AFP industry.

[45] The only other recent study to have offered any comparable insight to the one under discussion here is from the World Bank Group's Investment Climate Survey 2002. That sample was skewed towards large establishments, whereas our own sample is 'self-weighted'. Unfortunately, given the fairly highly aggregative way in which that data has been presented, it is not really practicable to get a handle on industry-specific results. It is not unusual therefore that the ICS-2002 reported a much higher prominence to debt as a source of finance. The estimate supported by the survey carried out by this team is much more representative of the broad swathe of establishments actually existing in Bangladesh.

[46] Alternatively, whether we ought to say that the demand for debt as a source of finance has been woefully small is moot too. After it takes two to tango, and in an analysis of one of the markets, such as here, there is demand as well supply to account for. Bangladesh's long-term interest rates have for long been high, especially the privatization of the banks. Over the life times of our sample observations, the interest rates for the term-lending loans have consistently been high. It is therefore no wonder that the proportionate prominence of debt as a source of finance is what it is, i.e. very very low.

[47] Receivables will no doubt correspond to different 'time-profiles'. There is instinctively a need for an 'averaging' in a situation like this. We derive this value while dividing the reported value of receivables by two: the average value of the receivable would naturally be an average of the 'longest' due and the 'youngest' due.

Respondents were asked about how many days in a year they typically want their businesses to stay open. As well, when answering our question about the level of production achieved, we had also solicited from the respondents information about the utilization of their capacities. We have now a choice between two measures of economic capacity, namely, the output equivalent of the number of days of intended operation cited by the respondent; and the capacity directly cited by the respondents. In every case, we choose the lower of the two values.

The following table presents the need or the requirement of access to finance from the perspective of the entrepreneurs themselves.

Table 4.30 Working capital provisioning per establishment

Firm size class	Raw material inventories (taka thousand)	Finished-goods inventories (taka thousand)	Transaction demand for cash resources (taka thousand)	Receivables in the market (taka thousand)	Value of working progress (taka thousand)
Micro	1843.60	5351.40	73.50	100.00	14.50
Small	74128.80	149230.80	564.20	304.10	191.50
Medium	44375.80	5249.10	3020.10	1018.40	922.60
Large	69010.00	10094.20	3729.20	4250.00	2565.60
MiSmall	65578.50	132212.80	506.20	280.00	170.60
MeLarge	31791.60	7978.00	3205.10	1861.40	1351.20
All firms	50843.30	3989.60	1399.40	803.30	561.30

Source: SMEF survey of six sectors, 2006/07

The Table 4.30 shows that both the raw material inventories and finished goods inventories was highest for small size firms. On the country, the cash in hand, receivable in the market and value of working progress were highest for large size firm among the six categories. The Table 4.30 also shows that the finished-goods inventories of micro, small and large size firms were higher than raw material inventories. But exception was observed in case of medium size firm where a finished goods inventory was lower than raw material inventories. This is a good indication that a medium size firm was more efficient in marketing their products. However, the trend in value of working progress was food increasing with increase in firm sizes-with average value in between small and medium.

We are going to argue that it makes perfect sense where firms are mono-product firms, evaluation of capacity is typically a straight-forward matter: one merely divides the rated *economic* capacity of the firm, evaluated in terms of the one product that it manufactures by the output, again measured similarly, and multiplied by a hundred.[48] Where, as is presently the case, multi-product firms predominate

[48] Note that we are using the concept of economic capacity, and not *rated engineering* capacity. Engineering capacities in the nature of things overstate economic capacities, because they fail to factor in *economic* or *business* or *regulatory* constraints which are *force mejeure* for the firms. The firms can't relax or mitigate these constraints. Economic constraints thus always lie below engineering constraints. In the approach we made in our own measurement of capacities at the level of individual products, we were diligent in steering the conversation with the entrepreneur such that the benchmark captured for purposes of the calculation of capacity utilization was economic capacity. A second issue was about how we dealt with the issue of plant, machinery, and equipment being fungible, i.e. capable

numerically, it is necessary to help respondents define the very concept of capacity so as to accommodate the plurality of the profit-maximizing output-mix of firms. This has been done presently.

Table 4.31 presents the proportions of revenue generated by each of the sample observation's main products in Agro and Food Processing Industries. We use these percentage (or relative shares) as weights in migrating from product-specific capacity utilization estimates into an weighted average capacity utilization estimate.

Table 4.31 Relative Weight of Various major products in the Agro and Food Processing Industry of Bangladesh

% of Revenue from different products

Firm Size Classes	Fisheries	Rice	Bakery Products	Pickle/ Jam/Jelly	Others	All
Micro	13.23	0.00	8.71	18.98	59.09	100
Small	2.85	53.71	10.23	0.85	32.37	100
Med	1.61	21.52	7.96	4.71	64.20	100
Large	59.73	0.00	2.45	4.00	33.82	100
Mismall	3.06	52.64	10.20	1.21	32.90	100
Melarge	50.50	3.41	3.32	4.12	38.64	100
All	40.99	13.27	4.70	3.53	37.49	100

Source: SMEF survey of six sectors, 2006/07

We find that the weighted average capacity utilization rises in a tidy monotonic way across the four size classes (Table 4.31). There exist wide variations in weighted capacity utilization among the products and the firms under study. At 61.30%, the weighted capacity utilization of the micro segment is the lowest. The micro-firms do considerably better, at 69%. Medium and large establishments score 62.3% and 65.4%. MiSmall establishments out-achieve Melarge establishments by only 0.9 percentage point advantage.

Table 4.32 Weighted average capacity utilization in the Agro and Food Processing Industry of Bangladesh

Firm size classes	Percentage of utilization of capacity						Weighted avg. capacity utilization ratio
	Sl. No of productivity			Avg. revenue from			
	Product 1	Product 2	Product 3	Product 1	Product 2	Product 3	
Micro	70.30	49.40	35.70	65.10	20.20	14.80	69.00
Small	62.30	48.20	37.10	60.80	24.60	14.70	62.60
Medium	62.50	51.90	27.50	62.50	26.60	11.00	61.30
Large	67.20	57.90	40.00	58.30	31.70	13.90	65.80
Mismall	63.20	48.40	36.90	61.30	24.10	14.70	63.40
Melarge	63.70	53.50	30.60	61.40	27.80	11.70	62.50
All	63.40	50.10	34.80	61.30	25.30	13.70	63.10

Source: SMEF survey of six sectors, 2006/07

of being used in tandem in the production of more than just one output. This was a real problem in that many, indeed a clear majority, among our sample observations are multi-product firms. It would be quite natural for the output-mix that would maximize profitability to be treated as among the factors that determine the *economic capacities* for each of the products under study. Our survey staff tried their utmost to convey these vibes to the respondents before asking the question about product-specific capacities utilized.

The Bangladesh-Canada Agriculture Sector Team (1991) estimated a capacity utilization index using firm-level data from the food-processing sector of Bangladesh. This study revealed that capacity utilization ranged from 16 per cent to 56 per cent across firms. Another study in the food-processing sector conducted by the International Labour Organization (ILO) (1991) found that 70 per cent of the enterprises realized less than 50 per cent of their productive capacity; another 20 per cent realized 51 to 60 per cent and only 10 per cent realized 61 to 80 per cent of their production capacity. Several studies undertaken by the Harvard conditions, the index should be nonnegative. Improvements in capacity realization or technical efficiency, on the other hand, reflect firms' ability to improve production with the given inputs and technology by adopting the best practice techniques within the selected technology. Therefore, it is not possible to determine from the earlier studies whether changes in TFP were caused by technological progress or improvements in firm-specific capacity realization. Consequently, it may be argued that in these studies TFP indices were determined with the implicit assumption that all the firms were producing with full productive capacity realization, which is not realistic. Institute for Inter- national Development and Employment and Small Scale Enterprise Policy Planning Project of the Bangladesh Planning Commission (HIID-ESEPP 1990a, 1990b, 1990c) have reported that there was no significant relationship between economic policy reforms (in terms of incentive structures) and manufacturing value-added growth and total factor productivity (TFP) growth. Although these studies have contributed significantly to the supply of information about Bangladesh food manufacturing, their results suffered from the following shortcomings. First, these studies adopted traditional approaches to capacity measurement that ignored firm-specific characteristics, which are very important from the productivity point of view. Second, the few studies, which estimated TFP growth, did not distinguish between the two components of TFP growth: improvement in capacity realization and technical progress. Technical progress reflects the impact of new technology through the shifting of the production function. Under normal economic Under normal economic or policy variables will result in a new environment that may, in turn, lead to new optimal decisions and new economic structures. Also, the random coefficient framework facilitates the examination of the impact of reform on the production performance of firms in the absence of reliable data on all reform measures because, as Maddala (1977) pointed out, these policy variables would be entering the model as determinants of the magnitude of the parameter of the model.

4.14 Comprehensive understanding of the marketing chain

Marketing is the business of connecting consumers with manufacturers. This involves transporting a commodity between places, storing it between periods and changing its form to make it fit for human consumption. In all economies, this is a vital function to perform efficiently, i.e. At least possible resource costs. Economies, and markets, differ in terms of how well the marketing function is performed. Marketing is efficiently performed when the marketing agents charge keen rates for the use of their resources- time, money, skills, vehicles or fixtures, assets, godowns and risk-bearing and earn competitive profits. The consumer pays a price that is deemed closely related to the resource costs of supplying to him the commodity in the quantity and at the place and time desired. The manufacturer receives a price that keenly compensates him for the use of the resources up to that stage of production. Understanding how competitively a market performs involves looking at the costs of and normal returns to marketing. On the cost side, we look at the cost of production, and at the cost of spatial arbitrage and at the cost of marketing. Finally, we look at the wholesale and retail margins of benchmark versions of products produced by sample observations covered by us in the survey.

4.14.1 Cost of production

The average cost of production of different categories of products that are produced by the establishments in the agro and food processing industry are presented at Table 3.32. Before proceeding to any further, we have to note that these average costs of production cover a relatively large collection of products. These averages in the table are weighted averages, arrived at by dividing average outlay per establishment across size classes by the corresponding average physical volume of production. Cost of production of micro establishments in the sample is Tk. 2006.70, as opposed to Tk. 12897.10 for small establishments. Likewise, the cost of production of medium establishments is Tk. 27260.90 *versus* as opposed to Tk. 286492.30 for large establishments.

Table 4.33 Average cost of production of final produce in the Agro and Food Processing Industry of Bangladesh (Taka per unit)

Firm size classes	Cost of production per establishment (000)	Total physical output	Cost of production per unit of output
Micro	2006.70	13498.70	148.60
Small	12897.10	27626.40	466.80
Medium	27270.90	178244.40	153.00
Large	286492.30	354471.80	808.20
MiSmall	11609.00	25955.40	447.30
MeLarge	88665.80	354471.80	250.10
All firms	37109.80	134673.00	275.50

Source: SMEF survey of six sectors, 2006/07

We find significant differences among the various size-classes of firms in terms of the unit production cost. Indeed, unit price on average monotonically goes up as one goes across the size class of establishments. Differences among various size-classes in terms of the monthly wage rates too are also all that different. Naturally enough, retail prices differ very significantly among various size classes. Medium and large (MeLarge) firms significantly out price micro and small (MiSmall) establishments.

As expected, we find a statistically significant difference between the MiSmall and MeLarge establishments in terms of measured marketing margin that varies from products to products (Table 3.34). Maximum average retail price is found in fisheries products of Mismall establishment (Tk 1649.41/kg) followed by Bakery products (Tk.88.61/kg) and pickle/jam/jelly (Tk.61.43/pack) while minimum retail price is observed in rice products (Tk.26.00/kg).

Table 4.34 Average retail prices of five major categories of final produce in the Agro and Food Processing Industry of Bangladesh (Taka per unit)

Firm Size Classes	Fisheries (kg)	Rice (kg)	Bakery Products(kg)	Pickle/Jam/Jelly (pack)
Micro	1766.00	--	80.00	6.00
Small	1634.83	26.00	89.30	68.83
Med	284.00	30.00	85.00	65.00
Large	540.00	--	100.00	56.66
Mismall	1649.41	26.00	88.61	59.86
Melarge	384.50	30.00	90.00	61.43
All	1249.13	27.35	88.95	59.27

Source: SMEF survey of six sectors, 2006/07

The foregoing table shows that, on an average, these four flagship products of the agro & food processing industry retail, respectively, at Tk.1249.13/kg, Tk.27.35/kg, Tk.88.95/kg and Tk.59.27 /pack.

A narrative regarding the marketing chain of the agro- and food processing industry

Marketing chain is about the risk-taking activities that relentlessly drive the migration of goods downstream from the factories where they are produced to where they finally enter the consumption stream of final consumers. The spread between the ex-factory price and the retail-level price gives rise to what is called marketing spread or marketing margin. This typically is equal to the cost of transporting the goods to final consumption stage, the cost of storage that might incidentally arise in that process, the arbitrageur's profits. Depending upon the number of arbitrageurs that take a position along this marketing chain, upon the brand power of these various arbitrageurs, upon the prevalence of 'information asymmetry' in the informational power pitting off the sellers from the buyers, marketing margin in absolute terms will vary between one industry to another.

Clearly, the agro and food processing industry is a very mixed bag, comprising between ten to twelve major subsectors, with highly significant differences characterizing these individual subsectors in terms of the major narratives. The narrative dimensions are about (i) whether the supply chain is atomistically competitive versus oligopolistic; (ii) the extent to which the nature of the commodity is such that informational asymmetry prevails between the sellers and buyers; and (iii) the number of stages of marketing between the sellers most 'upstream' and the consumers downstream. We divide these subsectors into two polar categories in terms of their broad characterization from the perspectives of the marketing disciplines, as follows:

Traditional marketing model

This is a flat kind of marketing chain, in which each stage of marketing is characterized by relatively healthy, almost atomistic, state of competition. We argue that most of the subsectors of the agro and food processing will belong in this category. These subsectors are rice- and wheat-milling; poultry-processing; bakeries and condiment-making; spice-processing; bread-making, etc. These are subsectors in which there is little or no firm-specific promotion or branding efforts that go on.

Aggressive marketing model

This is a slightly hierarchical kind of marketing chain, in which the most upstream stage of marketing is populated by a dual production regime. There is a certain amount of duality in that structure. Small, presumably atomistically competitive, firms cohabit the space and co-exist along with extremely large, very well capitalized and nationally-branded firms that typically are already well-diversified, and are seeking even more diversification. We argue that the following subsectors of the agro and food processing will belong in this category. Manufacture and marketing of bottled, treated, water; dairy products; breads; breakfast-food producers; beverages and soft drinks, etc. These chains are slightly hierarchical in the sense that fairly substantial firm-specific effort to promote company branding is in force, as is an effort to plant and capitalize firm-specific 'sole distributors'. The last-noted has the effect of somewhat supplanting some of the traditional-regime agents of the marketing chain, such as the wholesalers.

We present in the following some essential aspects of the marketing chain of the agro and food processing industry taken as a whole.

4.14.2 Decomposing the relative importance of exports *versus* domestic marketing

The following table presents information concerning the comparative reliance of the sample establishments upon domestic sales versus exports. It is found that only a small percentage of the output of the agro and food processing industry is exported. And this does not change whether we consider MiSmall or MeLarge class of players.

Table 4.35 Comparative prominence of export-oriented versus domestically-marketed in the Agro and Food Processing Industry (Per cent)

Firm size class	Percentage of revenue derived from		
	Sales domestically	Exports	Total
Micro	100.00	0.00	100
Small	94.76	5.24	100
Medium	86.18	13.82	100
Large	86.00	14.00	100
MiSmall	95.38	4.62	100
MeLarge	86.13	13.87	100
All firms	93.32	6.68	100

Source: SMEF survey of six sectors, 2006/07

From Table 4.35, it is evident that only 6.68 percent of the revenue in this industry are generated through exporting, and the residual of 93.32% are generated from domestic sales by all firms. Melarge establishments received highest share (13.87%) in export markets as compared to Mismall establishments (4.62%). That said, the survey found a statistically significant difference between MiSmall and MeLarge establishments in terms of the exposure to the export markets.

Table 4.36 shows that average number of principal customers per establishment on this sample is 3.87. The difference between MiSmall and MeLarge establishments in terms of the number of principal customers is very narrow (1.16). The percentage of own-account exports is 96.67 and exporting through one's agents is 3.3 only. The study indicates that no export is made using the so-called 'unofficial' channels for any of the agro & food processed products.

Table 4.36 Number of principal customers buying from sample observations in the Agro and Food Processing Industry (Per cent)

Firm size class	No. of principal customers	Of exports, % that has been exported through others	% exported unofficially	Average unit price of exports ($ US)
Micro	0.00	0.00	0.00	0.000
Small	3.17	0.00	0.00	4.26
Medium	4.20	0.00	0.00	1.12
Large	4.50	12.50	0.00	2.74
MiSmall	3.17	0.00	0.00	4.26
MeLarge	4.33	5.56	0.00	1.84
All firms	3.87	3.33	0.00	2.81

Source: SMEF survey of six sectors, 2006/07

Results about the pattern of domestic marketing using various market channels are presented in Table 4.36.
Overall, 42.73 % of all outputs/ products are sold domestically sold through wholesalers channel, which is followed by through own outlets' through selling of 25.59% of all outputs. The next most important market channel happens to be 'the marketing through miscellaneous channels' which is marketing only 21.17% of all outputs. Important differences however lie behind these 'average' figures.

Table 4.37 Market channels for domestic sales in the Agro and Food Processing Industry

(Per cent)

Firm size class	% sold domestically through wholesalers	% sold domestically through own outlets	% sold domestically through agents	% sold domestically through others
Micro	27.00	7.00	26.00	40.00
Small	42.53	25.87	5.20	26.67
Medium	53.13	24.375	20.00	3.44
Large	28.18	44.09	9.55	18.18
MiSmall	40.71	23.65	7.65	28.24
MeLarge	46.74	29.42	17.33	7.21
All firms	42.73	25.59	10.90	21.17

Source: SMEF survey of six sectors, 2006/07

The percentage of domestic output marketed using own-outlets of the MeLarge establishments relative to MiSmall split is 29.42% and 23.65% only respectively. This might be due to fact that the MiSmall establishments out-depend the MeLarge establishments when it comes to relying upon wholesalers. And this result is perfectly intuitive: opening own outlets is not within everybody's wherewithal's, or capacities. Typically, opening one's own outlets requires a good deal of additional capital. We have already seen that access to finance involves certain egregious asymmetries across the MiSmall *versus* MeLarge class of establishments. And having a secure line of credit is of critical importance when it comes to determining whether a firm feels bold enough to launch into own-account marketing. The MiSmall establishments are much deeply capitalized compared with MeLarge, and therefore rely proportionately much less upon direct outlets. Instead, they depend more upon wholesalers.

MeLarge establishments depend more on own-account outlets in order to build their own customer-service brand loyalty. It is not always prudent to depend upon wholesalers building brand loyalty is one's objective. A second reason, why manufacturers are not really enamoured of wholesalers is that the latter demand and get suppliers' credit.

Table 4.38 Wholesaling market channels in the Agro and Food Processing Industry

(Per cent)

Firm size class	Number of wholesalers	% to be sold on credit	Average tenure for the credit(days)	% premium charged	% that remains unpaid for at end of year
Micro	1.00	0.90	19.10	0.90	0.00
Small	4.30	12.60	29.26	0.73	3.05
Medium	6.82	18.24	64.12	5.18	6.32
Large	13.33	5.42	17.50	0.83	0.50
MiSmall	3.91	11.22	28.05	0.75	2.69
MeLarge	8.52	14.89	51.96	4.04	4.80
All firms	5.44	12.43	35.96	1.84	3.39

Source: SMEF survey of six sectors, 2006/07

Table 4.38 shows wholesaling market channels in the Agro & food processing industry. It is evident from the result that average number of wholesalers in all establishments is 5.44. Among all agro & food processed products only 12.43% are sold on credit. The rate of selling of products on credit is found higher in Melarge establishments (14.49%) as compared to Mismall establishments (11.22%). Average calculated tenure for the credit among the all firms was 35.96 days. The Melarge establishments show maximum tenure of 51.96 days while Mismall establishments show only tenure of 28.05 days. The percentage of premium charged varies widely among the firm size classes (Table 4.38). Maximum percentage of premium (5.18) is charged in medium size establishments followed by Melarge type of establishments (4.04%) while minimum percentage of premium (0.75%) is charged in Microsmall type of firms in agro & food processing sector.

Table 4.39 Direct sales outlets channels in the Agro and Food Processing Industry

(Per cent)

Firm size class	Total sales Outlet	Employees No.	Administrative cost.(in taka thousand)	Wages per month	% Rejected
Micro	1.50	10.00	350.00	2400.00	2.50
Small	2.32	11.54	415.29	3117.86	1.07
Medium	3.71	374.35	527.65	5011.76	0.88
Large	7.75	20.50	575.00	2950.00	0.00
MiSmall	2.27	11.43	410.93	3070.00	1.17
MeLarge	4.48	306.95	536.67	4619.05	0.71
All firms	3.18	133.12	462.71	3707.84	0.98

Source: SMEF survey of six sectors, 2006/07

Table 4.39 shows several things. Firstly, overall firms in the AFP industry man 3.27 own-account sales outlets. MeLarge establishments out-retain MiSmall establishments by a factor of almost 50%--3.74 outlets *versus* 2.50. Secondly, the average size of a direct sales outlet maintained by the MeLarge establishments in terms of the number of workers per sales outlet is more than three times as large as compared with MiSmall establishments (4.74 *versus* 1.34 workers hired per sales outlet).

Tables 4.40 and 4.41 are about the economics of the commissioned agents and about the terms under which manufacturers' transactions with them take place.

Table 4.40 Commissioned agents' channels in the Agro and Food Processing Industry

(Per cent)

Firm size class	Total Agent	Total wages per months(taka thousand)	Per head Com.in per thousand units	Total Com.per year (in taka thousand)	% rejected
Micro	3.00	8.00	50.00	1120.00	2.50
Small	7.00	25.57	15.00	414.29	5.86
Medium	5.67	28.44	14.38	335.00	1.22
Large	68.75	1.25	42.50	7619.75	1.00
MiSmall	6.11	21.67	22.78	571.11	5.11
MeLarge	25.08	20.08	23.75	2763.25	1.15
All firms	17.32	20.73	23.33	1823.76	2.77

Source: SMEF survey of six sectors, 2006/07

Table 4.40 indicates that percentage of commissioned agents varied widely among the firm sizes in the agro and food processing industry. The large establishments employ maximum percentage (68.75 of agents and minimum percentage (3.00) is found in small enterprises in this sector. The rate of total wages/month provided by the firms also varied significantly among the establishments. The average wages/month among the firms is found Tk.20730.00 only. The maximum wages per month is provided by medium firms (Tk.28440.00), which is followed by small firms (Tk.25570.00) while the minimum amount of total wages /month (Tk.1250.00) is provided by the large firms in the sector. The variations in per head commission/thousand units also varied widely among the firms studied. The result of the study indicates that the average total commission per year in_all establishments in agro and food processing sector is Tk.1, 823, 760.00 only. Firm-wise breakup among the all establishments indicates that Melarge firms provide the highest yearly commission (Tk. 2,763,250.00) followed by large firms (Tk. 7,619,750.00) while lowest commission (Tk.335, 00 .00) is provided by medium size firms. The percentage of rejected products in all categories of establishment channeled by commission agents is found 2.77 and the lowest rejection (1.0%) is recorded from large firms while highest percentage of rejection (5.86) followed by (5.11%) is recorded from Small and Mismall firms in the sector.

4.15 The drivers of unit costs of production

Unit costs are defined as the total cost of production divided by the rate of the establishment's output. The following budget line items have been added up while getting at total cost of production:

a) Cost of raw materials;
b) Cost of other materials (such as fuel, lubricants, dyes and chemicals, packing materials);
c) Spares parts, and cost of preparing moulds etc.;
d) Repair and maintenance, etc;
e) Financing costs;
f) Office supplies;
g) Communication, storage, and transportations;
h) Wages and salaries;

- All kinds of utility expenses
- Advertisement expenses
- Marketing outlay
- Rentals of various kinds
- Commercial expenses arising in connection with foreign trade
- Miscellaneous expenses

Table 4.41(a). Cost of production per establishment in the Agro and Food Processing Industry

(Tk.000s)

Firm size class	Raw materials costs	Parts & components, repair & maintenance	Wages	Other expenses	Total cost of production	Overall cost of production per unit of output (Tk)
Micro	1484.60	29.80	249.80	492.20	2006.60	148.60
Small	11318.50	88.50	824.90	1490.00	12897.00	466.80
Medium	22781.30	166.90	2057.70	4322.50	27270.70	153.00
Large	246854.00	779.20	20967.90	38859.00	286492.20	808.20
MiSmall	10155.40	81.50	756.90	1371.95	11608.85	447.30
MeLarge	81235.10	326.60	6990.80	13332.40	94894.10	250.10
All firms	33678.20	162.60	2812.00	5322.15	39162.95	275.50

Source: SMEF survey of six sectors, 2006/07

Cost of production per firms in the Agro and Food Processing Industry is presented in Table 4.41(a). The average raw materials costs in all firms is calculated Tk.33.68 millions. The highest raw materials costs (Tk. 81.24 million) is incurred by Melarge firms which is followed by Large firms (Tk. 24.69 million) while the lowest raw materials costs (Tk. 1.48 million) is incurred by Micro establishments. Similar trend of results is also observed in case of costs incurred for parts and components, repair and maintenance among the firms in the sector. The amount of wages provided by different categories of firms varies widely among the establishments under study. The average wages provided by all firms is calculated Tk.2.812 millions. The total wages of Tk. 20.97 million is incurred by Large firms which is followed by Melarge firms (Tk..6.99 million) while the lowest raw materials costs (Tk. 0.25 million) is incurred by Micro enterprises in the sector. The variations in other expenses among the establishments are also found more or less in similar trends.

Data presented in Table 3.41(a) reveals that all establishments in the agro and food-processing sector under study incur the total average cost of production of Tk. 39.16 million. The highest total cost of production (Tk.286.49 million) is incurred by Large firms which is followed by Melarge firms (Tk.6.99 million). The lowest cost of production (Tk.2.00 million) is incurred by Micro enterprises in the sector. The average overall cost of production per unit of output also varies among the different firm size classes under study. The average cost of production / unit of output in all firms is calculated Tk.0.28 millions. The highest cost of production / unit of out put (Tk.0.81 million) is incurred by Large firms which is closely followed by Melarge firms (Tk. 0.47 million) while the lowest cost of production / unit of output is (Tk. 0.15 million) is incurred by Micro firms in agro and food processing industry.

Table 4.41(b). Table Average expenses per farm (Taka thousand)

Firm size classes	Raw mat. cost	Maintenance cost	Wages	All types of utility cost	Ad/marketing cost	Lease /rental cost	Commercial cost	Bank interest charges
Micro	1484.60	29.80	249.80	117.40	50.90	67.30	0.00	6.80
Small	11318.50	88.50	824.90	366.80	40.10	190.30	3.10	64.80
Medium	22781.30	166.90	2057.70	970.10	118.50	292.40	0.00	883.80
Large	246854.00	779.20	20967.90	3346.70	461.30	3752.30	108.30	10222.50
MiSmall	10155.40	81.50	756.90	337.30	41.90	175.80	2.70	57.90
MeLarge	81235.10	326.60	6990.80	1590.10	207.90	1194.90	28.70	3320.00
All	33678.20	162.60	2812.00	751.90	96.50	513.10	11.20	1137.40

Source: SMEF survey of six sectors, 2006/07

Average total expenses per firm under study in the Agro and Food Processing Industry is presented in Table 4.41(b). The average raw material costs, maintenance costs and wages are interpreted in foregoing pages. The result shows that all establishments in the agro and food-processing sector under study incur the total average all utility costs of Tk. 0.75 million. The highest all types of utility cost (Tk.3.35 million) is incurred by Large firms which is followed by Melarge firms (Tk.1.59 million). The lowest all types utility costs (Tk.0.117 million) is incurred by Micro firms in the sector. The average advertisement/marketing cost per firm varies among the different firm size classes under study. The average advertisement/marketing cost per firm in all firms is calculated Tk.96, 500.00 and maximum cost in this respect (Tk.0.46 million) is incurred by Large firms which is closely followed by Melarge firms (Tk. 0.20.8 million) while the lowest cost is (Tk.40, 100.00) is incurred by Small firms in agro and food processing industry.

Distribution of expenses of total cost per firm under study is presented in Table 4.41(c). The average raw material costs in all firms occupies 69.2% of total expenses which is followed by wages (18.7%) and the rest 12.1% of expenses is distributed as costs of maintenance, utility, advertisement/marketing, lease/rental, commercial and bank interest charges.

Table 4.41(c) % of expenses of total cost

Firm size classes	Raw mat. cost	Maintenance cost	Wages	All types of utility cost	Ad/marketing cost	Lease /rental cost	Commercial cost	Bank interest charges
Micro	72.90	1.30	12.90	6.20	2.90	3.50	0.00	0.20
Small	71.80	1.60	16.50	5.90	0.90	2.50	0.10	0.80
Medium	64.10	1.90	24.40	7.10	1.30	0.60	0.00	0.60
Large	62.50	1.30	23.10	4.60	1.80	2.50	1.20	3.00
MiSmall	71.90	1.60	16.10	5.90	1.10	2.60	0.10	0.70
MeLarge	63.60	1.80	24.00	6.50	1.40	1.10	0.30	1.20
All	69.20	1.70	18.70	6.10	1.20	2.10	0.20	0.90

Source: SMEF survey of six sectors, 2006/07

4.16 Fitting Cost Functions in the Agro & Food Processing Industry of Bangladesh

Policy-making for pro-poor growth will often put a premium on being able to understand the drivers of unit costs. The point here to note is that cost competitiveness is good for competitive performance. And that being able to lower one's average costs is good for one's survival in the long run. As well, unit costs are the metric that everyone, especially including the competitors in the emerging industrial powerhouses in the Asia region, watches intently. Especially in China and India, the world's largest manufacturing juggernauts are amassing latest technologies, skills and computer-aided manufacturing gadgetries, helping such countries become ready receptors of the massive surge in demand for their products which are now in the process of being unleashed. Therefore, aggressive monitoring and mentoring of costs is imperative if firms have any ambition at all for survival, and growth, in a feverishly competitive 'global village' that the world of commerce and industry have managed to become in the last four decades.

Competitive cost analysis is important for a number of reasons. While financial accountants concern themselves mainly with elements of costs and the management also importantly shares this concern it is however the cost drivers that are of far greater operational significance. The literature suggests that cost drivers essentially fall into four categories, and they are (i) design-related costs; (ii) facility-related costs; (iii) geography-related costs; and finally (iv) operation-related costs. Before proceeding any further, it is moot to enter just a few sentences each with respect to each of these four categories of cost drivers.

Design-related cost drivers: Because a product owes itself to a design process, it is imperative to get the design-related costs of alternative specifications right. This is necessary so that an apples-to-apples comparison is possible among alternative product designs that offer comparable functionalities. It is important in doing to start off from an well-agreed definition of what is the goal of the design process. We mean to say that the same set of functionalities can be achieved with or without offering *additional desirable capabilities*. Such design-stage add-ons will always come on with cost additionally.

Facility-related cost drivers: Some production technologies are such that it is advantageous to scale their output up, because larger scales of output ensue economies of scale, which smaller scales of output don't. This consideration makes it imperative to treat the scale of output, or the technologically-determined size of the plant a facility-related cost driver that we need to model the effect of. As well, at times, the economies of scale are not so much technologically datum as the derivative of some economic incentives, for instance the fact that volume discounts may be available on input purchases, and that large scales of output are associated with large volumes of input purchases. That is, there are economies of procurement and marketing. If used or rented equipment are cost-effective relative to new equipment, the recycling of used or rented equipment is a desirable cost driver. If frequent power outages render investment on large capacity electricity generators cost-effective, the shrewdness in the process of locating the least-cost generation technology is likely a positive cost driver.

Geography-related cost drivers: Spatial pockets of relatively high wages, or high input prices exist in every country. Rental rates are relatively high in certain clusters than in others. The down-payments that need to be made in the swankiest parts of the city in order to lease 'showroom' or 'display centers' tend to be much higher than in boorish parts of town. The point is that geography can be destiny in certain kinds of businesses. And yet geography can be an important competitive cost motivator.

Operation-related cost drivers: It is increasingly recognized that manufacturing operations can be more or less mean. Japanese manufacturing has famously introduced lean manufacturing, or the just-in-time (JIT) manufacturing. The extent of specialized training of the Managing Director will be an operational cost driver, as will whether the establishment is located on or near the all-weather highway. As well, the ratio of the number of production workers to the number of mid-level supervisory and managerial workers will also shape up as yet another operational cost driver. Moreover, percentage reliance of the establishment on imported raw materials (to be evaluated using the ratio of imported parts and components in the total outlay on raw materials) will be utilized as yet another operational cost driver.

The really important question is what are the drivers of the unit cost of production. To answer that question, we shall need to consider a number of competitive cost drivers.

The most basic form of the cost function is the one in which the cost is simply modeled as a function of the rate of output, and transformations based thereon. At times, in order to test for any non-linearity in the cost surface, a quadratic terms is also typically factored in. Sometimes, even a cubic term is also introduced into such a cost equation. Under these circumstances, the cost function has the following appearance:

$$C = c_0 + c_1*(Q)+ c_2*Q^2 + c_3 Q^3 + c_i \Sigma X_i$$

Where C = Average cost of production

Q = The rate of output

c_0, c_1, c_2 and c_3 are coefficients of the cost function to be estimated;

and X is a matrix of a number of explanatory, shifter, variables.

Such a model can only be reasonably applied to the data provided it is certain that the output of the study establishments is homogeneously measured.

The coefficients of the cubic cost function that we have estimated are presented in Table 4.42. Several findings are to be noted. First, we find that the underlying cost surface rises in the linear X-Y space in this industry. The coefficients of the linear term is positive, but of the cubic segments are negative. Both coefficients are found to be highly significant.[49] This means that as the scale of output rises early on, cost rises significantly, as, for instance, machines are not 'run in', and workers fumble running up the learning curve. The cubic term then is negative once again, with its coefficient highly significant. Dummies for micro, small and medium establishments are each highly significant. Because the large establishments provide the control in the specification of these three dummies, the implication is that relative to large establishments, costs of micro, small and medium establishments are, given their quality quotients, significantly lower.

[49] The value of the coefficient of the quadratic term in the cost function was exceedingly small and very insignificant. That is why SPSS chose to not report on it.

Table 4.42 Determinants of logarithmic cost function in the Agro and Food Processing Industry

(Regressing natural log of average production cost per unit of output in Taka)

Explanatory variable	Coefficient	t-stat
Constant	6873023.500	3.741
Physical output(Q)	69.137*	35.123
Physical output(Q)^3	0.000*	-34.139
Micro	-6636258.903*	-2.818
Small	-6267707.429*	-3.495
Medium	-5051497.899*	-2.624
Dhaka	-2132524.140*	-2.236
Chittagong	2660014.723*	1.225
R^2		0.921
Dependent Variable	**Total Cost**	

Source: SMEF survey of six sectors, 2006/07

Note: Single asterisk attached to a T-statistic implies that the corresponding regression coefficient is significant at 5% error probability level, and two asterisks imply significance at 10% error probability level.

4.16.1 Fitting a flexible translog cost function to the data

A translog cost surface is often advanced as an appropriate analytical tool to capture the drivers of costs in any industry. All unit data are transformed logarithmically. LnY refers to natural log of the output level; lnP1 refers to natural log of input prices; lnP2 refers to natural log of the wage rate; lnP3 refers to natural log of the interest rate; lnK refers to the natural log of fixed capital on replacement cost basis; $\ln^2 Y$ refers to the square of the natural log of Y. All the remaining terms are interaction terms based on the foregoing variables. The results are now discussed.

First, compared with the cubic cost function, r^2 has fallen to 0.81. Following findings are important. First, if the scale of output increases, total variable cost (TVC) decreases. Variables costs are increasing in material input prices, and the effect is statistically significant. This result is quite intuitive. Variables costs are also increasing in wage rates, and the effect too is statistically significant. This result is also quite intuitive. Variables costs are also increasing in the value of fixed capital, and the effect is statistically significant, too. This result is also as it should be.

Table 4.43 Determinants of translog variable cost function

Explanatory variable	Coefficient	t-stat
Constant	10.778	0.657
Ln Physical output	-2.605*	-2.253
Ln Input price	0.441*	4.744
Ln Wage rate	2.063*	2.038
Ln Interest rate	-6.311	-1.011
Ln Capital	3.358*	2.679
Ln Capital*Ln Wage rate	-0.214	-1.657
Ln Capital*Ln Interest rate	-0.739*	-1.790
Ln Interest rate*Ln Physical output	1.135	2.525
R^2	0.807	
Dependent Variable	**Ln total variable cost**	

Source: SMEF survey of six sectors, 2006/07

Note: Single asterisk attached to a T-statistic implies that the corresponding regression coefficient is significant at 5% error probability level, and two asterisks imply significance at 10% error probability level.

4.17 Actionable plans for lowering average costs

From a number of studies, we now know that unit costs are powerfully influenced by the rate of output, by capacity utilization, by locational advantage, the relative reliance on imports, and the like. Of this, all three are potentially relevant from the perspective of policy feasibility. For instance, fostering greater competitiveness in the markets for or greater access to the capital input, or both can influence the rate of output. Note that interest rates in Bangladesh which are among the highest in Asia (Chowdhury and Miah, 2006; Chowdhury, 2007) can potentially be lowered using measures that bring about greater competitiveness in the credit markets[50].

It stands to reason that capacity utilization (CU) is inversely related with unit costs. This implies that measures that positively motivate CU will lower unit costs and thus improve competitive performance of establishments. Units that are located on the main grid of the roads or within some well-recognized clusters tend to have lower average costs compared with units that are located more inland. And finally, reliance on imports ramps up costs. This is largely because imports are squeezed for all they can sustain. Bangladesh depends on customs duties on imports for more than 40% of her revenues. Imported inputs are therefore more expensive compared with inputs that are domestically produced.

Sustained growth of firms requires consistent improvement in their productivity. Within the industrial sector, the growth of the agro and food processing industry is particularly important for Bangladesh as this is one of the major industries in terms of contribution to total manufacturing production and employment. For example, it ranks second only to textiles in terms of the value of output and employment, accounting for some 25 per cent of total industrial output and 16 per cent of total manufacturing employment in 1990/91 (BBS 1995). Empirical studies (Little, Scitovosky, and Scott 1970; Steel 1972; Rahman 1983) carried out in Bangladesh and elsewhere have shown that manufacturing firms had operated with a high degree of unrealized productive capacity due to the excessive controls of the protective regimes in the 1960s and 1970s. It is expected that recent liberalization programs will encourage firms to improve productivity growth. Bangladesh can no longer afford to hold unrealized capacity and recent reforms have put an emphasis on productivity gains rather than, as in past, the injection of new inputs into the production process. Studies examining the extent of capacity realization and the overall productivity performance of firms in the agro and food processing industry are limited in Bangladesh.

We include interventions in the Action Plan (Section 5) that we write for the Agro and Food Processing Industry so as to assist the firms in this industry to lower their costs, and thus improve their competitive positions in the industry. While the details of this information will be presented in the Action Plan that we include later

[50] Already, the SME Foundation is on the cusp of initiating credit wholesaling in an potentially effective effort to lower the binding interest rates that especially micro and small establishments have to pay while servicing their loans from the banking system.

in this report, suffice it to say for the moment that the following are the principal props of this action plan:

a) There has to be a certain degree of facilitation by appropriate authorities in the interest of increasing the capacity utilization of the establishments in the industry. Such authorities may include the National Board of Revenue (NBR), the Ministry of Industries, the SME Foundation, the BSTI. Clearly, the taxation policy of the country will have to carry a lot of the burden of rolling back the average costs for industry. Naturally enough, the NBR, as the locus of the design and the implementation of the Government's taxation policies too will also have to become more accountable in terms of rolling back the costs.

b) Unit cost is merely the observed level of factor productivity achieved or, more precisely, of the total factor productivity. Anytime factor productivity increases in an industry, the average cost of production in it falls. This recognition makes it imperative to take a close look at whatever influences the level of factor productivity. *Prima facie*, capacity utilization, the rate of output, the age of the capital machinery, the nature and the length of the training by the entrepreneur, the location of the enterprise, are the factors that influence average costs.

4.18 The ICT Platform of the Agro and Food Processing Industry

The Information Revolution is inexorably transforming the world. Information technology (IT) has profoundly transformed the *modus operandi* for customer satisfaction in businesses. The delivery of government services and its interactions with the governed have changed like never before. Markets, production, storage, marketing, safe-keeping one's money, keeping track of it, even making it, have morphed due to ICTs in ways never before thought possible.

The state and the relevance of the information and communications technology infrastructure that is harnessed by the sample observations is therefore of some interest to us. The following tables present information about these aspects concerning the establishments on our sample. Several findings are worthy of being mentioned. Firstly, the percentage of cases of establishments owning and using personal computers overall is found to be 70%, and of server-grade machines 10%. Similarly, some 45% of the establishments have an internet connection. Significantly, this proportion of internet access is somewhat higher compared with the proportion of cases of establishments that have at least one mobile telephone: forty one percent of the establishments have at least one mobile phone. The proportion of cases where the establishment was found to have at least one fixed telephone line was about 65%, significantly in excess of the corresponding percentage of cases where establishments owned either Internet access or a mobile telephone. This shows that fixed telephone line in this industry still retains an edge when it comes to selecting the mode of people of keeping connected for business or recreation. The reason why this is so is probably because the broadening of the base of the use of the internet is impeded by the lack of Internet bandwidth, for all the rapid rate at which Internet bandwidth provisioning in Bangladesh has grown. Another reason why the penetration of mobile telephony on this sample still lags behind fixed telephony is probably the fact that, for all the bounding growth rate of mobile telephony subscriber base, many areas are not characterized by robust and always-available network connectivity.

Table 4.44 reveals on the average number of personal computers, servers, mobile and fixed telephony connections etc. that the sample has returned per user.[51] Several findings are worth emphasizing here. First, establishments that admitted to owning any personal computers admitted owning an average of 2.42 personal computers. Establishments that admitted to owning any personal computers admitted owning an average of 1 server-grade computers. Establishments that admitted to owning an access to the Internet admitted paying for an average of 42 Kbps of access to Internet bandwidth. Establishments that admitted to owning any mobile admitted owning an average of 3.84 mobile telephones. Establishments that admitted to owning any fixed telephone admitted owning an average of 1.84 fixed-line telephones. Establishments that admitted to owning any business automation software admitted owning an average of 1.75 software of that nature.

Table 4.44 Profiles of the penetration of information and communications technology into in the Agro and Food Processing Industry, Bangladesh (% of establishments with At least one)

Firm size class	PCs	Servers	Internet access	Business automation software	Mobile telephone	Fixed telephone
Micro	2.16	0.00	1.44	7.19	3.60	0.00
Small	23.74	4.32	20.14	29.50	29.50	0.72
Medium	15.11	2.16	12.23	20.86	20.86	0.72
Large	76.26	7.91	56.83	169.78	129.50	0.72
MiSmall	18.71	0.72	12.23	59.71	39.57	0.00
MeLarge	23.74	4.32	20.14	29.50	29.50	0.72
All firms	42.45	5.04	32.37	89.21	69.06	0.72

Source: SMEF survey of six sectors, 2006/07

Data presented in Table 4.44 shows that wide variations exist in use of PC among the firms in agro and food processing industry. Small-scale industry is using comparatively more modern facilities such as, PC, servers, internet, business automation software and mobile phones than medium scale industry among the firms under study. Large-scale industry is more equipped with modern communication and management facilities than the other industry, which is obvious. The use of PC (76.26%), servers (7.91%), internet access (56.83%) in Large firms was highest as compared to others firms under study. The use of fixed telephone is found absent in micro and small firms while the use is found in less than 1.0 per cent among the other four sizes of firms. Use of business automation software in large industry was found 169.78%, which might be due to less production cost of items and also more profit earned by them. The percentage of mobile phone used in large industry was 129.5%, which indicates that some of the employees are using more than one set of mobile phones.

[51] These are averages. These averages are calculated based only on respondents that own any or all of the ICT devices cited in the previous discussion. Cases returning zeroes, while perfectly valid for other computations, have been omitted from the calculations surrounding Table 46.

Table 4.45 Profiles of the penetration of information and communications technology into in the Agro and Food Processing Industry, Bangladesh

Average Use of computer, software and Internet (No)

Firm size class	PCs	Servers	Bandwidth (kbps)	Business automation software	Mobile telephone	Fixed telephone
Micro	1.33	0.00	32.00	0.00	1.40	1.75
Small	2.61	2.00	40.00	0.00	2.80	2.10
Medium	5.71	1.33	43.00	0.00	5.27	2.72
Large	35.42	2.67	42.45	1.00	137.17	2.14
MiSmall	2.46	2.00	39.11	0.00	2.67	2.10
MeLarge	16.51	2.00	42.12	1.00	43.87	2.50
All firms	10.32	2.00	40.93	1.00	16.30	2.27

Source: SMEF survey of six sectors, 2006/07

Table 4.46 is about management hierarchy. Taxonomically, 'flat' versus 'hierarchical' management structures are really the two polar divides that comes to mind. The two terms are not necessarily unambiguously defined in the literature. Lay people would understand by flat management structure a rather loose, informal, fluid structure in which canons regarding relationships between tasks and briefs, chain of command and accountability, even rewards and rebukes, are not formalized. Such informality is frequently the mantle of micro and small, at times even medium-sized, enterprises. Hierarchical management structures however set much larger store by codification and formalization, documentation and processes. Such processes are often written into business rules that get codified into the working of human resources software that get written so as to enforce such hierarchy in as much an impersonal manner as possible.

Table 4.46 Profiles of the management structure in the Agro and Food Processing Industry, Bangladesh (per cent)

Firm size classes	Flat	Hierarchical	Other	All
Micro	100.00	0.00	0.00	100
Small	78.00	22.00	0.00	100
Medium	64.70	32.40	2.90	100
Large	33.30	58.30	8.30	100
MiSmall	80.60	19.40	0.00	100
MeLarge	56.50	39.10	4.30	100
All	72.70	25.90	1.40	100

Source: SMEF survey of six sectors, 2006/07

Respondents were asked to assess if their own management structures were flat in some 'general' manner. Their responses have been tabulated in Table 3.46. Several findings stand out. First, a full 70.7% of the sample respondents consider their own management model as being 'flat' in nature, while another 29 % think theirs are a hierarchical management model. That said, secondly, important difference emerge between MiSmall and MeLarge establishments. Whereas as much as 83% of the sample establishments consider themselves to have 'flat' management structures, the corresponding percentage for the MeLarge establishments is only 56%.

Table 4.46 shows that no hierarchical profile of management observed in micro-scale industry. The highest percentage of hierarchical profile (58.3) was found in Large firms which was followed by 39.10% in Melarge firms. Hierarchical of management increased with the increase in size of the industry i.e. medium size industry was having more hierarchy than small size and the large size than that of medium size. However, the flat profile of management was found inversely proportional with the size of the industry i.e. the largest firm was having the lowest flat profile of management (33.30%) while the highest flat profile of management (100%) was observed in small-scale firms. The medium and large size firms, in addition to flat and hierarchical profiles of management, other forms of management structure were observed while other profile of management was completely absent in micro, small and MiSmall types of firms.

4.19 Towards the formulation of growth strategy

The next topic is about growth strategy. But before we take growth strategy up, we have to remind ourselves that growth will need to be pro-poor. In a pro-poor scheme of things, we need to grasp, with some real accuracy, the process whereby the ‘demand’ for labour and capital drive themselves at the levels of the firms that comprise the world of manufacturing. After all, it is the drivers of factor demand in general, and of labour in particular that any growth strategy will need ultimately to be about. We, therefore, have invoked a full-information model so as to estimate a system of ‘input demand functions’. The factors or inputs considered are labour, fixed capital and material inputs. The following is the structure of the model. In order to estimate this system of equations, we employ Zellner’s Seemingly Unrelated Regression Estimators (SURE). This estimator is the most appropriate when the disturbance term are correlated across the equations comprising a system of equation of the kind to be introduced in the appendix to this report. It is quite appropriate to say that it is in the determination of the labour demand and capital demand that we are most interested.

Labour demand

We find that the labour demand function is negatively sloped in wage rate (lnW). The regression coefficient is not significant.[52] We find that the labour demand function is negatively sloped in fixed capital (lnK). We find that the labour demand function is positively sloped in the dummy variable relating to automation (D_a). The regression coefficient is statistically highly significant.

The equation says that in order to stimulate the demand of labour by the establishments in the industry, efforts have to be made in order to lower the reservation price of labour. Reservation price is about the minimum opportunity cost that is consistent with the worker being able to reproduce its labour-selling power and thus deciding to supply labour. Essentially, reservation price revolves around workers’ cost-of-living. Clearly, there is a lot that public policy can do about workers’ cost of living. Foremost among them is about leveraging the cost of food as a policy variable.

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[52] Note that with SURE, it is z-statistics, rather than t-statistics, that is calculated in order to assess statistical significance of individual regression coefficients.

Secondly, the automation dummy has a positive and statistically highly significant coefficient. The higher is the index for automation, the higher is the demand for labour. There are times when entrepreneurs automate their business processes in such a manner that by simultaneously raising the rate of production also raises the demand for labour, especially in peripheral and support functions, such as packaging, storing, manning security arrangements. If this happens, automation can in principle have a positive coefficient on this particular function. Automation need not forever lead to contract the number of jobs offered by a firm. It depends upon on what kind of automation one is talking about, and how successful automation is in raising the output level of the firm in question.

The demand for capital:

We find that the capital demand function is negatively sloped in interest rates (lnI): the regression coefficient is algebraically tiny and is statistically insignificant. This is a very strong and perfectly intuitive result. We also find that the capital demand function is positively sloped in product price (lnP). However, the regression coefficient is statistically insignificant. The upshot is that this estimate of the capital demand equation is quite intuitive. It says that in order to stimulate the demand of capital by the establishments in the industry, efforts have to be made in order to lower the prevailing interest rate so that access to capital becomes more and more affordable. Clearly, there is a lot that public policy can do about interest rates. Foremost among them is about empowering public-private partnerships (PPP) such as the Small and Medium Enterprise Foundation (SMEF) credit wholesaling programmes.

Material input demand:
We find that the input demand function is negatively sloped in own price, which is what it should be. The regression coefficient is statistically highly significant. We also find that the labour demand function is positively sloped in automation dummy (D_a). The regression coefficient is statistically highly significant.
The upshot is that this estimate of the input demand equation is quite intuitive. It says that in order to stimulate the demand of inputs by the establishments in the industry, efforts have to be made in order to lower prices of raw materials. What implications does that have for policy making? It says that macroeconomic stability must be maintained, so that the inflation rate can capped at an appropriate level. This is needed in order for an environment of price stability to be in force. Policies that work on keeping as low as possible the reservation price of labour also implicated in this particular content. As said already, reservation price of labour is about the minimum opportunity cost that is consistent with the worker being able to reproduce its labour-selling power and thus deciding to supply labour. Essentially, reservation price revolves around workers' cost-of-living. To reiterate, clearly, there is a lot that public policy can do about workers' cost of living. Foremost among them is about leveraging the cost of food as a policy variable.

Table 4.47 Towards the drivers of a growth strategy in the Agro and Food Processing Industry, Bangladesh

	Regression coefficient	Z-variable
Head count		
Wage rate	-0.00012	-0.5
Average product price	0.00060	-49
Fixed capital	3.4e-06	-49
Automation Dummy	0.687*	2.0
Physical output	-2.9e-8	-0.38
Dhaka dummy	0.469	1.4
Chittagong. Dummy	0.589	0.94
Constant	3.237*	11.24
Fixed capital		
Interest rate	-0.1408*	-2.08
Average product price	0.0030	1.35
Physical output	-6.41e-10	-0.00
Automation Dummy	0.476	0.73
Dhaka dummy	-0.800	-1.26
Chittagong. Dummy	1.25	1.14
Constant	9.34*	8.59
Input		
Input price	-.0124*	-2.14
Physical output	1.13e-07	.68
Automation Dummy	2.346*	3.16
Dhaka dummy	-1.96*	-2.72
Chittagong. Dummy	1.029	0.83
Constant	10.278	20.04

Source: SMEF survey of six sectors, 2006/07

The achievement of growth on the sample

We measured the extent of growth using four variables, namely, employment, equity, revenue and number of machines. Using the following formula, we calculate compound annual growth rate in each of these variables over the life-cycles of the firm for each of the firms on the sample. We then presented average compound annual growth rates across firm size classes. The formula is:

$R_i = \exp((\ln(E_t)-\ln(E_0))/n)-1$, where R is the growth rate, E_t is headcount in study year, E_0 is headcount in start-up year, n is the number of years of firm's life since start-up, exp is code for exponentiation, and 'i' is an index at firm-level.

Table 4.48 shows that maximum employee growth rate (18.1) was observed in Large firms which was followed by Melarge (12.5) and Small (12.4) firms while the lowest employee growth rate (2.2) was found in Mcro enterprises under study. Similar trend of growth rate was observed in other variables such as machine, equity and revenue among the different sizes of firms.

Table 4.48 Growth in selective variables per year over the life of firms in

Firm size classes	Employee growth rate	Machine growth rate	Equity growth rate	Revenue growth rate
Micro	2.20	0.00	11.40	15.10
Small	12.40	11.90	25.10	41.90
Medium	10.50	3.90	13.80	17.40
Large	18.10	12.50	25.30	33.10
MiSmall	11.20	10.80	23.40	38.70
MeLarge	12.50	6.00	16.80	21.50
All	11.60	9.10	21.20	33.00

Source: SMEF survey of six sectors, 2006/07

Table 4.49 then explains the inter-firm variations in growth rates achieved per year by sample firms. Following results emerge from it. First, an outstanding result is that age of the firm the number of years since its birth is strongly and inversely related with the growth achieved. The regression coefficient of age of the firm is negative and statistically significant in each of the four equations estimated. In lay terms, this result is strongly suggestive of a 'generation gap' among firms' prognosis for growth: younger firms are on higher growth trajectories.

Second, the educational attainment of the Managing Director returns a significantly positive coefficient on the growth rate function in the number of machines.

Third, with the exception of growth in equity, each of the other functions achieves a quite significant explanation of the dependent variable. The bottomline is that greater entrepreneurial preparation associated with 'late entry', and human resources development are two positives for spurring organic growth.

Table 4.49 Drivers of annual growth rate over firms' life

	Dependent variable is							
	'Headcount'		No. of machine		Equity		Revenue	
Explanatory variable	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat	Coeff	T-stat
Constant	0.914	12.466	0.866	14.523	0.531	4.266	0.879	14.981
Ln firm age	-0.375	-22.249*	-0.336	-24.559*	-0.244	-8.525*	-0.350	-26.005*
Ln MD's schooling	0.052	1.912**	0.035	1.592	0.047	1.020	0.042	1.912**
Cluster dummy	0.020	.985	0.015	.902	-0.027	-0.775	0.004	0.263
Loan Dummy	-0.014	-.645	-0.008	-.434	0.008	0.223	0.019	-1.092
Dhaka dummy	0.028	1.366	0.006	-1.315	0.069	1.958**	0.025	1.486
R^2		0.802		0.835		0.381		0.848

Source: SMEF survey of six sectors, 2006/07

Data presented in Table 3.50 shows that in agro and food processing industry the percentage of gross profit as a return of total capital varied from 10.10 to 17.00 among the different size of firms under study. Maximum gross profit was realized from medium-scale of firms whch was closely followed by Small, MiSmall and Melarge firms. The gross profit as a return of total capital was 11.10% in Micro-scale enterprises.

Table 4.50 Return to investment into agro & food processing industry in Bangladesh

Firm size classes	% Of gross profit as a return of total capital	% Of net profit as a return of total capital
Micro	11.10	8.60
Small	16.10	10.00
Medium	17.00	15.90
Large	10.10	7.90
MiSmall	15.60	9.80
MeLarge	15.40	14.10
All	15.60	11.30

Source: SMEF survey of six sectors, 2006/07

The percentage of net profit also varied widely among the firms under study. The highest net profit (15.90) was derived from Medium-scale firms, which was followed by Melarge firms with net profit of 14.10%. The lowest net profit (7.90%) was recorded from large firms while the rest types of firms showed intermediate percentage of net profit as a return of capital.

Growth strategy in the AFP industry

Growth strategy is primarily a matter in which development economists are interested. Because growth itself owes to two broad classes of source, a growth strategy will be about activities that channelization of two kinds of resources into the industries of interest. The following is a definition of a growth strategy that we employ in this study:

"A growth strategy is a coherent organization of initiatives, especially by the government and public-private partnership (PPP) sector, that have demonstrably positive effect on both factor accumulation and factor productivity growth in the sector of interest".

There are two keywords in this definition that it is worth drawing particular attention to. First, the initiatives must have a demonstrably positive effect on both factor accumulation and factor productivity growth, based on statistically significant regression coefficients. We shall carry out multivariate regression equations to explain statistical variations in two classes of variables, namely, factor accumulation and factor productivity. Only factors that have statistically significant coefficient in these regressions warrant inclusion in a growth strategy. Quality money and time will potentially be invested in implementing the sector growth strategies that this work will help spawn. It is therefore imperative that the initiatives and interventions that we highlight must pass muster based on rigorous statistical tests involving causalities that are theoretical sound and intuitive.

Results from the SURE estimation point up several strategic directions to foster growth in the agro and food processing industry of a type that spurs the demand for labour. First, policies that work on macroeconomic stability and keep in check inflation rate are important. As well, policies that help in keep relatively low and stable the prices of 'wage goods' food, clothing, fuel, housing rents, etc. will be needed in order to keep labour's reservation price in check. Secondly, interventions are needed in order to improve access to finance, especially for the MiSmall class of firms. Thirdly, the entrepreneurs need assistance in order to upgrade the quality, turn-around, functionality, etc of their products, as relatively high product price strengthen the demand for labour. Fourthly, naturally anything that is positive for capacity utilization is, via the route of the positive effect of measured output on the demand for labour, also good for the latter.[53] Finally, any intervention that helps lowering the market prices of agricultural products and industrial chemicals provides a positive fillip to the demand for raw materials and chemicals. Enhancing the access to credit in the agricultural and rural nonfarm sector, including by broadening and deepening the outreach of micro credit, will potentially help with augmenting supplies and at least keeping prices of agricultural and high-value products relatively stable.

We also tapped the opinions of our esteemed respondents about their perceptions of which various growth motivators or impediments they would much rather have assistance. We have analyzed their responses. Several findings rate a mention. First, the largest single percentage (18%) of suggestions fingered high bank interest rates as a kind of 'black eye' from which relief is urgently sought by the survey respondents. We can take it that reforming the financial sector is the fourth most important strategic task before the country. Second, sixteen percent fingered erratic supply of raw material as a drag that needed fixing. Third, about fourteen percent spoke out in favour of government's 'pro-industry' policy-set. About eleven percent spoke strongly in favour of relaxing the huge constraint in terms of the supply of electricity to the national grid.

[53] We shall desist from discussing the strategic implications of the SURE results with regard to the other two equations estimated. We leave this to be a pleasant duty of the reader to reach their own conclusions based on those two equations.

Section 5

ACTION PLAN FOR AGRO AND FOOD PROCESSING SECTOR

SL. No.	Key issues	Objectives	Activities	Expected outputs	Time frame	Action taken by
Framing and adopting policy for AFP industry development and adequate functioning						
1.	Formulate and finalize a national policy for AFP industry	i) To create an enabling environment to ensure level playing field for AFP enterprises of all sizes ii) Treduce custom duty rates on basic raw materials and intermediate imports used by export oriented AFP industries iii)To improve Bank's performance in AFP industrial lending iv)To rationalize tax structure to provide support to small & cottage AFP industries by raising the ceiling of exemption limits as regards taxation, and by lowering the VAT rates v) To develop separate credit policy for AFP SMEs	i) Constitute a committee to formulate a National AFP Policy so that AFP SMEs can develop with its own potentials ii) Mainstreaming AFP industry as a crucial sector in National Development Plans iii) Finalize the draft after discussions and consultations with the stakeholders	i) National AFP Policy formulated and approved by the authority	Short term	MoA, MoI, MOSICT, MoP &F and SMEF
B. Finance						

2.	Enhance access to finance	i) To enhance easy access to finance for AFP SMEs	i) Change in lending policy ii) Reduce the type and amount of collateral iii) Establish venture capital for AFP industries ii) iv) Increase access to finance to AFP enterprises through credit wholesaling	i) Credit lending policy changed ii) The type and amount of collateral for AFP enterprises reduced iii) iii) Credit wholesaling for AFP industries introduced	Medium term	Bangladesh Bank, Commercial Banks, Leasing Companies and Venture Capital Companies
C. Technology						

3.	Appropriate technology intervention	i) To enhance competitive efficiency through appropriate technology intervention	Assess the present technological capabilities of AFP R&D institutes and identify weakness and strengths Increase fund for R&D activities to the universities and research institutes Provide credit, tax, VAT and duty facilities for import of technology to support the AFP industries Make inventory of available technologies and prepare a database and load on SMEF we-portal so that they are readily accessed Conduct a survey to assess the technological needs of AFP sector Increase coordination between research organizations and the AFP industries Provide assistance for new technology Strengthen R&D organizations and increase research facilities ix) Introduce need based subjects in universities, vocational institutes and modernize education curricula for AFP industrial promotion	Capabilities of R&D institutes assessed Fund support increased for R&D activities Credit, tax, VAT and duty facilities for import of technology provided Database on available technologies for AFP sector available Suver conducted to assess technological needs Coordination between R&D institutes and the AFP enterprises increased vii. Assistance for new technology provided R&D organizations strengthened and research facilities increased Universities and vocational institutional curricula modernized	Medium to long term	R & D institutions, Universities, BCSIR, BARI, BRRI, BLRI, BFRI, BITAC, BSTI, SCITI, SMEF, Hortex Foundation, Krishi Gobeshona Foundation, BAPA and NASIB

SL. No.	Key issues	Objectives	Activities	Expected outputs	Time frame	Action taken by
D. Market for AFP products						
4.	Enhance access to market	i) To enhance AFP products access to domestic and international markets	i) Diversify AFP products and identify new AFP products ii) Build display center for AFP products iii) Organize AFP products fairs iv) Participate in international fairs/exhibitions with AFP products v) Improve quality of products vi) Provide incentive to build awareness about the advantages of AFP products and their quality assurance mechanism through generic advertisement and publicity ii) vii) Initiate market promotion campaign for new products mix and brand name support.	i) AFP products diversified and new products identified ii) Display center built for AFP products iii) Organized fairs iv) Participated in international fairs/exhibitions v) Quality of products improved vi) Provided incentives to built awareness about the AFP products through to advertisement iii) vi) Market promotion campaign initiated	Medium term	MoA, MoI, MoC, BAPA, SMEF, BFVAPEA and Hortex Foundation
5.	Develop guidelines for agricultural marketing, market research and market information system for processed products	i) To strength marketing system ii) To ensure adequate price of products iii) To locate new and promising markets for processed products	i) A committee formed with experts ii) Marketing guidelines developed iii) Marketing research areas selected	i) Guidelines approved ii) Marketing research conducted iii) New markets identified	Medium to Long term	MoI, SMEF, MD, FBCCI, Universities, R&D institutions

E. Capacity building and skill development training for technicians and workers of AFP industries						
6.	Review of existing institutional programmes and facilities extending towards AFP human resource capacity development	i) To increase human resource capacity of the AFP industries to improve their skills	i) Prepare list of experts, review present curriculum, syllabus and examine standard of materials of various skill training and revise ii) Conduct training need assessment to remove mismatch between supply and market demand. iii) Organize meeting with all relevant institutions and exchange information among agencies iv) Organize market oriented training of trainers course for AFP SMEs v) Provide training on management development of private entrepreneurs vi) Support in-factory skill up-gradation and training activities through providing fiscal and other incentives	i) Expert list prepared, curriculum and syllabuses, examined standard of materials, revised ii) AFP sectoral training need assessed; iii) Organized meeting, exchanged information among institutions and agencies iv) Organized market oriented training of trainers courses v) Provided training on management development of AFP entrepreneurs and managerial capabilities of AFP SMEs enhanced vi) In-factory skill up-gradation and training activities provided	Medium to Long term	SMEF, SCITI, INFST, BARI, BAU, BSCIC, Hortex Foundation and BFTI
F. Infrastructure and institutional facilities for AFP industry						
7.	Adopt policy to ensure utility (electricity, water and gas) services AFP industry	i) To ensure an un-interrupted power and adequate water and gas supply ii) To improve production system iii) To minimize labourer wastage	i) Excluded AFP industry from load shading and gas shortage ii) Power supply in main grid in AFP industry area increased	i) Production increased ii) New SME industry established iii) Profit in AFP industry increased	Medium to Long term	PDB, MoE, REB, Private PS companies, WASA
8.	Develop scheme for	i) To increase capacity utilization of AFP industries	i) Ensure regular supply of quality raw materials	i) Capacity utilization of AFP industries increased	Medum to Long	MoA,MoI,SMEF,BAPA and Hortex Foundation

	strengthening of backward linkages of AFP industries	ii) To ensure remunerative price to farmers iii) To ensure supply of high quality nputs and planting materials of appropriate varieties to farmers along with technical know how etc through the processor	through contract farming ii) Provide remunerative price by creating direct linkage between farmer and processor iii) Ensure supply of high quality seeds/fertilizers/pesticides and planting materials of appropriate varieties to farmers along with technical know how etc through the processor	through ensured contract farming ii) Direct linkage between producer and processor created iii)High quality inputs provided to the farmers by the processor	term	
9.	Strengthen traditional fish processing technologies	i) To increase value addition and quality of dried fish for domestic and export market	i) Develop scheme for strengthening of traditional fish processing infrastructures and technologies that will result in value addition and hygienically dried fish	i) Traditional fish processing infrastructures and technologies strengthened and increased value added activities and hygienic dried fish products increased	Medium to Long term	MoFL, SMEF, BFRI
10.	Develop scheme for modernization of meat, poultry, milk and egg processing	i) To develop processed meat, poultry, milk and egg products	i) Initiate scheme for modernization of meat, poultry, milk and egg processing with assured quality and health standards through effective quality assurance system	i) Modernized processing units of meat, poultry, milk and eggs units developed through assured quality assurance activities	Medium to Long term	MoI, MoFL, BSTI, BAPA, SMEF
SL. No.	**Key issues**	**Objectives**	**Activities**	**Expected outputs**	**Time frame**	**Action taken by**
11.	Establish post-harvest infrastructure and cool chain facilities for agro and food	i) To provide/develop post-harvest infrastructure like establishment of cold storage and cool chan facilities etc. ii) To build efficient post-harvest handling system right	i) Provide partial grant assistance (50%) of the cost of capital equipment and technical civil works.	i) Partial grant assistance provided	Medium term	MoI, MoFL, BSTI, BAPA, SMEF, Commercial Banks and Other financial institutes

	processing	from the farm to retail marketing iii) To develop setting –up pre-cooling facilities, refrigerated transportation system and refrigerated retail outlets iv) To develop cold storage system etc in major ports and airports for food products meant for export				
12.	Promote the establishment of ice-plant in rural areas	i) To increase the supply of ice for fish and meat preservation ii) To reduce the spoilage of fish and other products	i) Granting loan for ice-plant in rural areas ii) Govt.-private venture ice plant in rural areas	i) Supply fish increased ii) Shelf-life of fish / shrimp increased iii) Price of fish / shrimp decreased due to steady supply	Medium to Long term	MoI, SMEF, PDB, REB, R&D institutions
13.	Setting up feed mills to produce quality feed (fish, poultry and animal)	i) To increase fish product ii) To increase poultry product iii) To save foreign currency iv) To ensure growth of fish and poultry in the country	i) Sanction loan for poultry and fish mill ii) Public-private entrepreneurship developed	i) Quality feed available ii) Feed available at cheaper price iii) Steady supply ensured	Medium To long term	MoI, SMEF
14.	Develop baby and weaning food processing industry in the country	i) To ensure the good health of infants and children ii) To safe foreign currency	i) Finance for industry sanctioned ii) Formula developed iii) Processing technology developed iv) Infrastructure developed	Local made baby food, weaning food available in the country at cheaper price	Short term	BCSIR, MoI, INFS, Universities, R&D institutes
15.	Modernize rice milling	i) To produce quality head-rice ii) To reduce milling cost iii) To produce quality bran suitable for oil extraction	i) Huller mills gradually reduced by modern rice milling equipments / machineries ii) Rice milling capacity	i) Aromatic rice export increased ii) Head rice production increased	Medium To Long term	MoI, SMEF, R&D institutions

			increased			
16.	Strengthen capacities of SMEF to rander better services	i) To provide more services for AFP industries through strengthening capabilities	i) Provide support to increase the institutional capabilities	i) More services received by the stakeholders	Medum term	MoI, Donor agencies
G. Handling, grading and transportation of raw materials						
.	Develop handling and transportation guidelines for agro & food processed products	i) To standardize a guideline ii) To facilitate the AFP industry to use the guideline	i) A committee formed with experts ii) Draft prepared and submitted by the committee to authority for approval	a. Handling and transportation guidelines available for use	Short term	R&D institute, Universities, BCSIR, HRC, Hortex Foundation, SMEF
18.	Formulation, dissemination and enforcement of grade and standards	i) To standardize different grades of produces	i) Expert committee formed ii) Draft for grades prepared	i) Grades approved and circulated among the users	Short term	R & D institute, Universities, HRC/DAF
19.	Improve transportation of frozen foods to expand export	ii) To facilitate export from the country	i) Refrigerated transport system made available ii) Cargo/ship availability increased	i) Frozen F&V transportation cost reduced ii) Export cost decreased thus profit increased	Medium To Long term	SMEF, MoCT, MoA, MoI

H. Quality and standards of AFP products						
20.	Improve quality and standards of AFP products	To improve the quality and standards of AFP products	Strengthen capacity of industries to conform with the increasingly stringent quality standards in the global market by strengthening quality control measures and related institution.	Strengthened industrial capabilities to handle the quality and standards of manufactured products.		MOI, MOF &E,, NBR, MOC, Trade Bodies, BSTI, SMEF, BOI and BSCIC

			Strengthen institutional/ national capacity in relation to Standard, Metrology, Testing and Quality (SMTQ).	Strengthened national capacity to address the issue related to product quality (SMTQ).		MOI, MOC, MOA, MOF &LS, SMEF
			Enhance Quality Management System (QMS) complying international standards.	iii) Developed national quality management system		MOI, MOC, MOA, MOF &LS and SMEF.
			iv) Enhance product certification system by BSTI and make it easier for SME entrepreneurs.	Enhanced product certification system		MOI, BSTI and SMEF
			v) Ensure compliance of quality assurance and environmental friendliness in the industries.	v) Increased compliances of quality assurance and environmental friendliness in the industrial sector.		MOI, MoF & E, BSTI and SMEF
			vi) Develop programme on capacity building in the area of food hygiene and safety through implementing GMP, GHP and HACCP etc.	vi) Developed capacity in the area of area of food hygiene and safety.		MOI, MOH&FW, BSTI and SMEF.
			vii) Introduce part grants for ISO 9000, 14000 and HACCP certification for SMEs.	vii) Grant available for ISO and HACCP certification.		MOI, MOH&FW, BSTI and SMEF.
I. Business support services for AFP entrepreneurs						
21.	Extend Business Development Services for local and international trade	i) To strengthen business development support services for AFP entrepreneurs	i) Organize more National & International trade fairs ii) Enhance activities of Advisory Service Center of SMEF iii) Advocate for insurance facilities iv) To bargain for reducing customs and excise duties v) Introduce award and	i) Organized more numbers of national and international fairs ii) Activities of SMEF's ASC enhanced iii) Insurance facilities advocated iv) AFP industries earned more profit	Medium term	SMEF MoC ,Hortex Foundation, Universities and R& D institutes and MoA

			incentives for well performance in AFP industry sector			
22.	Development of public-private partnership	i) To facilitate join venture establishment	i) Initiative to start industry jointly	i) More SME industry under joint venture started	Medium To long term	MoCT, MoI, SMEF
J. Coordination and monitoring						
23.	Develop institutional mechanism for coordination and monitoring	i) To ensure effective monitoring to oversee the progress of AFP industry sector	i) Formation of monitoring and evaluation committee ii) Assign concern institution(s) to coordinate with ministries and the stakeholders related to AFP sector	i) Monitoring and Evaluation Committee formulated	Short-term	SMEF, MoA, MoC, BAPA and MoP&F

SL. No	Key issues	Objectives	Activities	Expected outputs	Time frame	Action taken by
K. Public –private partnership						
24.	Enhance and harmonize the service delivery activities of both public and private sectors in promoting AFP industries	i) To rationalize the service delivery activities through public –private partnership	i) Develop regular consultation process with business associations and other stakeholders to foster the public-private partnership ii) Assist AFP enterprises to work together through integrated networks to improve competitiveness and access to markets ii) iii) Enhance partnership between NGOs working in the field of AFP enterprise development	i) Regular consultations held between business associations and other stakeholders ii) AFP industries are assisted through integrated network of partnership activities iii) Partnership between NGOs working for AFP enterprise developed are enhanced	Medium term	MoI, MoA, SMEF, BAPA,Professionals, NGOs, Development partners, R&D institutes, Trade bodies, Universities and Hortex Foundation
L. Environment pollution						
25.	Environmental pollution control	i) To minimize the adverse effects of industrial pollution due to establishment and growth of AFP	i) Formulate policies, guidelines and standards to check and minimize the adverse effects of	i) Policies and guidelines formulated to minimize pollution	Medium term	MOI, MOF&E,, Trade Bodies, BSTI, SMEF,

		industry	pollution due to industrial growth ii) Make arrangements in the MOI through manning it with qualified and skilled manpower, to conduct environmental impact assessment during the period of licensing itself. iii) Strengthen BSTI to develop standards to assess and monitor industrial pollution.	ii) Environmental impact assessment conducted iii) Strengthened BSTI to assess and monitor the environmental pollution		BOI, Boiler office, DPDT and BSCIC,.
M. Miscellaneous						
26.	Contact farming to produce F&V	i) To ensure steady supply	i) Develop a framework ii)Develop and test models	i) Quality improved ii) Tracibility established iii) Supply of raw materials ensured	Medium to long term	SMEF, Hortex, BRAC , Private organization
27.	Promotion of technical Advisory services	i) To strengthen and improve technical services	i) Formation of Advisory Committee with experts	i) Specific action taken by the committee	Long term	ASME, Hortex, MoA, R&D institutes, Universities
28.	Onfarm processing of Horticultural produce	i) To reduce spoilage ii) To increase self-life iii) To maintain quality	i) Ripening, curing and other treatments after harvest	i) Quality and shelf-life improved	Medium to long term	R&D institutes, Universities, SMEF
29.	Rationalize financial incentives	i) To increase exports	i) SIP rescheduled ii) Incentives increased	i) Profit increased	Short to long term	SMEF, MoI, MoA, Hortex

Annexure-1

Food products brought under compulsory certification marks scheme by Bangladesh Standard and Testing Institution (BSTI) up to June, 2008

SL. No.	Name of the Products	BDS No.
1.	Pineapple juice	865 : 2002
2.	Fruit squash	506 : 2002
3.	Jam, Jelly and Marmalade	519: 2002
4.	Fruit vinegar (Sirka)	523 : 1990
5.	Fruit and vegetable juice	513 : 2002
6.	Fruit syrup	528 : 1991
7.	Honey	1039 : 2002
8.	Canned & Bottled Fruit	503 : 1991
9.	Fruit Cordial	508 : 1990
10.	Sauce (Fruit or vegetable)	512 : 1991
11.	tomato paste	517 : 2002
12.	Pickles	520 : 2001
13.	Tomato juice	516 : 2001
14.	Concentrated Fruit Juice	527 : 1991
15.	Canned pineapple	853 : 2002
16.	Tomato ketchup	530 : 2002
17.	Infant formula	BDS/CAC-72-2003
18.	Whole Milk Powder and Skim Milk Powder	860 : 2001
19.	Butter	BDS/CAC-A-1: 2002
20.	Butter Oil and Ghee	908 : 2001
21.	White Bread	382 : 2001
22.	Biscuits	383 : 2001
23.	Lozenges	490 : 2001
24.	Toffees	1000 : 2001
25.	Packet Tea	1107 : 1995
26.	Liquid Glucose	141 : 1994
27.	Dextrose Monohydrate	140 : 1986
28.	Maida	381 : 2001
29.	Wheat Atta	380 : 1980 Amendment no-1 : 2001

SL. No.	Name of the Products	BDS No.
30.	Carbonated Beverages	1123 : 2002
31.	Noodles	1106 : 2001
32.	Lodized Salt	1236 : 2001
33.	Drinking water	1240 : 2001
34.	Natural Mineral Water	1414 : 2000
35.	Ice Cream	1083 : 1996
36.	Chilies, Whole and Ground	1017 : 2001
37.	Soybean oil	909 : 2000
38.	Mustard oil	25 : 2000
39.	Coconut oil	99 : 1991
40.	Turmeric powder	991 : 2001
41.	Edible palm oil	999 : 2000
42.	Vacuum Pan Sugar (Plantation white sugar)	361 : 1994
43.	Condensed Milk and Condensed Skim Milk	896
44.	Pasteurized Milk	1702 : 2002
45.	Chips / Crackers	1556 : 1997 Amendment no. 1: 2004
46.	Chanachur	1564 : 1997 Amendment no. 1 : 2004
47.	Lachsa Semai	1620 : 2000
48.	Soft Drink Powder	1586 : 1998
49.	Banaspati	804 : 2001
50.	Instant Noodles	1552 : 1997
51.	Palm Olein	1567 : 1997
52.	Edible Sun Flower Oil	BDS CAC 23 : 2002
53.	Wheat Bran	997 : 1982

Annexure-2

Harnessing Stochastic Production Frontier in search for diagnostic wisdom

The point of the presentation of this model, and some results based on it in Section 2.0, is to demonstrate that it is practicable to glean valuable diagnostic results from a dataset generated with policy research in mind.

Estimation of the SPF requires a particular functional form of the production function to be imposed. A range of functional forms for the production function frontier are available, with the most frequently used being a translog function, which is a second order (all cross-terms included) log-linear form. This is a relatively flexible functional form, as it does not impose assumptions about constant elasticities of production nor elasticities of substitution between inputs. It thus allows the data to indicate the actual curvature of the function, rather than imposing *a priori* assumptions. In general terms, this can be expressed as:

$$\ln Q_{j,t} = \beta_0 + \sum_i \beta_i \ln X_{j,i,t} + \frac{1}{2}\sum_i \sum_k \beta_{i,k} \ln X_{j,i,t} \ln X_{j,k,t} - u_{j,t} + v_{j,t}$$

where $Q_{j,t}$ is the output of the establishment j in period t and $X_{j,i,t}$ and $X_{j,k,t}$ are the variable and fixed establishment inputs (i,k) to the production process. As noted above, the error term is separated into two components, where $v_{j,t}$ is the stochastic error term and $u_{j,t}$ is an estimate of technical inefficiency.

Alternative production functions include the Cobb-Douglas and CES (Constant Elasticity of Substitution) production functions. The Cobb-Douglas production function is given by:

$$\ln Q_{j,t} = \beta_0 + \sum_i \beta_i \ln X_{j,i,t} - u_{j,t} + v_{j,t}$$

As can be seen, the Cobb-Douglas is a special case of the translog production function where all $b_{i,k}$ = 0. The production function imposes more stringent assumptions on the data than the translog, because the elasticity of substitution has a constant value of 1 (i.e. the functional form assumption imposes a fixed degree of substitutability on all inputs). And the elasticity of production is constant for all inputs (i.e. a 1 percent change in input level will produce the same percentage change in output, irrespective of any other arguments of the function).

The CES production function is given by:

$$Q_{j,t} = \gamma\left[\delta X_{i,j,t} + (1-\delta)X_{2,j,t}\right]^{-1/\theta} - u_{j,t} + v_{j,t}$$

Where, q is the substitution parameter related to the elasticity of substitution (i.e. q = (1/s)-1 where s is the elasticity of substitution) and d is the distribution parameter. The CES production function is limited to two variables, and is not possible to estimate in the form given in (7) in maximum likelihood estimation (MLE) (making it unsuitable for use as the basis of a production frontier). However, a Taylor series expansion of the function yields a functional form of the model that can be estimated, given as:

$$\ln\left(\frac{Q_{j,t}}{X_{2,j,t}}\right) = \ln\gamma + (\upsilon-1)\ln X_{2,j,t} + \upsilon\delta\ln\left(\frac{X_{1,j,t}}{X_{2,j,t}}\right) - \frac{1}{2}\upsilon\theta\delta(1-\delta)\left[\ln\left(\frac{X_{1,j,t}}{X_{2,j,t}}\right)\right]^2 - u_{j,t} + v_{j,t}$$

The model can be estimated as a standard or frontier production function, and the parameter values derived through manipulation of the regression coefficients. The functional form in (8) can be shown to be a special case of the translog function where $b_{i,i} = b_{k,k} = -0.5b_{i,k}$.

Given that both the Cobb-Douglas and CES production functions are special cases of the translog, ideally the translog should be estimated first and the restrictions outlined above, tested. However, the large number of variables required in the process of estimating the translog may cause problems if a sufficient data series is not available, resulting in degree of freedom problems. In such a case, more restrictive assumptions must be imposed.

To estimate the stochastic production frontier, an appropriate functional form is assumed (i.e. Cobb-Douglas, CES or Translog production function) and the parameters of the model (including s^2_v and s^2_u) are estimated by MLE. Estimation of the maximum value of the log likelihood function is based on a joint density function for the split error term $e_j = v_j - u_j$ (Stevenson, 1980). From this, technical efficient capacity utilization (TECU) can be calculated for the individual firm, given by:

$$E\left[\exp(-u_j)\middle|\varepsilon_j\right] = \frac{1-\Phi(\sigma_A + \gamma\varepsilon_j/\sigma_A)}{1-\Phi(\gamma\varepsilon_j/\sigma_A)}\exp(\gamma\varepsilon_j + \sigma_A^2/2)$$

Where, $\sigma_A = \sqrt{\gamma(1-\gamma)\sigma_s^2}$, $\sigma_s^2 \equiv \sigma_u^2 + \sigma_v^2$, $\gamma \equiv \sigma_u^2/\sigma_s^2$
and Φ is the density function of a standard normal random variable (Battese and Coelli, 1988). From this, if g = 0, then the expected value of the TECU score is one. That is, there are no deviations due to technical inefficiency or capacity underutilization (i.e. $\sigma_u^2 = 0$). If g = 1, then all deviations are due to technical inefficiency and capacity underutilization (i.e. $\sigma_v^2 = 0$). Hence if 0< g<1, deviations are characterized by both TECU and a random or stochastic component (Battese and Corra, 1977).

In order to separate the stochastic and TECU effects in the model, a distributional assumption has to be made for u_j (Bauer, 1990). From the literature on technical efficiency estimation, four distributional assumptions have been proposed: an exponential distribution i.e.

$$u_j \approx \exp(\Theta)$$

(Meeusen and van der Broeck, 1977); a normal distribution truncated at zero, for example, $u_j \approx \left|N(\mu_j, \sigma_u^2)\right|$ (Aigner, Lovell and Schmidt, 1977); a half-normal distribution truncated at zero i.e. $u_j \approx \left|N(0, \sigma_u^2)\right|$ (Jondrow *et al.*, 1982); and a two-parameter Gamma/normal distribution (Greene, 1990).

There are no *a priori* reasons for choosing one distributional form over the other, and all have advantages and disadvantages (Coelli, Rao and Battese, 1998). For example, the exponential and half-normal distributions have a mode at zero, implying that a high proportion of the firms being examined are perfectly efficient. The truncated normal and two-parameter gamma distribution both allow for a wider range of distributional shapes, including non-zero modes. However, these are computationally more complex (Coelli, Rao and Battese, 1998). Empirical analyses suggest that the use of the gamma distribution may be impractical and undesirable in most cases. Ritter and Simar (1997) found that the requirement for the estimation of two parameters in the distribution may result in identification problems, and several hundreds of observations would be required before such parameters could be determined. Further, a maximum of the log-likelihood function may not exist under some circumstances. Bhattacharyya *et al.* (1995), however, offer one approach for selecting the distribution to reflect technical inefficiency; they suggest the use of a data generating process.

Technical efficiency (TE) measures the relationship between a establishment's inputs to the manufacturing process and its outputs, with full efficiency being achieved when outputs are maximized from a given set of inputs. Inputs can be fixed (e.g. the machinery, looms, engine, other equipment, etc.) or variable (e.g. labour input, working capital, etc). Fixed inputs may also be intangible, such as entrepreneur's skill and quality differences between technologies. TE scores can be calculated using the econometric stochastic production frontier (SPF).

In the present case, we opt for Cobb-Douglas as the form of the production function to provide a kind of initial estimate of the stochastic frontier. Using Maximum Likelihood Estimates of such a production function, we obtain the sample variances of the normally distributed error component, and the 'irregular' error component with a truncated distribution. Using these, it is possible to calculate the value of the frontier, as also the value returned for each of the sample observation for the efficiency or capacity variable of choice. We picked gross value added as our measure of 'efficiency'. By deducting the value obtained for the observation from the frontier, we obtain a measure of the 'distance'. It is this distance that we then regress on a large number of explanatory variables, each of whom has a certain diagnostic value. This entire discussion is presented in Section 2.0.

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