Report on

Post Enumeration Check of the Economic Census, 2024

Mohammad Yunus
Badrun Nessa Ahmed
Md. Shahadat Hossain

December 2025

Bangladesh Institute of Development Studies (BIDS)
E-17 Agargaon, Sher-e-Bangla Nagar, Dhaka-1207

TABLE OF CONTENTS

List Tables

List of Figures

EXECUTIVE SUMMARY

The Economic Census 2024 was conducted by the Bangladesh Bureau of Statistics (BBS), which aimed to enumerate all eligible economic units across Bangladesh, excluding agriculture, and collect detailed information on their operational characteristics. As the first fully digital Economic Census in Bangladesh, the 2024 exercise marked a significant milestone in national statistical modernization. Given the scale and complexity of the census, covering over 87,000 enumeration areas (EAs), errors in coverage and content were anticipated. Coverage errors refer to the omission or duplication of economic units, while content errors pertain to inaccuracies in reported characteristics such as ownership, registration, and activity type. The Post Enumeration Check (PEC) was to quantify these errors and assess the credibility of the census data. Accordingly, the PEC was conducted by the Bangladesh Institute of Development Studies (BIDS) from 28 June to 10 July 2025 to independently evaluate the accuracy and reliability of census enumeration and content reporting, generate adjustment factors by domain, and provide actionable insights for improving future census operations.

The PEC adopted the dual-system estimation method to derive the "true" number of economic units by comparing independent counts from the Economic Census and the PEC. This method assumes a closed population of economic units between the Economic Census and the PEC dates, operational independence, and absence of erroneous inclusions or incomplete matches. The PEC sample comprised 352 EAs, selected through stratified random sampling across divisions and location types, including rural, city corporation, municipality, and upazila sadar. This design ensured proportional representation of Bangladesh's predominantly rural economic landscape, while capturing the urban complexity of city corporations, municipalities, upazila sadars, and growth centers.

Field operations were conducted independently from the Economic Census to preserve methodological rigor. Enumerators and supervisors were trained extensively on both the questionnaire and the use of Computer-Assisted Personal Interviewing (CAPI) devices. Data collection followed a two-phase structure: publicity and enumeration. Real-time digital uploads and supervisory monitoring ensured quality control. Matching operations between the Economic Census and the PEC data were supported by reconciliation phone calls to resolve doubtful or unmatched cases.

Nationally, the PEC estimated a Net Coverage Error (NCE) rate of 2.95 percent, indicating that the Economic Census 2024 successfully enumerated the vast majority of economic units. Rural areas exhibited lower undercount rates (2.55%) compared to urban areas (3.90%), with city corporations recording the highest domain-specific rate (5.99%). Division-level results showed Dhaka with the highest NCE (4.19%), followed by Rangpur (3.04%) and Chattogram (2.59%). Khulna recorded the lowest rate (2.04%), though with high relative error. By type of economic unit, permanent establishments were more accurately enumerated (3.03%) than temporary establishments (8.29%). Manufacturing units had lower undercount rates (2.08%) than service units (3.05%).

The dual-system estimate placed the true population economic units in the sample at 51,279, compared to 49,769 enumerated in the Economic Census, yielding an adjustment factor of 1.031 at the national level. Inclusion probabilities were high: 97.06 percent for the Economic Census, 98.38 percent for the PEC, and 95.49 percent for both. Regression analysis identified key predictors of coverage error. Economic units with formal registration, Tax Identification Numbers (TINs), and longer operational histories were less likely to be missed. In contrast, newly established, unregistered, service-sector units in city corporations were more prone to omission, underscoring the need for targeted strategies to improve coverage of informal and mobile economic units.

Content error analysis focused on matched cases, comparing unedited PEC responses with unedited census responses across five key variables. The most error-prone variable was registration status, with an inconsistency index of 60.6 percent and a low rate of agreement (67.1%). Temporary and service establishment classifications also showed high inconsistency (61.2% and 61.09%, respectively), reflecting definitional ambiguity and respondent confusion. Ownership type was more reliably reported for government units (19.22%). Still, partnerships, limited companies, and “other” ownership types exhibited high misreporting (>70%). Fire safety status had a high inconsistency index (58.23%) despite a high overall agreement rate (94.09%), suggesting issues with interpretation and classification.

Regression results revealed that content mismatches were more likely among service establishments, privately owned establishments, urban units—especially in city corporations—and unregistered units without TINs. Formalization and administrative

visibility were associated with lower error rates, reinforcing the importance of regulatory integration and training for enumerators.

The PEC confirms that the Economic Census 2024 achieved high coverage and generally reliable content reporting. Remaining gaps are concentrated among informal, service-sector, and urban establishments. The absence of systematic bias in content errors supports the credibility of census results for policy and planning. However, definitional clarity, improved training, and targeted outreach are needed to enhance future census quality.

Key lessons from the PEC include the importance of early integration with Economic Census planning, conducting timely fieldwork to minimize changes in population economic units, and maintaining operational independence between the Economic Census and PEC teams. The use of GPS and digital monitoring should be employed for location verification of respective shape files for the enumeration areas, and pilot PEC procedures should be institutionalized to refine instruments and matching protocols.

Recommendations include synchronizing the PEC budgets and timelines with Census planning, focusing on high-risk domains (urban, informal, and service sectors), strengthening definitions for problematic variables, and institutionalizing the independence of PEC through external partners. Adopting the term “Post Enumeration Survey” in line with global best practices is also advised to align with international standards and enhance methodological transparency.

CHAPTER 1: INTRODUCTION

1.1. Background

The Bangladesh Bureau of Statistics (BBS) is the National Statistical Office (NSO), responsible for collecting, compiling, and disseminating official statistics. The BBS conducted the 4th Economic Census digitally for the first time during 10-26 December, 2024 in which data on location, legal and ownership status, total persons engaged, capital stock excluding land and building, nature of goods and services (manufacturing and service) produced, registration with the appropriate authorities, etc., have been collected in addition to the counts. The country was divided into 87,629 economic enumeration areas (EA) during the census. It is the primary source of disaggregated statistical data, essential for design, implementation, monitoring, and planning in all sectors. These data are also significantly helpful for developing various short-term and long-term development plans, which will also help measure the progress of the Sustainable Development Goals (SDGs). Specifically, economic census helps measure employment, aiding efforts to reduce poverty, which is related to SDG 1 (No Poverty); provides insights into business activities, labor markets, and industrial growth, essential for promoting sustainable economic development which is related to SDG 8 (Decent Work and Economic Growth); helps collects data on industries and infrastructure, supporting innovation and sustainable industrialization, which is related to SDG 9 (Industry, Innovation, and Infrastructure); can highlight economic disparities, enabling policies to address inequalities, which is related to SDG 10 (Reduced Inequalities); and helps track resource use and sustainable practices in production processes, which is related to SDG 12 (Responsible Consumption and Production).

For operational purposes, the Economic Census defines eligible units for enumeration as follows: (i) economic units physically located within the designated enumeration area, and (ii) economic units typically active during any portion of the census period within that area, even if not continuously present. Based on this operational definition, the primary objectives of the 4th Economic Census of Bangladesh were to conduct a comprehensive enumeration of all eligible economic units as of a specific reference date, thereby producing a complete and timely profile of economic activity across the country. Inevitably, both coverage and content errors are likely to occur in a monumental task like the census. Coverage errors occur when eligible economic units are either missed (undercount) or erroneously included (overcount) due to the

omission of mobile or informal units, misclassification of residential versus economic units, boundary and listing errors, temporal mismatches, access constraints, and other factors. Similarly, content errors refer to inaccuracies in the information collected about each unit due to respondent misreporting, enumerator bias or fatigue, instrument design flaws, proxy responses, recall bias, and other factors.

A well-designed Post Enumeration Check (PEC) is crucial for quantifying and adjusting for these errors, ensuring that the census provides a robust foundation for economic planning, statistical benchmarking, and academic research. Accordingly, a PEC survey is undertaken to evaluate the accuracy of the enumeration process, following the completion of the Economic Census 2024. The PEC includes verifying whether all eligible units were captured and whether the information collected accurately reflects their operational characteristics. It also assesses the reliability and validity of the census data, both in terms of coverage and content, through a structured PEC questionnaire.

1.2. Issues in the Post Enumeration Check

The United Nations does not lay down an explicit methodology for conducting the PEC of the Economic Census. However, the agency provides a revised version of the principles and methodology for conducting the PEC of the Population and Housing Census (UN, 2017). Insofar as the conceptual issues of identifying coverage and content errors in the Economic Census are the same as those in the Population and Housing Census, these methodological guidelines are tailored for the present exercise. Additionally, Bakht (2014) also implicitly adopted the methodology recommended by the UN (2008) for the Population and Housing Census in conducting the PEC of the Economic Census 2013. Therefore, the same approach, as outlined by the UN (2017), which is a revised version of the UN (2008), is adopted in the present exercise.

Accordingly, the following definition has been used in the present exercise. *A PEC is a complete re-enumeration of a representative sample of census economic units (except agriculture), followed by matching each economic unit enumerated in the PEC with information obtained from the Economic Census enumeration. The results are mainly used to measure rates of undercount, overcount, coverage error*, *and content error*. *Coverage error refers to either an undercount or overcount of economic units owing to omissions or*

duplication/erroneous inclusion, respectively. Content error pertains to the error in the characteristics that are reported for the economic units that are matched between the Economic Census and the PEC. Both types of error can affect the distribution of economic units in the population with respect to their characteristics.

In essence, the PEC is intended to provide possible answers to the following questions: How accurately have the economic units been enumerated (coverage error) in the Economic Census? How precisely have specific characteristics (content error) of the economic units been recorded in the Economic Census? To that end, the primary objectives of the PEC are to estimate the magnitude of omissions (under-count) and duplications (over-count) of economic units in the economic census to determine the coverage error. It consists of omission or duplication of enumerated economic units. While omission or under-count includes omission of economic units, duplication or over-count includes the erroneous inclusion of enumerated economic units.

Coverage errors can arise in the following situations:

1. There are economic units, such as garages and buildings, that are unconventional, yet they host economic activities that are not typically expected to be conducted. Census enumerators may consider these houses as residential, which, in fact, are non-residential; consequently, this results in the omission of these economic units.
2. One or more economic units might be locked at the time of the visit of the economic census enumerator in their EAs. Therefore, these economic units are excluded from the Economic Census. These types of situations arise when the economic units may be closed during the daytime due to various natural, socioeconomic, and political reasons.
3. There may be cases where economic units usually located elsewhere have decided to locate in the current EA and have made some preliminary structural works, etc. In fact, this economic unit should be enumerated only at the location where it still operates.
4. Informal businesses, street vendors, and mobile service providers often operate without fixed locations or formal registration, making them difficult to identify and enumerate accurately.

5. As mentioned before, the country was divided into 87,629 economic enumeration areas (EAs). Errors in EA boundary definitions or outdated listings could result in establishments being excluded or duplicated.

During the conduct of the PEC survey, appropriate steps were taken to measure errors in responses or content errors in the recorded characteristics of certain items canvassed in the economic census, such as legal and ownership status, types of economic activities (manufacturing and services), and registration status, among others. The content error arises from how the enumerator explains the question, how the respondents understand the question, or both. Further, it is not always the representative of the economic unit who is concerned who provides the data. Errors may also arise because the respondent may not be aware of all the particulars of an economic unit about which the information is being reported in the economic census. For example, a newly recruited, non-managerial-level employee may not be familiar with the unit's correct economic activities at the time of the economic census.

Content error in the Economic Census 2024 refers to inaccuracies in the data collected from establishments that were successfully enumerated. These errors distort the true values of key variables such as employment, revenue, expenditure, and sector classification. The major channels of content error include:

1. To avoid tax scrutiny or regulatory attention, some businesses—especially in manufacturing and trade—understate income or employment. Conversely, some firms inflate figures to appear more prominent or attract future benefits.
2. Owners of small or informal businesses often estimate figures from memory, leading to imprecise reporting.
2. With the shift to digital tablets, mistyped values or incorrect dropdown selections (e.g., sector codes) can introduce errors.
3. In cases of respondent fatigue or time pressure, enumerators may skip or simplify nuanced questions related to financial flows or ownership structures.
4. Broad categories may fail to capture hybrid or multi-sector enterprises, especially in peri-urban areas.
5. Errors can also occur because of the difficulty in understanding the concepts. For example, a respondent may report the value of total capital, which includes land and buildings, instead of excluding the value of land and buildings, as required.

Nevertheless, such errors must be minimized to the greatest extent possible, providing users with reliable information. Therefore, a study of such errors is useful in understanding the source of these errors and taking corrective measures when designing questionnaires and operational procedures for future economic censuses. These steps will also help users better understand the economic census data.

1.3. Objectives of the Post Enumeration Check

The primary objectives of the PEC are to assess the quality of census data by collecting quality information after the completion of census enumeration, thereby accurately determining and describing the economic units that existed during the census. The next step involves matching the results from the PEC with those obtained from the census questionnaires. Thus, the primary goal of the PEC is to determine sources and magnitude of rates of undercounts and overcounts, which, in turn, assess coverage errors across location (rural, urban (city corporation, municipality, and other urban areas), administrative divisions, nature of economic activities, legal and ownership status, and content errors across a few critical characteristics of the economic units. Thus, the specific objectives are:

- To evaluate the accuracy of census data by providing quantitative information on coverage error (measure undercount and overcount) at specified domains, such as location (rural, urban, etc.), administrative divisions, type of structure (permanent, temporary, economic household), nature of economic activity (manufacturing and services);
- To measure the content errors through levels of agreement for responses to questions on selected characteristics, such as location, types of structures, the nature of economic activities, ownership status, registration, fire safety, etc., and
- To generate the adjustment factors for coverage errors for the characteristics of economic units and to provide a statistical basis for adjustments of census data, if and when it becomes necessary.

These objectives reflect international best practices in census evaluation and are designed to support both methodological transparency and policy relevance. The coverage errors would ensure completeness and representativeness of the census by quantifying undercount and overcount across key domains. Accurate counts across rural/urban areas, administrative

divisions, and structure types ensure fair policy targeting and resource allocation. The content errors would help assess the quality of responses by comparing census data with PEC re-interviews on selected characteristics. The adjustment factors would help develop statistically sound correction coefficients to adjust census aggregates where necessary. Additionally, these estimates would help decision-makers and various stakeholders, such as users of unit record data and socioeconomic planners, by assisting them in making judicious interpretations and use of census results, given the PEC results of the coverage and content errors. Besides, measuring coverage and content errors across a few critical domains helps planners of future censuses to improve the design and implementation of future censuses and large-scale surveys.

1.4. Organization of the Report

This report describes and discusses the salient features of the PEC of the Economic Census 2024, including its scope, methodology, the information gathered, and the results. The report is organized as follows. Following the introduction, **Chapter 2** describes the data analysis framework and its related issues**. Chapter 3** evaluates the dual system estimates of population and the consequent coverage errors, while **Chapter 4** presents the estimates of content errors. **Chapter 5** provides the summary and conclusions of the report.

CHAPTER 2: FRAMEWORK OF ANALYSIS

Non-sampling errors of various kinds frequently occur in large-scale data collection, such as the Economic Census. To identify the nature and extent of these errors, an independent Post Enumeration Check (PEC) is therefore a standard practice. This chapter outlines the methodology and assumptions used in conducting the independent PEC. It also summarizes the procedures for designing the PEC sample and the assumptions made while developing the PEC methodology documents and instruments.

2.1. Assumptions of the Dual System of Estimation in the PEC

Dual-system estimation has been used to derive the true population economic units of Bangladesh. This process involves using two independent sources or 'systems' to estimate the true population economic units: the Economic Census 2024 and the PEC. The dual system provides an estimate of the cases included in one source (PEC) and excluded from the other (census), and vice versa, as well as the number of those economic units that are enumerated in both sources. It also allows for the computation of the number, as well as the rate, of economic units missed by both the Economic Census and PEC using the principle of independence and probability methods. Both estimates contribute to the dual-system estimates, which are more complete than either the Economic Census or the PEC estimates alone. Ultimately, this count of true population economic units is compared with the census-enumerated economic population units, and the difference represents the net undercount (or overcount). The dual system requires the following assumptions to apply:

a) Closed population: relocation of economic units between the Economic Census and PEC is insignificant, and the composition of the economic units remains relatively unchanged.
b) There is independence between the Economic Census and the PEC, i.e., the organization of the economic census and PEC, especially fieldwork operations, must be managed by different institutions or organizations.
c) There is an absence of erroneous inclusions in either the economic census or the PEC.
d) There are no incomplete matches. Any failure to match the economic census and PEC items should be attributed to actual omission, rather than inability to match.

e) ‘Procedure C’ as described in the US Bureau of Census (1985), Dauphin and Canamucio (1993), and UN (2010) will be chosen as the preferred method for analysis of the PEC results.

2.2. Sample Design of the PEC

The PEC attempts to estimate the total number of economic units during the census time. The units of observation are the economic units that were operational during the census time and/or the PEC time in their respective locations. For inter-census comparability between 2013 and 2024, the number of PSUs for PEC was 350 EAs of the Economic Census 2024, as indicated in the ToR. However, two more EAs were included because of the inaccurate delineation of boundaries. Therefore, data were collected from 352 EAs for the exercise of PEC of the Economic Census 2024.

A three-step sampling procedure was followed to determine the sample size by domains. In step 1, stratification was done by division into rural and urban areas (city corporations, municipalities, and other urban areas). In step 2, the proportionate sample of EAs was determined by administrative division. In step 3, a simple random sampling technique was used to select the relevant EAs within each division, ensuring unbiased selection. Table 2.1 presents the distribution of the EAs by location across the administrative divisions, and Figure A.1 in Appendix A shows the spatial locations of the EAs across the country.

Table 2.1: Ex-post Distribution of Allocation of EAs by Stratification Factors

Division	Rural	City Corporation	Municipality	Upazila Sadar	Total EAs	
					Count	(%)
Barishal	13	1	4	1	19	5.40
Chattogram	35	7	14	7	63	17.90
Dhaka	48	33	18	1	100	28.40
Khulna	31	2	7	2	42	11.94
Mymensingh	18	1	3	2	24	6.82
Rajshahi	34	1	12	1	48	13.64
Rangpur	29	2	5	4	40	11.36
Sylhet	12	1	3	0	16	4.54
Bangladesh	220	48	66	18	352	100.00

Table 2.2 presents the division-wise distribution of population economic units in percentage terms. Dhaka Division dominates with 27.07 percent of the total population economic units, with a substantial share in city corporations (8.27%) alongside a large rural base (15.10%). Chattogram follows with 17.51 percent of the population economic units, which is mainly rural, at 12.08 percent, but also shows a significant concentration in municipalities and city corporations. Rajshahi, accounting for 14.37 percent, and Khulna, with 12.71 percent, also hold significant shares of population economic units, primarily concentrated in rural areas. In contrast, Sylhet (4.68%) and Barishal (5.62%) have the lowest shares of population economic units among the divisions. Nationally, the rural economic units account for 70 percent of the total, whereas urban areas (including municipalities and city corporations) account for just over 27 percent. This breakdown confirms that the sample in Bangladesh is mainly rural, with Dhaka and Chattogram city corporations accounting for notable shares.

Table 2.2: Division-wise Distribution of Population Economic Units

(in percent)

Division	Rural	City Corporation	Municipality	Upazila Sadar	Share in Total Population Economic Units
Barishal	4.29	0.31	0.75	0.26	5.62
Chattogram	12.08	2.04	2.74	0.64	17.51
Dhaka	15.10	8.27	3.32	0.39	27.07
Khulna	10.02	0.53	1.80	0.36	12.71
Mymensingh	5.18	0.32	0.97	0.17	6.64
Rajshahi	10.99	0.31	2.53	0.54	14.37
Rangpur	8.98	0.44	1.33	0.66	11.41
Sylhet	3.52	0.43	0.60	0.13	4.68
Bangladesh	70.17	12.65	14.03	3.15	100.00

Table 2.3 compares the census counts of the economic units with those of the PEC and provides matched counts. The PEC shows slightly higher total economic unit counts than the census, with 50,649 against 49,769, resulting in a difference of 880 economic units. The matched figure across the selected enumeration areas is 49,023, indicating an overall match rate of nearly 97 percent. Rural areas account for the largest share, with 32,452 in the PEC, compared to 32,099 in the census, of which 31,564 matched, representing a match rate of 97.3 percent. Municipalities performed best with a 98.4 percent match rate, where PEC recorded 9,352

against 9,201 in the census. Upazila Sadar areas also showed strong consistency with a 97.9 percent match rate. While generally consistent, city corporations showed the lowest relative match rate at 96.7 percent, highlighting the greater challenge of ensuring accuracy in high-density urban contexts. Overall, the PEC results confirm the reliability of the census, with only minor discrepancies observed. The rural-urban distribution is broadly consistent across both census and PEC.

Table 2.3: Counts of Population Economic Units by Economic Census and PEC

Location	Economic Census	PEC	Matched
Rural	32,099	32,452	31,564
City Corporation	6,210	6,542	6,108
Municipality	9,201	9,352	9,096
Upazila Sadar/Growth Center	2,259	2,303	2,255
Total	49,769	50,649	49,023

2.3. Questionnaire Development for the PEC

The PEC questionnaire was prepared to mimic the Economic Census 2024 questionnaire, ensuring an accurate reflection of coverage errors and content errors in the Economic Census. In essence, the selected questions in the PEC questionnaire are identical to those in the Economic Census 2024 questionnaire, with a few additional questions and conditionalities. The approach to questionnaire design focuses on capturing the main elements for measuring coverage and content errors. The final questionnaire is presented in Appendix B.

Table 2.4: PEC Enumeration Status of Economic Units

Categories	Status
1	Non-mover
2	Out-mover
3	In-mover
4	Out of scope (Established after the Economic Census)

For measuring coverage error due to omissions, duplications, and erroneous inclusion, the PEC questionnaire provides a provision for classifying each listed economic unit in a particular EA as a non-mover, out-mover, in-mover, or out-of-scope. Based on this procedure, the status of

each economic unit is determined, as shown in Table 2.4. The categories classify establishments according to their movement status within the Economic Census framework. They distinguish between non-movers, out-movers, in-movers, and those out of scope, such as units established after the census.

Non-mover: an economic unit that was located in a particular EA as of the Economic Census date and still operating at the PEC date (i.e., present on both Economic Census and PEC dates);

Out-mover: an economic unit located in a particular EA on the Economic Census date but not on the PEC date.

In-mover: an economic unit located on the PEC date but not on the Economic Census date. Such an economic unit was relocated from elsewhere after the date of the Economic Census.

Out-of-scope: an economic unit that does not belong to the target population of the Economic Census date. For example, an economic unit was established after the Economic Census date and hence was found only on the PEC date.

2.4. Fieldwork of the PEC

Following a rigorous six-day training program (21–26 June 2025) for 352 field enumerators and 20 supervisors, the Post-Enumeration Check (PEC) was conducted by the Bangladesh Institute of Development Studies (BIDS) from 28 June to 10 July 2025. The PEC independently assessed the accuracy and reliability of census enumeration and content reporting, produced domain-specific adjustment factors, and generated actionable insights to strengthen future census operations. As the PEC replicates the Economic Census in the sample EAs, all methodologies and procedures for data collection are based on methods and procedures used in the Economic Census. Extra measures were taken to ensure that the PEC was conducted as a comprehensive audit of the Economic Census. For example, extensive probing was undertaken to identify and classify all economic units. The PEC fieldwork was split into three phases: publicity, enumeration, and mop-up operations. Publicity focused on informing and educating respondents and relevant stakeholders about the purpose of the PEC to ensure successful coverage of all economic units in selected EAs. Enumeration involved interviewing respondents and recording responses in the fields provided in the CAPI questionnaire.

2.4.1 Planning for Data Collection

A well-thought-out, realistic, and tenable work plan is essential for ensuring the timely completion of fieldwork and getting quality data. In this regard, therefore, the priority was to prepare a work plan before commencing the actual fieldwork. While preparing the work plan, the following major considerations were kept in mind:

- Timely and smooth completion of the fieldwork;
- Establish rapport in the study EA; and
- Close supervision and monitoring of the fieldwork.

2.4.2 *Supervision and Monitoring of Data Collection*

One of the core team members was responsible for monitoring the field activities. After the data were collected, consistency and quality checks were performed, and the entire dataset was thoroughly cleaned before analysis. Data collection was monitored in different ways. The key professionals and supervisors closely supervised the work of the enumerators and performed the following duties to ensure the quality of data:

- Verify, on-the-spot, the interviewing technique;
- Make random checks to ensure that respondents are interviewed correctly,
- Check uploaded data regularly at the BIDS/BBS offices for inconsistencies and incomplete responses (if any),
- Discuss problems with the enumerators at the end of each day, and
- Review the interviewers' daily progress report.

2.4.3 Data Collection and Processing

As the PEC is a much smaller-scale operation (and hence easier to control) than the Economic Census, it enables the production of accurate estimates of the percentage of economic units missed by the Economic Census. The following measures were taken to maintain the operational independence of the PEC:

- Ensuring that the listing of the EAs in the PEC sample is Independent of the Economic Census;
- Using separate/independent officers and staff in the PEC that were not part of the Economic Census; and

- Ensuring that the PEC field enumerators were not employed as the Economic Census field staff in the same EA, and vice versa.

2.5. Matching Operations

The collection of Economic Census data from BBS for the EAs included in the PEC sample, as well as surrounding EAs, was prioritized to ensure that both the Economic Census and the PEC data are available in time for matching and reconciliation. The matching process involves comparing records of economic units in the Economic Census data and the PEC data to ensure consistency. The first stage of matching an EA involved locating the Economic Census EAs corresponding to the PEC EAs. For this purpose, the census questions for an EA with a different number or a combination of EAs are required to match the EAs of the PEC. After locating the corresponding enumeration areas (EAs), the next step involved matching economic units within each EA. This task was accomplished by comparing address listings from the Economic Census with those recorded by PEC enumerators to identify corresponding economic units. Where this was inconclusive, the units were compared to see if a match could be found based on the names and other characteristics of the economic units. However, this is not easy in cases where, for example, a different name or initials appear to have been used. In these cases, an economic unit was matched based on a few variables, including telephone numbers and email addresses.

2.5.1 Follow-Up Phone Calls

The purpose of the reconciliation calls is to collect relevant information to determine the final match status of unresolved cases identified during initial matching, specifically to:

- Resolve the final match status for 'Possible Match' cases.
- Determine whether economic units enumerated in the Economic Census but not in the PEC are correctly or erroneously enumerated in the Census; and
- Clarify doubtful cases or cases with insufficient or unclear information.

The PEC questionnaire included information on the respondent's telephone or mobile number. This inclusion significantly facilitates the task of reconciling non-matched economic units. The follow-up phone calls are limited to non-matched economic units. In most cases, the non-matched economic units are reconciled through the process.

The final matching stage combined information from the initial matching phases and reconciliation phone calls to assign a definitive match status to each case. Table 2.5 illustrates the prototype expected outcomes from the final matching.

Table 2.5: Matching Status of Economic Units in the PEC

1.	**Matched**
In the PEC but not in the Economic Census:	
2.	Missed in the Economic Census
3.	PEC erroneous inclusion – economic units in the PEC not in the Economic Census that are outside the EA boundaries or otherwise erroneously included in the PEC
4.	Insufficient information in the PEC – economic units in the PEC but not in the Economic Census, for which a final match status cannot be assigned due to insufficient information
5.	In-mover – economic units relocated in the EA from another EA that is outside the PEC jurisdiction
6.	Economic units established after the Economic Census
In the Economic Census but not in the PEC:	
7.	Correctly enumerated in the Economic Census but missed in the PEC.
8.	Erroneous inclusions in the Economic Census.
9.	Insufficient information in the Economic Census - units in the Economic Census but not in the PEC for which a final match status cannot be assigned due to insufficient information

CHAPTER 3: EVALUATION OF CENSUS COVERAGE

Based on the guidelines from the US Bureau of the Census (1979), Dauphin and Canamucio (1993), and the United Nations' operational manual (UN, 2010), the coverage measures were calculated exclusively for cases within the relevant population. In other words, the system excluded erroneous inclusions. The objective is to identify all the necessary elements for deriving dual system estimates. The estimation process is described below.

3.1. Sample Weights

The allocation of sample EAs is described in Table 2.1 in Chapter 2. The EAs were stratified by rural and urban areas, and urban EAs, in turn, were stratified by upazila sadar, municipality, and city corporation. Within each stratum, units were distributed geographically across the administrative divisions. The weight of a sample EA was equal to the inverse of the population concerned. Within each EA, the weight for each economic unit was equal to the EA sampling weight since their probability of selection, given the selection of the EA, was equal to one. It should be noted that during the data collection process, no replacement of the selected EA was made due to problems related to field operations or the frame; therefore, no adjustments were made to the weights. Thus, the inverse selection probabilities were applied as calculated from the computer program without any further adjustments.

3.2. Basic Tenets of Coverage Estimation

The estimates are calculated based on the PEC sample for the following parameters in the initial tabulation. These estimates consist of the sum of the sample values from either the ‘P’ sample or the ‘E’ sample.

a. Total number of non-mover economic units in the universe (P sample);

b. Total number of out-mover economic units in the universe (P sample);

c. Total number of in-mover economic units in the universe (P sample);

d. Total number of matched non-mover economic units in the universe (P sample);

e. Total number of matched out-mover economic units in the universe (P sample);

f. Estimated total number of matched in-mover economic units in the universe (P sample);

[Note: *since a matching of the in-mover economic units is not attempted, the number of matched in-mover economic units cannot be calculated directly. However, the assumption of a closed population economic units implies that the 'out-mover economic unit' and the 'in-mover economic unit' constitute the same group in the universe: the 'mover economic unit'. Accordingly, one can assume that in the universe, the match rate for in-mover economic units would be the same as that for out-mover economic units. This match rate can be estimated by the e/b ratio. Hence, the total number of matched in-mover economic units in the universe is estimated indirectly by [(e/b)*c*].[1]

g. Total number of census erroneous inclusions in the population economic units (E sample);

h. Total number of cases correctly enumerated in the Economic Census but missed in the PEC (E sample);

i. Total number of economic units with insufficient information (E sample); and

j. Total number of PEC erroneous inclusions and PEC insufficient information cases (E sample).

For operational purposes, the dual system of estimating the Economic Census and the PEC begins by assigning symbols to various estimates in Table 3.1, which facilitates the development of compact standard formulas, as illustrated in Table 3.2.

Table 3.1: Basic Elements of Dual System Estimates

Symbol	Parameter
I1	Number of non-mover economic units
I2	Number of out-mover economic units
I3	Number of in-mover economic units
I4	Number of matched non-mover economic units
I5	Estimated rate of matched out-mover economic units
I6	Estimated number of matched in-mover economic units
I7	Number of erroneous inclusions of economic units in the Economic Census
I8	Number of correctly enumerated in Economic Census units missed in the PEC
I9	Number of economic units of the Economic Census with insufficient information

Following Dauphin and Canamucio (1993) and the UN (2010), the operational definitions below are used to estimate critical parameters based on the prototype shown in Table 3.1.

[1] For details, see Dauphin and Canamucio (1993).

a) The total number of matched non-mover economic units plus the estimated total number of matched in-mover economic units in the universe gives the 'matched' unit.

$$\text{Mathched Population} = \text{Matched Non\_mover economic units} + \text{Estimated matched in\_mover economic units} \quad (3.1)$$

b) The estimate of the economic units enumerated in the Economic Census [Uncorrected economic units in the Economic Census] is the sum of the matched economic units, the units erroneously included in the Economic Census, the units correctly enumerated in the Economic Census but missed in the PEC, and the economic units in the Economic Census with insufficient information.

$$\text{Uncorrected economic units in Economic Census} = \text{Matched economic units} + \text{Correctly enumerated economic units in Economic Census but missed in the PEC} + \text{Erroneous inclusion of economic units in Economic Census} + \text{economic units with insufficient information} \quad (3.2)$$

c) The corrected economic units in the Economic Census are calculated without adding the erroneous inclusions, and the economic units of the Economic Census units with insufficient information.

$$\text{Corrected economic units in the Economic Census} = \text{Matched economic units} + \text{Units correctly enumerated in the Economic Census but missed in the PEC} \quad (3.3)$$

d) The Economic Census-sample units estimate of the total economic units [Census Units] is the sum of the non-mover economic units and the in-mover economic units.

$$\text{Economic Census units} = \text{mover economic units} + \text{mover economic units} \quad (3.4)$$

e) The PEC-enumerated economic units missed in the Economic Census are calculated by subtracting the matched economic units from the PEC estimate of the total economic units to obtain:

$$\text{PEC units missed in the Economic Census} = \text{PEC units} - \text{Matched economic units} \quad (3.5)$$

f) The proportion of PEC economic units missed in the Economic Census represents the number of missed economic units as a percentage of the PEC estimate of the total economic units. The estimated total number of erroneous inclusions in the Economic Census is calculated by summing up fabrications, duplications, geographic misallocations, etc. The

primary purpose of this construct is to provide an estimate to permit a correction in the dual system estimate of the true economic units. The proportion of erroneous inclusion is equal to the total number of economic units erroneously included in the Economic Census relative to the estimate of the Economic Census economic units.

g) The preliminary dual system estimate of the true economic units is calculated by multiplying the units estimated from the PEC by the economic units estimated from the Economic Census (after correcting for erroneous inclusions and insufficient information), and then dividing by the matched economic units.

$$\text{True Economic Units} = \frac{\text{PEC Units} \times \text{Corrected economic units in the Economic Census}}{\text{Matched economic units}} \quad (3.6)$$

h) The Net Coverage Error, also known as the 'Net Omission Rate' or the 'Net Undercount Rate', is the difference between what should have been counted (true economic units) and what was counted (economic units of the Economic Census). The net coverage error rate is the total net error relative to the dual system estimate of the true economic units. This measure constitutes the single most crucial indicator of the quality of census coverage.

$$\text{Net Undercount Rate} = \frac{(\text{True Economic Units} - \text{Uncorrected economic units in the Economic Census})}{\text{True Economic Units}} \quad (3.7)$$

i) The Gross Coverage Error, also known as the 'Gross Omission', is, as defined in this context, what the Economic Census truly missed without taking into account the overcount. It is the gross omission relative to the true economic units, as opposed to the net omission, without being offset by the erroneous inclusions.

$$\begin{aligned} &\text{Gross Coverage Error} = \text{Economic units counted in PEC but missed in Economic Census} - \\ &\text{Economic units missed in both Economic Census and PEC} = \text{PEC units missed in Economic Census} + \\ &\frac{(\text{True Economic Units} - \text{Corrected Economic Census units}) \times (\text{True economic units} - \text{PEC economic units})}{\text{True Economic Units}} \end{aligned} \quad (3.8)$$

$$\text{Gross Coverage Error Rate} = \frac{\text{Gross Coverage Error}}{\text{True Economic Units}} \quad (3.9)$$

Equivalently,

$$\begin{aligned} &\text{Gross Coverage Error Rate} = \left(1 - \frac{\text{Matched economic units}}{\text{PEC economic units}}\right) = \\ &\text{Rate of PEC economic units missed in the Economic Census,} \end{aligned} \quad (3.10)$$

Accordingly, the Total Gross Error can be calculated as follows:

$$\text{Total Gross Error} = \text{Rate of PEC economic units missed in the Economic Census} \times \text{True Economic Units} \quad (3.11)$$

j) The final dual system estimate of the true economic units, which corresponds to the 'adjusted units', is obtained through a ratio estimator of the total, which is superior in accuracy to the preliminary estimate as it reduces both variance and bias.

$$\text{Final Dual System of True Economic Units} = \left[\frac{\text{Preliminary True Economic Units}}{\text{Uncorrected units in the Economic Census}}\right] \times \text{Actual counts in the Economic Census} \quad (3.12)$$

where the ratio inside the bracket represents the 'adjustment factor' for the Economic Census counts.

k) The relationship between the undercount rate and the adjustment factor is the following:

$$\text{Adjustment Factor} = \frac{1}{1 - \text{Undercount Rate}} \quad (3.13)$$

In other words, the adjustment factor is the reciprocal of the complement of the undercount rate. For example, an undercount rate of 2% implies an adjustment factor of 1.02, subject to rounding errors. Likewise, an undercount rate of 10% suggests an adjustment factor of 1.11, and so forth. Another way of viewing the adjustment factor is the following:

$$\text{Adjustment Factor} = \frac{\text{PEC economic units} * \text{Corrected units in the Economic Census}}{\text{Matched economic units} * \text{Uncorrected units in the Economic Census}}$$

If we consider $\frac{\text{Matched Units}}{\text{PEC Units}}$ as the 'coverage rate', then:

$$\text{Adjustment Factor} = \left(\frac{1}{\text{Coverage Rate}}\right) \times \left(\frac{\text{Corrected Census Units}}{\text{Uncorrected Census Units}}\right)$$

While the first term inside the parentheses is a correction for under-enumeration, the second term – the proportion of the units in the Economic Census that was correctly enumerated, i.e., not erroneously included – serves as a correction for over-enumeration. Hence, the final adjusted population is, in effect, calculated as follows:

$$\text{Final Adjustment True Economic Units} = \text{Underenumeration correction factor} \times \text{Overenumeration correction factor} \times \text{Counts in the Economic Census} \quad (3.14)$$

It should be noted that the correction factor for under-enumeration is always greater than or equal to 1. In comparison, the correction factor for over-enumeration is always less than or

equal to 1. The overall factor can theoretically fall on either side of 1, depending on which of the two factors is higher. The outcome of the above formulae is summarized in Table 3.2, and the probabilities of inclusion and omission of an economic unit are presented in Table 3.3.

Table 3.2: Schematic Derivations of the Dual System Estimators

Symbol	Derivation	Description
A1b	(I4 + I5) + I7 + I8	Economic Census units (excluding erroneous inclusion)
A2a	I1 + I3	PEC economic units
A2b	I4 + I6	Matched economic units
A3	A2a–(I4 + I6)	PEC economic units missed in the Economic Census – Total
A3 rate (%)	(A3/A2a)*100	PEC economic units missed in the Economic Census – Rate (%)
(1 - A3 rate) (%)	(1-A3/A2a)*100	Economic Census Coverage Rate (%)
A4	I8	Units correctly enumerated in the Economic Census but missed in the PEC
A4 rate (%)	(A4/A1b)*100	Units correctly enumerated in the Economic Census but missed in the PEC – Rate (%)
A5	I7	Erroneous inclusions in the Economic Census – Total
A5 rate (%)	(A5/A1b)*100	Erroneous inclusions in the Economic Census – Rate (%)
A6	(A1b*A2a)/A2b	Preliminary Dual System Estimate of True Population economic units
A7	A6–A1b	Net error (Net undercount) – Total
A7 rate (%)	(A7/A6)*100	Net error (Net undercount) – Rate (%)
A8	A3+A5	Gross error – Total
A8 rate (%)	(A8/A6)*100	Gross Error Rate relative to True Population economic units (%)
A9	A6/A1b	'Adjustment Factor' for Economic Census
A9*Actual count in the Economic Census	A9*Actual count in the Economic Census	Final Dual-system Estimate of True Population economic units

Note: The parameters are based on groupings presented in Table 3.1.

Table 3.3: Schematic Derivation of Probabilities of Inclusions and Omissions

Symbol	Derivation
P(included in the Economic Census)	A1b/A6
P(included in the PEC)	A2a/A6
P(included in both the Economic Census and the PEC)	(A1b/A6)*(A2a/A6)
P(included in the Economic Census but missed in the PEC)	(A1b/A6)*(1 - A2a/A6)
P(included in the PEC but missed in the Economic Census)	(1 - A1b/A6)*(A2a/A6)
P(missed in both the Economic Census and the PEC)	(1 - A1b/A6)*(1 - A2a/A6)

The prototype distribution of the *true economic units* based on the preliminary dual system estimate after removing the cases of erroneous inclusions and insufficient information in the Economic Census is presented in Table 3.4:

Table 3.4: Schematic Distribution of True Economic Units

		Economic Census Units		
		Included	*Omitted*	Total
PEC Units	*Included*	Matched economic units (N_{11})	Economic units in the PEC but missed in the Economic Census (N_{12})	PEC included economic units ($N_{1.}$)
	Omitted	Economic units in the Economic Census, but missed in the PEC (N_{21})	Economic units missed in both the Economic Census and the PEC (N_{22})	PEC omitted economic units ($N_{2.}$)
	Total	Corrected Economic Census units ($N_{.1}$)	Gross census omission ($N_{.2}$)	True economic units (N)

The elements in the above matrix are calculated using the formula listed in the following box.

Units in the Economic Census corrected for erroneous inclusion and insufficient information ($N_{.1}$) = P (included in the Economic Census) × Dual system estimate of the economic units.

PEC population (excludes erroneous inclusion and insufficient information) ($N_{1.}$) = P (included in the PEC) × Dual system estimate of the economic units.

Units included in both the Economic Census and the PEC (N_{11}) = P (included in both the Economic Census and the PEC) × Dual system estimate of the economic units.

Units included in the Economic Census but missed in the PEC (N_{21}) = P (included in the Economic Census but missed in the PEC) × Dual system estimate of the economic units.

Units included in the PEC but missed in the Economic Census (N_{12}) = P (included in the PEC but missed in the Economic Census) × Dual system estimate of the economic units.

Units missed in both the Economic Census and the PEC (N_{22}) = P (missed in both the Economic Census and the PEC) × Dual system estimate of the economic units.

3.3. Empirical Elements of the Coverage Evaluation

The estimate of the true economic units is derived by exploiting two independent sources of information: the Economic Census and the PEC. Based on an exhaustive enumeration, the first step in measuring the true economic units starts with the units enumerated in the Economic Census. The second attempt yields the PEC estimate of the total economic units based on sampling techniques. Both of these estimates are used to derive a third, composite estimate of the true economic units, known as the dual system estimate. It may be stressed that neither the Economic Census nor the PEC is considered superior to the other, as both are subject to the same types of non-sampling errors, e.g., non-responses. However, the dual system estimate is more comprehensive than the Economic Census or the PEC estimate alone, as it draws on the information from both the Economic Census and the PEC. Hence, the true economic units are compared with the units enumerated in the Economic Census to arrive at an estimate of the net undercount rate, both nationally and across other domains in which the PEC sample is representative, such as locations, personal attributes, and administrative areas.

3.3.1 Estimate of the True Economic Units

Table 3.5 provides a categorical breakdown of the dual system estimates. The estimates indicate that, among the 49,769 units in the in-scope sub-universe of economic units, 46,392 units are non-mover economic units, 3,674 are out-mover economic units, and 378 are in-mover economic units. As many as 45,019 economic units could be matched between the Economic Census and the PEC. Similarly, 3,637 economic units could be matched as out-mover economic units. On the assumption of a closed universe, following the US Bureau of the Census (1979) and Dauphin and Canamucio (1993), the matched in-mover economic units are estimated at 374. No economic units were estimated as erroneously included in the Economic Census. Finally, 746 economic units are estimated to be correctly enumerated in the Economic Census that were missed in the PEC.

Table 3.5: Elements of the Dual System Estimates of Economic Units

Symbol	Description	Units
I1	Non-mover economic units	46,392
I2	Out-mover economic units	3,674
I3	In-mover economic units	378
I4	Matched non-mover economic units	45,019
I5	Matched out-mover economic units	3,637
I6	Matched in-mover economic units [(I5/I2)*l3]	374
I7	Erroneous inclusions of economic units	0
I8	Economic units correctly estimated in the Economic Census but missed in the PEC	746

Note: Estimates are subject to rounding errors.

Following the dual-system estimation approach outlined by Dauphin and Canamucio (1993) and the United Nations (2010), the number of units enumerated in the Economic Census and the PEC were estimated at 46,139 and 46,770, respectively (Table 3.6). Comparison of these two independent sources identified 45,393 matched economic units. The results indicate that 1,377 economic units, equivalent to 2.9 percent of the PEC's enumerated units, were missed in the Economic Census. Conversely, 746 economic units, or 1.62 percent of Economic Census-enumerated units, were missed in the PEC. The overall Economic Census coverage rate is, therefore, estimated at 97.06 percent.

Table 3.6: Empirical Derivations of the Dual System Estimates

Symbol	Description	Value
A1b	Economic Census units (exc. erroneous inclusion)	46,139
A2a	PEC economic units	46,770
A2b	Matched economic units	45,393
A3	PEC economic units missed in the Economic Census – Total	1,377
A3 rate (%)	PEC economic units missed in the Economic Census – Rate (%)	2.944
(1 - A3 rate) (%)	Economic Census Coverage Rate (%)	97.056
A4	Correctly enumerated in the Economic Census but missed in the PEC	746
A4 rate (%)	Correctly enumerated in the Economic Census but missed in the PEC – Rate (%)	1.617
A5	Economic Census erroneous inclusions – Total	0
A5 rate (%)	Economic Census erroneous inclusions – Rate (%)	0

Symbol	Description	Value
A6	Preliminary Dual System Estimate of True Population Economic Units	47,539
A7	Net coverage error (Net undercount) – Total	1,400
A7 rate (%)	Net coverage error (Net undercount) – Rate (%)	2.945
A8	Gross coverage error – Total	1,377
A8 rate (%)	Gross coverage error rate relative to True Population Economic Units (%)	2.944
A9	'Adjustment Factor' for the Economic Census	1.03
A9*Actual Economic Census Count	Final Dual System Estimate of True Population Economic Units	51,279

Notes: (1) Estimates are subject to rounding errors. (2) The term 'True Population Economic Units' should be interpreted as the actual economic units of the EAs counted and not the 'True Population Economic Units' counted in the country as a whole. (3) The actual Economic Census units in the Table should not be confused with the total economic units of the country as a whole. (4) Row A9*Actual Economic Census count is used only to show the correspondence between Table 3.5 and Table 3.6.

Table 3.7 presents the overall empirical probabilities of an economic unit being either included in or omitted from the Economic Census or the PEC, calculated according to the derivation procedures outlined in the preceding section. The results imply that a unit of the in-scope sub-universe had approximately a 97.06 percent chance of being enumerated in the Economic Census, a 98.38 percent chance of being enumerated in the PEC, and a 95.49 percent chance of being enumerated in both. Conversely, a unit had approximately a 1.57 percent chance of being included in the Economic Census but missed in the PEC, a 2.90 percent chance of being included in the PEC but missed in the Economic Census, and a 0.05 percent chance of being missed in both. As mentioned earlier, the probability of the economic units not being included in either the Economic Census or the PEC is exceptionally low. It indicates that the enumeration procedure has effectively captured the targeted economic units in the Economic Census.

Table 3.7: Probabilities of Inclusions and Omissions of Economic Units

Symbol	Value
P(included in the Economic Census)	0.9706
P(included in the PEC)	0.9838
P(included in both the Economic Census and the PEC)	0.9549
P(included in the Economic Census, but missed in the PEC)	0.0157
P(included in the PEC, but missed in the Economic Census)	0.0290
P(missed in both the Economic Census and the PEC)	0.0005

Note: Estimates are subject to rounding errors.

Although the counts of the economic units by rural and urban locations have been reported, only the national estimates are explained in detail for brevity. It is worth noting that four components collectively comprise the dual system estimate of the true economic units in Bangladesh. Table 3.5 and Table 3.6 provide a breakdown of the dual system estimate of the true economic units, which is 51,279. By applying the probabilities from Table 3.7 to the estimated True Population obtained through the dual-system estimate, the distribution presented in Table 3.8 is derived. The number of economic units included in both the Economic Census and the PEC is estimated to be 48,963 economic units. Those included in the PEC but missed in the Economic Census are estimated at 1,486, while those included in the Economic Census but missed in the PEC are estimated at 805. Finally, the number of economic units missed in both the Economic Census and the PEC is estimated at 24. It is worth noting that this figure is mathematically derived following Chandrasekaran and Deming (1949).

Table 3.8: Empirical Distribution of True Population based on the Dual System Estimates

		Economic Census		
		Included	**Omitted**	**Total**
PEC	**Included**	48,963	1,486	50,449
	Omitted	805	24	829
	Total	49,769	1,510	51,279

Note: Estimates are subject to rounding errors.

3.4. Net Coverage Error Rates in the Economic Census

Following Dauphin and Canamucio (1993) and the UN (2010), the net coverage error, or undercount, is defined as the difference between the estimated true economic units (dual system estimate) and the estimated units in the Economic Census. The corresponding rate is expressed as a percentage of the estimated true economic units. The net coverage error rates, the corresponding standard errors, and the coefficient of variations are reported in Table 3.9. The standard errors are estimated following Cochran (1977) and Endlich et al. (1988) for the case of the weighted mean,[2] while the coefficient of variation is estimated following the US Bureau of the Census (1979).

[2] Bootstrapping results by Gatz and Smith (1995) show that the variance formula suggested by Cochran (1977) and Endlich et al. (1988) is a reasonable estimator for the square of the standard error of the mean.

Table 3.9 shows that the Net Coverage Error (NCE) rate for the Economic Census 2024 is estimated at 2.95 percent (SE = 1.07; 95% CI: 0.86%–5.05%) at the national level, representing a population-weighted average of the corresponding estimates for rural and urban areas. In contrast to earlier computations, the present estimates, both at the national level and for specific domains, were weighted according to the population shares of individual districts, thereby ensuring greater representativeness.

The national net undercount rate indicates a relatively modest level of under-coverage. Disaggregated results reveal that rural areas exhibit a lower undercount rate of 2.55 percent (SE = 0.49), with high statistical precision. In contrast, urban areas have a higher undercount rate of 3.90 percent (SE = 2.44), reflecting greater variability in enumeration outcomes.

Municipalities and upazila sadar/growth centers within the urban domain display comparatively lower coverage error rates. In contrast, city corporations register the highest point estimate at 5.99 percent (SE = 3.98), accompanied by a wide confidence interval from –1.82 percent to 13.80 percent, indicating substantial uncertainty in the sample estimate. These results suggest a positive association between the degree of urbanization and the magnitude of net coverage error, with more urbanized and complex environments exhibiting higher error rates.

Table 3.9: Net Coverage Error (NCE) Rates by Location

Domains	NCE	SE	95% CI	CV (%)	Weight.	
					Population	Sample
National	2.95	1.07	[0.86, 5.05]	36.22	-	-
Rural	2.55	0.49	[1.60, 3.51]	19.1	70.17	64.50
Urban	3.90	2.44	[-0.88, 8.68]	62.56	29.83	35.50
City Corporation	5.99	3.98	[-1.82, 13.80]	66.49	12.65	12.48
Municipality	2.33	1.22	[-0.06, 4.72]	52.32	14.03	18.49
Upazila Sadar/Growth Center	2.48	1.67	[-0.79, 5.74]	67.34	3.15	4.54

Note: Estimates are subject to rounding errors.

Further, standard errors are consistently larger in urban areas than rural areas, implying that rural estimates are more precise—likely due to simpler enumeration conditions or more effective coverage. The relative error for the national coverage estimate is 36 percent,

compared to 67 percent for the upazila sadar and growth center, underscoring notable differences in the reliability of estimates across domains.

Table 3.10 presents the (weighted) NCE rates disaggregated by different domains. The division-level estimates indicate that Dhaka records the highest NCE rate at 4.19 percent (SE = 2.50), followed by Rangpur at 3.04 percent (SE = 1.43) and Chattogram at 2.59 percent (SE = 1.02). The estimated rates for Barishal, Mymensingh, Rajshahi, and Sylhet fall within a relatively narrow range of 2.01 percent to 2.51 percent. The lowest estimated rate is observed in Khulna, at 2.04 percent; however, this estimate is accompanied by a high relative standard error of 165 percent, indicating substantial uncertainty and limited reliability.

Table 3.10: Net Coverage Error Rates by Different Domains

Area	NCE-	SE	95% CI	CV (%)	Weight	
					Population	Sample
Administrative Division						
○ Barishal	2.5	1.24	[0.07, 4.93]	49.67	5.62	5.90
○ Chattogram	2.59	1.02	[0.59, 4.58]	39.29	17.51	17.51
○ Dhaka	4.19	2.5	[-0.70, 9.09]	59.56	27.07	26.7
○ Khulna	2.04	3.38	[-4.58, 8.66]	165.37	12.71	12.35
○ Mymensingh	2.45	1.68	[-0.84, 5.75]	68.52	6.63	7.07
○ Rajshahi	2.51	2.91	[-3.19, 8.22]	115.92	14.37	13.74
○ Rangpur	3.04	1.43	[0.24, 5.84]	46.98	11.41	12.00
○ Sylhet	2.01	1.19	[-0.32, 4.34]	59.27	4.68	4.72
Structures of Economic Units						
○ Permanent	3.03	0.94	[1.19, 4.88]	31.04	53.53	61.45
○ Temporary	8.29	9.59	[-10.51, 27.08]	115.71	4.90	5.15
○ Economic Household	2.52	4.79	[-6.86, 11.90]	189.81	41.56	33.40
Nature of Economic Activities						
Manufacturing	2.08	1.17	[-0.20, 4.37]	55.99	9.97	8.80
Service	3.05	1.94	[-0.75, 6.85]	63.64	90.03	91.20

Note: Estimates are subject to rounding errors.

The coverage error rates by type of entity reveal that permanent establishments exhibit a national net coverage error (NCE) rate of 3.03 percent (SE = 0.94). In contrast, temporary establishments exhibit a substantially higher rate of 8.29 percent (SE = 9.59). The latter estimate is characterized by very low statistical reliability, indicating considerable uncertainty. These results suggest that permanent establishments are more accurately enumerated than their temporary counterparts. The fact that permanent establishments have not only fixed locations but also fixed structures may have facilitated this outcome.

The estimated coverage error rate for economic households (without agricultural activities) is 2.52 percent (SE = 4.79), accompanied by high variability. Disaggregation by the nature of economic activity shows that manufacturing units have a lower undercount rate of 2.08 percent (SE = 1.17), while service units record an undercount rate of 3.05 percent (SE = 1.94). Compared to manufacturing units, service units demonstrate lower variability and higher precision.

Overall, the findings indicate that while the Economic Census successfully enumerated the vast majority of economic units, undercount rates are notably higher in urban areas, particularly within city corporations and among temporary establishments.

In conclusion, the PEC results confirm that the Economic Census achieved high overall coverage, with national net coverage error rates of 2.95 percent (Table 3.9), indicating that only a small proportion of economic units were missed. Rural areas consistently show lower and more precise undercount rates than urban areas, where enumeration appears more challenging, particularly in city corporations. Among divisions, Dhaka and Rangpur record higher-than-average undercounts, while temporary establishments exhibit the largest domain-specific rate, despite being less reliable. The findings suggest that while the Census captured the vast majority of economic units, targeted improvements in urban coverage and the enumeration of temporary establishments could further reduce coverage errors in future rounds.

3.5. Adjustment Factors for Economic Census Counts

Economic Census results may be adjusted when coverage errors are substantial enough to cast doubt on their validity. Because decisions to revise census figures are highly sensitive, they are made at the highest levels of government (UN, 2010). Analysts and statisticians provide the

technical evidence and recommendations, but they do not make the final determination (US Bureau of the Census, 1985).

Net coverage error rates provide the foundation for adjusting the census unit count. Ultimately, the decision to adjust the census counts lies with the BBS, acting under the direction of senior policy authorities. Any adjustment must carefully consider the domains to which revised counts will apply, as these decisions carry significant implications. If a group of population economic units is substantially undercounted, adjustments may improve representation and produce more accurate statistics for both the affected group and the broader economy.

Two key issues arise when adjusting census counts. First, adjustments may be applied either at the aggregate (national) level or at more disaggregated levels by domain. Because coverage errors vary across sub-domains, such as location, administrative division, structure of economic units, or nature of economic units, adjustments may mask underlying disparities. These complexities support the use of domain-specific adjustment factors.

Table 3.11 presents the adjustment factors at the national level along with the relevant domains and sub-domains. The adjusted population economic units are obtained by multiplying the census count in each sub-domain by its corresponding adjustment factor and summing across all sub-domains. This procedure is equivalent to applying standard statistical weights. The table shows that the census unit adjustment factor is 1.030770 at the national level.

Second, a decision must be made between using a separate ratio estimate (summing adjusted counts across sub-domains) or an aggregate ratio estimate (using a single national adjustment factor). Aggregate ratio estimates have higher variance but lower bias due to the consistency of ratio estimators. Separate-ratio estimates yield lower variance but higher bias and are preferable only when sub-domains contain sufficiently large sample sizes. Additionally, the PEC universe may encompass only part of the population, limiting the ability to estimate net coverage error rates for all domains.

When coverage rates cannot be estimated for specific population segments, the economic census units must be divided into two components: the in-scope sub-census, where adjustment factors apply, and the out-of-scope sub-census, where coverage is unknown, and no adjustment is possible. All eligible units receive their domain-specific adjustment factor; all non-eligible

individuals are assigned a factor of 1. Adjusted and unadjusted counts are then summed to obtain the final adjusted population.

Table 3.11: Adjustment Factors for the Economic Census 2024 by Domain

Domain	Adjustment Factor
National	1.030770
Location	
Rural	1.026206
Urban	1.041507
City Corporation	1.064871
Municipality	1.024006
Upazila Sadar/Growth Center	1.025627
Division	
Barishal	1.025685
Chattogram	1.026605
Dhaka	1.044454
Khulna	1.021082
Mymensingh	1.025292
Rajshahi	1.025918
Rangpur	1.031422
Sylhet	1.020571
Structure of Units	
Permanent Establishment	1.031337
Temporary Establishment	1.099380
Economic Household	1.026465
Nature of Activity	
Industry	1.021327
Service	1.031586

Adjustment factors are assigned based on the original geographic and demographic domains of the economic units to ensure compatibility of distributions between the PEC and the Economic Census. An alternative, though less commonly used, approach is to create homogeneous adjustment classes using the Chi-square Automatic Interaction Detection (CHAID) method (Kass, 1980). Each class receives its own estimated undercount rate and adjustment factor, and the national total is the sum of the adjusted class totals. As with the main approach, only the in-scope PEC population is adjusted; the balance receives a factor of 1. This method is not

pursued further in this report. Finally, it is essential to apply adjustments only at levels where estimates are statistically reliable. Adjusting economic unit counts without adjusting related variables may introduce inconsistencies.

3.6. Drivers of Economic Census Coverage Error

To better understand why the economic units surveyed in the Economic Census are not found during the PEC, we estimated the likelihood that an economic unit is unmatched between the Economic Census and the PEC. Table 3.12 presents the results from a logit model specification along with the corresponding marginal effects using establishment and location characteristics as explanatory factors. The dependent variable is whether an establishment was not matched between the Economic Census and the PEC, which is interpreted as a potential coverage error.

Table 3.12: Drivers of Non-Matching Units in Economic Census

	Unmatched in the Economic Census and the PEC	
	Logit	**Marginal Effects**
	(1)	**(2)**
Institution (=1)	-0.183	-0.003
	[0.267]	[0.004]
Service Establishment (=1)	0.232***	0.003
	[0.147]	[0.002]
Private ownership (=1)	-0.092	-0.001
	[0.174]	[0.003]
Owner male (=1)	-0.111	-0.002
	[0.151]	[0.002]
Age of establishment (years)	-0.013***	-0.000***
	[0.004]	[0.000]
No other branch (=1)	-0.206	-0.003
	[0.254]	[0.004]
Unit is registered (=1)	-0.374***	-0.006***
	[0.096]	[0.001]
Log of the number of employees	0.005	0.000

	Unmatched in the Economic Census and the PEC	
	Logit	**Marginal Effects**
	(1)	**(2)**
	[0.094]	[0.001]
Capital 10 Lakh+ (=1)	0.132	0.002
	[0.199]	[0.003]
Have TIN (=1)	-0.342**	-0.005**
	[0.165]	[0.002]
City Corporation	0.227*	0.003*
	[0.119]	[0.002]
Municipality	-0.205*	-0.003*
	[0.110]	[0.002]
Upazila Sadar	-2.116***	-0.031***
	[0.501]	[0.007]
Constant	-3.668***	
	[0.279]	
Observations	497,69	
Wald chi²(13)	105.1	
Wald chi² p-value	0.000	

Note: Observations include the census sample. ∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01. Standard errors are robust.

The results from the logit model and the accompanying marginal effects, in columns 1 and 2, indicate that the institutional type of economic unit and ownership characteristics, such as being privately owned or male-owned, do not significantly influence the likelihood of a mismatch. Service establishments show a small positive association with coverage errors, but this effect is not robust. A key and highly consistent finding is that the probability of a mismatch decreases with the age of the establishment. Newer businesses are thus more likely to be omitted, underscoring the challenges of capturing recently established enterprises in census operations.

Formalization stands out as a critical factor in reducing coverage errors. Both registered establishments and those holding a tax identification number (TIN) exhibit significantly lower probabilities of being unmatched. In contrast, measures of establishment size, including the

number of employees and large initial capital, show no systematic effect on coverage accuracy, suggesting that formality rather than scale drives more reliable enumeration.

Geographic location also plays an important role. The logit estimates show that establishments in upazila sadar areas are significantly less likely to be missed. At the same time, those located in city corporations face a higher risk of mismatch. Establishments in municipalities experience moderate reductions in coverage errors compared to rural areas. These findings suggest that enumeration is strongest in upazila sadars, but weaknesses persist in urban contexts where coverage errors are significantly higher.

Columns 1 and 2 also highlight that economic census coverage errors are most pronounced among newly established, unregistered, and city-based enterprises. Strengthening enumeration in urban areas and improving outreach to informal and newly emerging establishments would help reduce census under coverage in future rounds.

CHAPTER 4: EVALUATION OF CONTENTS OF CENSUS UNITS

Content error, also referred to as response error, arises when the reported value for a characteristic of an establishment differs from its true value. In the Economic Census, such errors are particularly critical, as they impact core statistics such as employment, revenue, ownership structure, and output. Content error is generally classified into two categories: response bias (systematic error) and response variance (random error).

Errors may occur due to several factors. Enumerators may fail to follow the prescribed instructions or may misinterpret definitions. Respondents, often business owners, managers, or representatives, may misunderstand the questions, lack complete knowledge of the requested information, or intentionally misreport due to concerns such as taxation, confidentiality, or regulatory implications. Additional errors can result from difficulties in interpreting census concepts and definitions, including what constitutes "employment" or "output." More broadly, non-sampling errors in the Economic Census may also arise from issues with the sampling frame, non-response, processing operations, questionnaire design, weighting, and reporting (US Bureau of the Census, 1985).

To evaluate content error, consider a characteristic j (e.g., type of economic units) recorded for establishment i in both the Economic Census (EC) and the PEC. The reported value can be expressed as:

$$y_{ij} = \mu_{ij} + e_{ij} \qquad \forall \text{ i} = 1, 2, 3, \ldots, \text{n; j} = 1,2,3, \ldots, \text{C} \tag{4.1}$$

where μ_{ij} is the true value, and e_{ij} is the error. The error can be decomposed as: $e_{ij} = b_i + \epsilon_{ij}$, where b_i is the systematic error committed by enumerator i, and ϵ_{ij} is the random error associated with observation (i,j). Substituting yields: $y_{ij} = \mu_{ij} + b_i + \varepsilon_{ij}$.

Since the sample mean is an unbiased estimator of the population mean, the expectation is given by $E(\bar{y}) = \mu + B_b + B_\epsilon$, where μ is the true population mean, B_b represents enumerator bias, and B_ϵ represents response bias.

The variance of the sample mean for continuous variables such as sales or employment is:

$$V(\bar{y}) = \left(1 - \frac{n-1}{N-1}\right)\frac{\sigma_\mu^2}{n} + \frac{\sigma_b^2}{k} + \frac{\sigma_\epsilon^2}{n} \tag{4.2}$$

In this expression, the first term reflects population variance, the second term reflects enumerator (correlated) variance, and the third term reflects random error variance. Notably, variance due to correlated errors does not diminish with larger sample sizes; thus, as $n \to \infty$, the variance tends to be dominated by the enumerator component $\frac{\sigma_b^2}{k}$.

The PEC provides an independent re-interview of a sample of establishments from the Economic Census. Its purpose is to estimate response variance but not bias. In line with dual-system estimation, content error analysis emphasizes consistency between the Economic Census and the PEC responses rather than identifying which response is correct.

The PEC, therefore, plays a central role in assessing the quality of Economic Census data. By replicating the wording, response categories, question order, and definitions used in the census, the PEC ensures comparability. It provides a robust basis for evaluating response consistency across key economic characteristics.

4.1. Elements of Content Evaluation

In the Economic Census, content error refers to discrepancies in the reporting of establishment characteristics between the Economic Census and the PEC. Unlike coverage error, which is assessed on both matched and unmatched cases, the measurement of content error is confined solely to matched cases. In this context, it is essential to note that the PEC is not intended to represent the ultimate truth. Rather, it provides a benchmark for assessing the degree of response variability, though it cannot account for systematic response bias. Moreover, all comparisons in this analysis are made between unedited PEC responses and the corresponding unedited census responses.

The content error estimates generated through this process should not be directly compared with the final published census totals for several reasons. First, the PEC is based on a sample of census records and is therefore subject to sampling variability. Second, the estimates are restricted to matched cases only, while unmatched cases are excluded from the analysis. Third, the PEC relies on unedited responses, whereas the published census results are based on edited and adjusted data. Finally, the scope of the PEC is limited to establishments within the in-scope enumeration areas, whereas the Economic Census aggregates information across the census universe.

To assess content variability between the Economic Census and the PEC, a set of standard indicators is used. These include the Net Difference Rate (NDR), the Index of Inconsistency (both simple and aggregate forms), the Rate of Agreement (RA), and the Gross Difference Rate (GDR). Each of these measures captures a different dimension of reporting discrepancies. For instance, the net difference rate and simple index of inconsistency are computed at the category level. In contrast, the aggregate index of inconsistency, the rate of agreement, and the gross difference rate summarize discrepancies across the full distribution.

These measures are applied to a selection of establishment characteristics that are expected to remain stable over the reference period, such as industry classification, ownership type, and employment size. By comparing responses across these core variables, the PEC provides an assessment of the reliability of census data, highlighting the extent to which reporting variation may influence the overall quality of the Economic Census results. The indicators are presented with associated 95 percent confidence intervals, wherever applicable, to account for sampling variability.

4.1.1 Net Difference Rate

The net difference rate (NDR) is used in the Economic Census to evaluate discrepancies between census responses and those obtained from the PEC. It measures the difference in the number of cases classified in a given response category between the Economic Census and the PEC, relative to the total number of matched units across all categories. Formally, the NDR for the *i*th response category is defined as:

$$NDR = \frac{Y_{\bullet i} - Y_{i\bullet}}{n} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \qquad (4.3)$$

where, $Y_{\bullet i}$: Economic Census number of cases in *i*th category; $Y_{i\bullet}$: PEC number of cases in *i*th category; n: Number of matched cases, and C = total number of response categories for characteristic Y.

A positive value of NDR indicates that more cases were classified in the *i*th category in the Economic Census compared to the PEC. In contrast, a negative value suggests underestimation in the Census. It is important to note that the NDR can be interpreted as a measure of bias only when the reinterview (PEC) is considered more accurate than the original census response.

Following the methodology of the U.S. Bureau of the Census (1985), the 95% confidence interval (CI) for the NDR of category i (when $Y_{\bullet i} - Y_{i\bullet} = 0$) is given by:

$$\frac{(Y_{\bullet i} - Y_{i\bullet}) \pm 2\sqrt{Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii} + 1}}{n} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \tag{4.4}$$

In some cases, the absolute value of the NDR is normalized by the mean proportion of the population economic units for the respective category to assess the severity of content error (U.S. Bureau of the Census, 1985).

4.1.2 Index of Inconsistency

The Index of Inconsistency (IIC) measures the proportion of cases where responses differ between the Economic Census and the PEC. It is defined as the ratio of the simple response variance to the total variance of the characteristic, capturing both measurement and population variability. For each response category i, the IIC is computed as:

$$IIC = \frac{(Y_{.i} + Y_{i.} - 2Y_{ii})}{\frac{1}{n}[Y_{.i}(n - Y_{i.}) + Y_{i.}(n - Y_{.i})]} \times 100 \qquad \forall\ i = 1, 2, \ldots, C \tag{4.5}$$

where, Y_{ii}: Number of consistent cases in the *i*th category.

The 95% confidence interval of II_C depends on the magnitude of $(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii})/n$:

- If $(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii})/n \leq 0.10$:

$$CI_{95\%,i} = \frac{(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii} + 2) \pm 2\sqrt{Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii} + 1}}{Y_{\bullet i}\left(1 - \frac{Y_{i\bullet}}{n}\right) + Y_{i\bullet}\left(1 - \frac{Y_{\bullet i}}{n}\right)} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \tag{4.6}$$

- If $(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii})/n > 0.10$:

$$CI_{95\%,i} = \frac{(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii} + 2) \pm 2\sqrt{\frac{1}{n}(Y_{\bullet i} + Y_{i\bullet} - 2Y_{ii})(n - Y_{\bullet i} - Y_{i\bullet} + 2Y_{ii})}}{Y_{\bullet i}\left(1 - \frac{Y_{i\bullet}}{n}\right) + Y_{i\bullet}\left(1 - \frac{Y_{\bullet i}}{n}\right)} \times 100 \ \forall\ i = 1, 2, 3, \ldots, C \tag{4.7}$$

4.1.3 Aggregate Index of Inconsistency

The Aggregate Index of Inconsistency (II_{AG}) measures the overall proportion of cases for which responses differ between the Economic Census and the PEC across all categories of a characteristic.

It is defined as:

$$II_{AG} = \frac{(n-\sum_i^c Y_{ii})}{(n-\frac{1}{n}\sum_i^c Y_{\bullet i}Y_{i\bullet})} \times 100 \qquad \forall\ i = 1, 2,3, \ldots, \tag{4.8}$$

The 95% confidence interval of IIAG depends on $\left[\frac{n-\sum_{i=1}^c Y_{ii}}{n}\right]$:

- If $\left[\frac{n-\sum_{i=1}^c Y_{ii}}{n}\right] \leq 0.10$:

$$\frac{(n-\sum_{i=1}^c Y_{ii}+2)\pm 2\sqrt{n-\sum_{i=1}^c Y_{ii}+1}}{(n-\frac{1}{n}\sum_{i=1}^c Y_{\bullet i}Y_{i\bullet})} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \tag{4.9}$$

- If $\left[\frac{n-\sum_{i=1}^c Y_{ii}}{n}\right] > 0.10$:

$$\frac{(n-\sum_{i=1}^c Y_{ii}+2)\pm 2\sqrt{\frac{1}{n}(n-\sum_{i=1}^c Y_{ii})(\sum_{i=1}^c Y_{ii})}}{(n-\frac{1}{n}\sum_{i=1}^c Y_{\bullet i}Y_{i\bullet})} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \tag{4.10}$$

4.1.4 Rate of Agreement

The Rate of Agreement (RA) measures the proportion of cases for which responses in the Economic Census and the PEC agree. It is the complement of the gross difference rate: a low RA indicates high variability, while a high RA indicates consistency. The RA is calculated as:

$$RA = \frac{\sum_i^c Y_{ii}}{n} \times 100 \qquad \forall\ i = 1, 2, 3, \ldots, C \tag{4.11}$$

4.1.5 Gross Difference Rate

The Gross Difference Rate (GDR) measures the overall discrepancies between the Economic Census and the PEC responses for a characteristic. It is defined as the number of mismatches relative to the total number of matched economic units. Equivalently, it can be expressed as the sum of off-diagonal cells across all categories or as the complement of the sum of the diagonal cells:

$$GDR = \frac{(n-\sum_i^c Y_{ii})}{n} \times 100 \equiv 100 - RA \qquad \forall\ \mathrm{i} = 1, 2, 3, \ldots, \mathrm{C} \tag{4.12}$$

To interpret the resulting content errors, estimates need to be compared against reference guidelines. The UN PEC manual does not provide thresholds for assessing the severity of

content errors. However, based on the experience of the U.S. Bureau of the Census (1985), Table 4.1: provides benchmarks for interpreting various content error measures. While not without limitations, these ranges are commonly used as guiding principles to evaluate the severity of estimated content errors.

Table 4.1: Standards for the Interpretation of Different Measures of Content Errors

Measure	Low	Moderate	High
Index of Inconsistency	< 20	20–50	> 50
Aggregate Index of Inconsistency	< 20	20–50	> 50
Absolute value of NDR relative to the population proportion	< 0.01	0.01–0.05	> 0.05

Source: U.S. Bureau of the Census (1985).

4.2. Estimates of Content Errors

Given the above standards, a detailed assessment of the prevalence and nature of content errors is conducted across several critical classification variables employed in both the Economic Census and the Post-Enumeration Check (PEC). Although specific basic characteristics—such as reported addresses—demonstrate a high degree of consistency and reliability, the analysis reveals substantially higher levels of misreporting in more complex domains. Specifically, institutional attributes, economic indicators, and structural variables exhibit notable discrepancies, suggesting that respondents face greater challenges in accurately reporting information in these areas. The subsections that follow present a systematic summary of the findings for each domain, highlighting the extent of misclassification and its implications for data quality and subsequent policy use. The detailed supplementary tables corresponding to each of the table that follows are presented in Appendix C.

4.2.1 Type of Establishments

The classification of entities into establishments and economic households is a fundamental element of the Economic Census enumeration. As shown in Table 4.2: , reporting errors in this domain are considerably large.

Table 4.2: Response Validity Measures by Type of Establishment

Type of Structure	Consistent	Census	PEC	NDR		Index of Inconsistency	
				Estimate	95% CI	Estimate	95% CI
Permanent Establishment	27844	30223	31436	-2.47	[-2.79, -2.16]	26.11	[25.45, 26.72]
Temporary Establishment	1197	2521	3130	-1.24	[-1.48, -1.01]	61.20	[59.01, 63.30]
Economic Household	13056	16279	14457	3.72	[3.44, 3.99]	21.95	[21.24, 22.53]

Aggregate Index of Inconsistency: 28.06 % and CI: [27.45,28.7]

Gross Difference Rate (GDR): 14.13 %

Rate of Agreement (RA): 85.87 %

Permanent establishments exhibit an NDR of –2.47 percent (95% CI: [–2.79, –2.16]) with an inconsistency index of 26.11 percent (95% CI: [25.45, 26.72]), while temporary establishments show the highest degree of misclassification, with an NDR of –1.24% (95% CI: [–1.48, –1.01]) and an inconsistency index of 61.20% (95% CI: [59.01, 63.30]). In contrast, economic households without agricultural activities record a positive NDR of 3.72 percent (95% CI: [3.44, 3.99]) and a lower inconsistency index of 21.95 percent (95% CI: [21.24, 22.53]).

At the aggregate level, the Index of Inconsistency is 28.06 percent (95% CI: [27.45, 28.70]), with a GDR of 14.13 percent and an RA of 85.87 percent. These findings suggest that while permanent establishments and non-agricultural economic households are relatively well classified, temporary establishments are especially prone to definitional ambiguity and misreporting. More explicit operational definitions and improved field guidance are therefore essential to capture the contents of their activities.

4.2.2 Nature of Economic Activity

The classification of establishments into manufacturing and service categories also reveals high levels of inconsistency (Table 4.3:). For manufacturing, the NDR is 3.55 percent (95% CI: [3.29, 3.80]), while for services it is –3.55 percent (95% CI: [–3.80, –3.29]). Both categories indicate extremely high inconsistency indices of 61.68 percent (95% CI: [59.18, 63.07]), suggesting frequent reversals between manufacturing and service classifications.

Table 4.3: Response Validity Measures by Type of Economic Activity

Type of Economic Activity	Consistent	Census	PEC	NDR		Index of Inconsistency	
				Estimate	95% CI	Estimate	95% CI
Manufacturing	1480	4317	2578	3.55	[3.29, 3.80]	61.68	[59.18, 63.07]
Service	43608	44706	46445	-3.55	[-3.8, -3.29]	61.68	[59.18, 63.07]

Aggregate Index of Inconsistency: 61.09 % and CI: [59.18,63.07]

Gross Difference Rate (GDR): 8.03 %

Rate of Agreement (RA): 91.97 %

Overall, the Index of Inconsistency reaches 61.09 percent (95% CI: [59.18, 63.07]). The GDR is 8.03 percent, while the RA remains relatively high at 91.97 percent. These results indicate that although broad agreement is achieved, the distinctions between manufacturing and service were often applied inconsistently, likely due to ambiguous definitions or enumerator difficulties in assigning borderline cases.

4.2.3 Type of Ownership

Ownership status is central to characterizing the structure of establishments. The results in Table 4.4: reveal substantial variability in consistency across ownership categories.

Table 4.4: Response Validity Measures by Ownership Status

Ownership Status	Consistent	Census	PEC	NDR		Index of Inconsistency	
				Estimate	95% CI	Estimate	95% CI
Sole Proprietor	44213	45454	45268	0.38	[0.18, 0.57]	33.88	[32.49, 35.32]
Partnership	174	830	1034	-0.42	[-0.58, -0.26]	82.93	[78.74, 87.26]
Private Limited Company	65	194	269	-0.15	[-0.23, -0.08]	72.27	[64.76, 80.62]
Public Limited Company	24	106	123	-0.03	[-0.09, 0.02]	79.23	[68.29, 91.91]
Government	519	624	657	-0.07	[-0.13, 0.00]	19.22	[16.91, 21.85]
Autonomous	23	97	168	-0.14	[-0.21, -0.08]	82.88	[72.38, 94.83]
Non-profit (NGO)	767	1488	1062	0.87	[0.74, 1.00]	40.94	[38.39, 43.52]
Others	48	230	442	-0.43	[-0.53, -0.33]	86.37	[79.35, 93.74]

Aggregate Index of Inconsistency: 45.64 % and CI: [44.06,47.29]

Gross Difference Rate (GDR): 6.51 %

Rate of Agreement (RA): 93.49 %

Sole proprietor ownership is reported relatively consistently, with an NDR of 0.38 percent (95% CI: [0.18, 0.57]) and an inconsistency index of 33.88 percent (95% CI: [32.49, 35.32]). In contrast, partnerships and limited companies are reported with much higher inconsistency: partnerships show an NDR of –0.42 percent (95% CI: [–0.58, –0.26]) and an inconsistency index of 82.93 percent (95% CI: [78.74, 87.26]), while private and public limited companies record indices of 72.27 percent and 79.23 percent respectively.

Government ownership shows greater reliability, with an NDR of –0.07 percent (95% CI: [–0.13, 0]) and a relatively low inconsistency index of 19.22 percent (95% CI: [16.91, 21.85]). In contrast, autonomous bodies and "other" ownership types record high inconsistency indices (82.88% and 86.37%), indicating serious classification challenges. Non-profit organizations (NGOs) occupy a middle ground, with an NDR of 0.87 percent (95% CI: [0.74, 1]) and an inconsistency index of 40.94 percent (95% CI: [38.39, 43.52]).

At the aggregate level, the Index of Inconsistency is 45.64 percent (95% CI: [44.06, 47.29]), with a GDR of 6.51 percent and an RA of 93.49 percent. These results show that while straightforward categories such as government and sole private ownership are classified reliably, ownership types requiring finer distinctions are subject to frequent misreporting, highlighting the need for more precise definitions and stronger training.

4.2.4 Business Registration Status

Business registration status, a key indicator of formalization, emerges as one of the most error-prone classifications (Table 4.5:). Registered establishments show an NDR of –4.91 percent (95% CI: [–5.36, –4.46]) and an inconsistency index of 52.10 percent (95% CI: [51.04, 52.66]), suggesting systematic underreporting. Unregistered establishments record an NDR of 3.40 percent (95% CI: [2.90, 3.90]) and an inconsistency index of 62.22 percent (95% CI: [61.24, 62.92]). The "not applicable" category shows particularly severe misclassification, with an NDR of 1.51 percent (95% CI: [1.23, 1.80]) and an inconsistency index of 92.86 percent (95% CI: [90.20, 95.21]).

Table 4.5: Response Validity Measures by Business Registration Status

Registration Status	Consistent	Census	PEC	NDR		Index of Inconsistency	
				Estimate	95% CI	Estimate	95% CI
Registered	13443	18348	20755	-4.91	[-5.36, -4.46]	52.10	[51.04, 52.66]
Unregistered	19097	27488	25822	3.40	[2.9, 3.9]	62.22	[61.24, 62.92]
Not applicable	354	3187	2446	1.51	[1.23, 1.8]	92.86	[90.20, 95.21]

Aggregate Index of Inconsistency: 60.6 % and CI: [59.82,61.39]

Gross Difference Rate (GDR): 32.9 %

Rate of Agreement (RA): 67.1 %

At the aggregate level, the Index of Inconsistency is 60.60 percent (95% CI: [59.82, 61.39]), with a GDR of 32.90 percent and an RA of only 67.10 percent, the lowest across all variables examined. These results indicate widespread ambiguity in the interpretation of registration status among respondents and enumerators, underscoring the urgent need for more explicit criteria and robust training.

4.2.5 Fire Safety Status

The fire safety status, a critical safety indicator, also shows notable inconsistencies between the Economic Census and the PEC (Table 4.6). Establishments reported as having a fire safety system show an NDR of –1.55 percent (95% CI: [–1.77, –1.33]), while those without such systems show an equal but opposite NDR of 1.55 percent (95% CI: [1.33, 1.77]). Both categories share a high inconsistency index of 58.37 percent (95% CI: [56.11, 60.44]).

Table 4.6: Response Validity Measures by Fire Safety Status

Fire Safety Status	Consistent	Census	PEC	NDR		Index of Inconsistency	
				Estimate	95% CI	Estimate	95% CI
Have Fire Safety System	1176	2244	3004	-1.55	[-1.77, -1.33]	58.37	[56.11, 60.44]
No Fire Safety System	44951	46779	46019	1.55	[1.33, 1.77]	58.37	[56.11, 60.44]

Aggregate Index of Inconsistency: 58.23 % and CI: [56.11,60.44]

Gross Difference Rate (GDR): 5.91 %

Rate of Agreement (RA): 94.09 %

At the aggregate level, the Index of Inconsistency is 58.23 percent (95% CI: [56.11, 60.44]), with a GDR of 5.91 percent and an RA of 94.09 percent. These results suggest that although most establishments were consistently classified, substantial discrepancies occurred in some instances. The inconsistencies are likely to stem from definitional ambiguity over what

qualifies as a fire safety system and inconsistent field application of these criteria. More precise definitions and practical field guidelines are required to improve reporting accuracy.

The results highlight notable discrepancies in the reporting of fire safety system availability between the Economic Census and the PEC data. Establishments reporting the availability of a fire safety system show a negative Net Difference Rate (NDR) of −1.55, suggesting that the PEC recorded more establishments with such systems than the Economic Census. In contrast, those reporting no fire safety system exhibit a positive NDR of 1.55, indicating underreporting of the system availability in the Economic Census relative to the PEC. Despite these discrepancies, the Rate of Agreement (RA) remains high at 94.09 percent, underscoring that most responses were consistent across the two sources.

However, the Aggregate Index of Inconsistency (58.23%) indicates a substantial level of disagreement, particularly concerning the availability of the fire safety system. This inconsistency may stem from misreporting, limited respondent awareness regarding the availability of fire safety equipment, or variations in the definition of what constitutes a fire safety system.

The Gross Difference Rate (GDR) of 5.91percent further indicates that, while most establishments were consistently classified, a non-negligible share was misclassified between the Economic Census and the PEC. Given that the availability of fire safety systems is a critical safety indicator, these findings raise concerns about the reliability of administrative reporting. The results suggest the need for improved design of the Census questionnaire, more precise operational definitions, and more direct verification methods in future rounds of data collection.

4.3. Drivers of Economic Census Content Errors

Table 4.7 reports the results of logit regressions designed to identify the factors associated with mismatches between the Economic Census and the Post-Enumeration Check (PEC). The dependent variable is whether an establishment's information in the Economic Census is unmatched with the PEC. The analysis is organized around four central domains of classification—type of unit, type of industry, type of ownership, and registration status—which represent the key variables used in census tabulation and validation. For each domain, both

logit coefficients and marginal effects are presented, accompanied by robust standard errors, to provide a comprehensive view of the magnitude and statistical significance of the relationships.

The models incorporate a wide range of explanatory variables that capture institutional, economic, and structural characteristics of enterprises. These include industry category, ownership type, gender of the owner, years of establishment, branch structure, registration indicators, employment size, capital intensity, tax identification, and geographic location. By examining these attributes jointly, the results allow for a systematic assessment of how enterprise characteristics shape the likelihood of inconsistencies across the two data sources.

This framework provides the basis for understanding not only the overall prevalence of mismatches but also the specific domains in which reporting errors are most pronounced. The detailed interpretation of these findings is presented in the discussion that follows the table.

Table 4.7: Drivers of Economic Census Content Errors

	Mismatch in the Economic Census and the PEC							
	Type of Unit		Type of Industry		Type of Ownership		Have Registration	
	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Service Industry (=1)	0.311***	0.025***			0.943***	0.050***	0.433***	0.075***
	[0.065]	[0.005]			[0.096]	[0.005]	[0.043]	[0.008]
Private ownership (=1)	0.429***	0.034***	1.915***	0.127***			1.310***	0.228***
	[0.102]	[0.008]	[0.138]	[0.009]			[0.053]	[0.009]
Owner Male (=1)	-0.178***	-0.014***	-2.164***	-0.144***	-0.135	-0.007	0.848***	0.148***
	[0.064]	[0.005]	[0.045]	[0.003]	[0.101]	[0.005]	[0.061]	[0.011]
Years of establishment	-0.003*	-0.000*	-0.001	0	0.017***	0.001***	0.003**	0.000**
	[0.002]	[0.000]	[0.002]	[0.000]	[0.002]	[0.000]	[0.001]	[0.000]
No other branch (=1)	-1.595***	-0.126***	0.16	0.011	-1.294***	-0.068***	-0.512***	-0.089***
	[0.040]	[0.003]	[0.134]	[0.009]	[0.075]	[0.004]	[0.075]	[0.013]
Unit is registered (=1)	-0.319***	-0.025***	-0.168***	-0.011***	-0.313***	-0.016***		
	[0.044]	[0.003]	[0.045]	[0.003]	[0.046]	[0.002]		
Log of the number of employees	-0.127***	-0.010***	0.808***	0.054***	1.033***	0.054***	0.390***	0.068***
	[0.047]	[0.004]	[0.035]	[0.002]	[0.031]	[0.002]	[0.025]	[0.004]

	Mismatch in the Economic Census and the PEC							
	Type of Unit		Type of Industry		Type of Ownership		Have Registration	
	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects	Logit Estimates	Marginal Effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital 10 Lakh+ (=1)	-0.315***	-0.025***	-0.054	-0.004	0.374***	0.020***	1.020***	0.177***
	[0.109]	[0.009]	[0.084]	[0.006]	[0.068]	[0.004]	[0.055]	[0.009]
Have TIN (=1)	-1.043***	-0.082***	0.110*	0.007*	-0.037	-0.002	2.050***	0.357***
	[0.096]	[0.008]	[0.066]	[0.004]	[0.061]	[0.003]	[0.043]	[0.007]
City Corporation	1.227***	0.097***	-0.043	-0.003	-0.249***	-0.013***	0.299***	0.052***
	[0.049]	[0.004]	[0.060]	[0.004]	[0.059]	[0.003]	[0.034]	[0.006]
Municipality	-0.182***	-0.014***	0.116**	0.008**	-0.346***	-0.018***	0.336***	0.058***
	[0.052]	[0.004]	[0.048]	[0.003]	[0.054]	[0.003]	[0.028]	[0.005]
Upazila Sadar	0.402***	0.032***	-0.136	-0.009	-0.586***	-0.031***	0.479***	0.083***
	[0.074]	[0.006]	[0.095]	[0.006]	[0.118]	[0.006]	[0.049]	[0.008]
Institution (=1)			-0.791***	-0.053***	2.193***	0.115***	1.941***	0.338***
			[0.139]	[0.009]	[0.095]	[0.005]	[0.080]	[0.014]
Observations	49,023		49,023		49,023		49,023	
Wald $chi^2(12)$	2787.07		3231.94		3251.13		8729.39	
Wald chi^2 p-value	[0.000]		[0.000]		[0.000]		[0.000]	

Note: Observations include only the matched sample between the Census and Pethe C. ∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01. Standard errors are robust.

The results from the logit models and the marginal effects show that establishments in the *service industry* are consistently more likely to have mismatches. The effects are large and highly significant across all specifications, suggesting that service-related activities pose particular challenges for accurate enumeration. Similarly, privately owned establishments also face higher risks of content errors, indicating weaker reporting consistency in the private sector compared to other ownership types.

Ownership characteristics play an important role. Male ownership is associated with mixed effects: in some models, it reduces mismatches, while in others, it raises the probability of inconsistencies, especially when interacting with ownership and registration dimensions. Establishment age also matters; older establishments tend to have fewer mismatches, although the effect turns positive in certain specifications, implying that reporting consistency varies by context.

Formalization once again reduces errors. Registered establishments and those with a tax identification number (TIN) are significantly less likely to display mismatches in several specifications. These findings reinforce the earlier evidence from coverage error analysis, which suggests that formalized units are more accurately captured in both coverage and content, as well as establishment size; however, capital stock presents mixed results. A larger workforce tends to increase the likelihood of a mismatch in some models, while higher capital is associated with more frequent reporting inconsistencies in others. It suggests that larger or better-capitalized firms may introduce more complex reporting structures, which can generate discrepancies.

Geography also matters. Establishments in municipality areas generally have fewer mismatches, while those in Upazila sadar areas and city corporation areas are more prone to errors in some specifications. The strongest effects are observed for establishments in City Corporations, where the probability of content errors is markedly higher, indicating that data collection in large urban areas faces challenges.

Overall, the results demonstrate that content errors are more prevalent among service-oriented, privately owned, and urban establishments, while formalization through registration and TIN reduces mismatches. These findings suggest that improved data collection protocols and

targeted follow-up are critical for enhancing census accuracy among urban, service-sector, and informal enterprises.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The Post Enumeration Check (PEC) was designed to assess the coverage and content errors of the Economic Census 2024 independently and to strengthen confidence in the reliability of its results. As Bangladesh's first fully independent PEC for an Economic Census, this exercise represents a milestone in ensuring the credibility of business and establishment statistics, which are vital for economic planning, policymaking, and private-sector analysis.

Overall, the PEC findings indicate high consistency between the Economic Census and the PEC, with coverage errors remaining within acceptable limits. Most establishments enumerated in the Economic Census were successfully matched with the PEC records, and the rate of non-matched cases was relatively low. These findings demonstrate that operations of the Economic Census were broadly effective in capturing the scope of economic activities in Bangladesh. Two innovations contributed significantly to this outcome: (a) advanced listing of establishments, which reduced omission risks, and (b) the adoption of a digital data collection method with built-in monitoring tools, which minimized reporting errors and allowed for rapid oversight in the field.

For coverage error, the logit results and the marginal effects show that formally registered establishments, including those with a TIN, were less likely to be missed in the Economic Census. In contrast, newer and informal service-oriented businesses, especially in major urban areas, faced a higher risk of mismatches. It highlights the challenge of enumerating rapidly emerging informal firms that lack proper documentation and are not visible in official records.

Regarding content errors, the PEC revealed that discrepancies in establishment characteristics (such as ownership, capital, or employment size) were generally random rather than systematic. Enumerator agreement was high across most categories, indicating that protocols for data collection, training, and supervision in the Economic Census were satisfactory. The absence of systematic bias means that both the Economic Census and the PEC results can be trusted as reliable representations of the economic landscape.

For content error, the regression results and accompanying marginal effects show that content mismatches between the Economic Census and PEC are strongly driven by unit type,

ownership, registration, and location. Service industries, privately owned units, larger establishments, and those with higher capital are more prone to errors, while registration and having a TIN reduce mismatches in some specifications but increase them in others. Geographic effects are mixed: city corporations and Upazila Sadar units often show higher mismatch risks. At the same time, municipalities tend to mitigate these issues, highlighting the importance of institutional formality and location in data consistency.

Overall, the PEC results demonstrate that the Economic Census 2024 has produced robust, reliable, and credible data. The remaining gaps are concentrated in informal and fast-changing sectors of the economy, indicating areas where future census efforts can be further strengthened.

5.2. Lessons Learned

The PEC exercise entails several important lessons that can guide future economic censuses:

- **Early integration of the PEC planning with the Economic Census activities.** Questionnaires, procedures, and reconciliation methods should be prepared and thoroughly tested well in advance of the census, ensuring that the PEC can commence operations immediately after the census.
- **Timely completion of PEC fieldwork.** Economic activity can change quickly for establishments due to closures, relocations, new openings, or seasonality. Completing PEC fieldwork within a short period after the census reduces distortions caused by business dynamics.
- **Strengthening operational independence.** To maintain credibility, the PEC operations—including data collection, matching, and reconciliation—should be managed by a team that is independent of the Economic Census staff. This independence can be achieved through a reputable external partner organization.
- **Improving coverage of informal and service-sector establishments.** These types of businesses are more likely to be omitted. Future census planning should incorporate targeted strategies for identifying informal enterprises, such as leveraging local business associations, digital platforms, or administrative databases, to enhance the accuracy of census data.

- **Leveraging digital tools and geo-referencing.** Digital data collection significantly improved data quality in the Economic Census 2024. Expanding the use of GPS coordinates for establishments and recording owner contact details would further strengthen reconciliation efforts.
- **Introducing the Digital Economic Enumeration Area.** The current practice of manual cartographic EA is prone to errors that can result in the duplication or omission of data collection, often due to erroneous demarcation of the enumeration areas. The digital demarcation of EAs using appropriate shape files, together with digital data collection guided by the shape files, will obviate many of these limitations.
- **Conducting pilot PECs.** Pilot testing is crucial for refining matching techniques, questionnaires, and reconciliation procedures. Even small-scale pilots can provide valuable guidance for full implementation.
- **Revisiting terminology.** As with international practice, *the Post Enumeration Survey* may be preferable to *the Post Enumeration Check*, as it emphasizes the survey's role as an independent quality assessment rather than implying errors in the Economic Census.

5.3. Recommendations

Building on the conclusions and lessons learned, the following recommendations can be offered for future PECs of economic censuses in Bangladesh:

- Ensure PEC planning and budget allocation are synchronized with the census timeline.
- Prioritize rapid field implementation within three months of completing the census.
- Focus on informal, service-sector, and urban establishments, which remain more prone to coverage errors.
- Enhance the use of GIS in digitally delineating EA, collecting data, and digital monitoring systems to track establishment boundaries and locations.
- Institutionalize PEC independence by contracting a reputed independent organization or at least strengthening an in-house PEC unit.
- Adopt the nomenclature *Post Enumeration Survey* in line with global best practices. (Dauphin & Canamucio, 1993; UN, 2010).

REFERENCES

Bakht, Z. (2014). Report on Post Enumeration Check (PEC) of the Economic Census 2013. Dhaka: Bangladesh Institute of Development Studies.

Chandrasekaran, C., & Deming, W. E. (1949). On a Method of Estimating Birth and Death Rates and the Extent of Registration. *Journal of the American Statistical Association*, 44(245), 101-115.

Cochran, W. G. (1977). Sampling Techniques (3rd ed.). Nashville, TN: John Wiley & Sons.

Dauphin, M., & Canamucio, A. (1993). Designing and Implementation of Post-Enumeration Survey: Developing Country Example. Washington, DC: US Bureau of the Census.

Endlich, R. M., Eynon, B., Ferek, R., Valdes, A., & Maxwell, C. (1988). Statistical Analysis of Precipitation Chemistry Measurements over the Eastern United States. Part I: Seasonal and Regional Patterns and Correlations. *Journal of Applied Meteorology*, 27(1322), 1322-1333.

Gatz, D. F., & Smith, L. (1995). The Standard Error of a Weighted Mean Concentration—I. Bootstrapping vs Other Methods. *Atmospheric Environment*, 29(11), 1185–1193.

Kass, G. V. (1980). An Exploratory Technique for Investigating Large Quantities of Categorical Data. *Applied Statistics*, 29(2), 119-127.

UN. (2008). Principles and Recommendations for Population and Housing Census, Revision 2. Statistics Division, Department of Economic and Social Affairs. New York: United Nations.

UN. (2010). Post Enumeration Surveys: Operational Guidelines. Statistics Division, Department of Economic and Social Affairs. New York: United Nations.

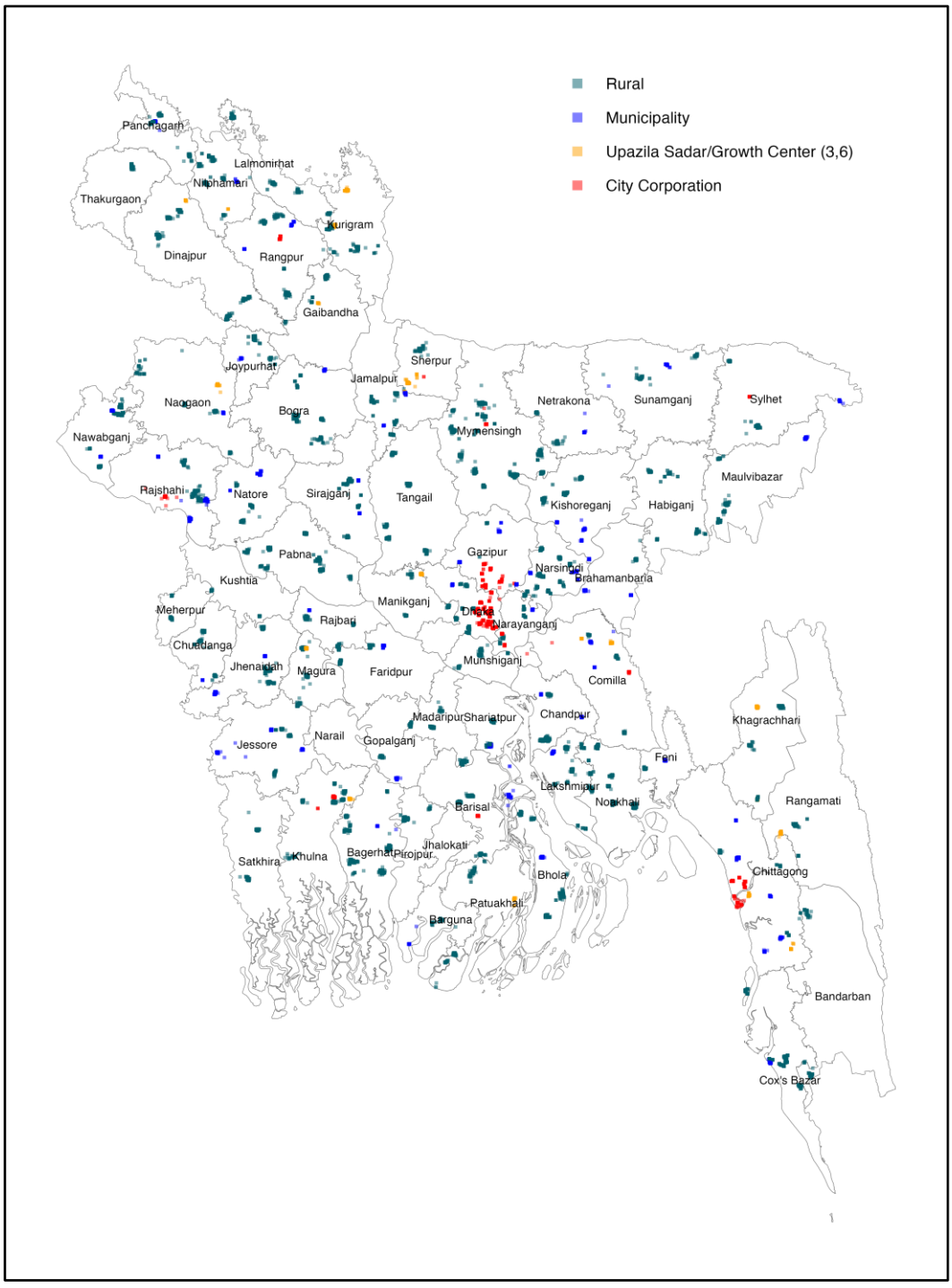
UN. (2017). Principles and Recommendations for Population and Housing Census, Revision 3. Statistics Division, Department of Economic and Social Affairs. New York: United Nations.

US Bureau of the Census. (1979). Popstan: A Case Study for the 1980 Censuses of Population and Housing. Washington, DC: US Bureau of the Census.

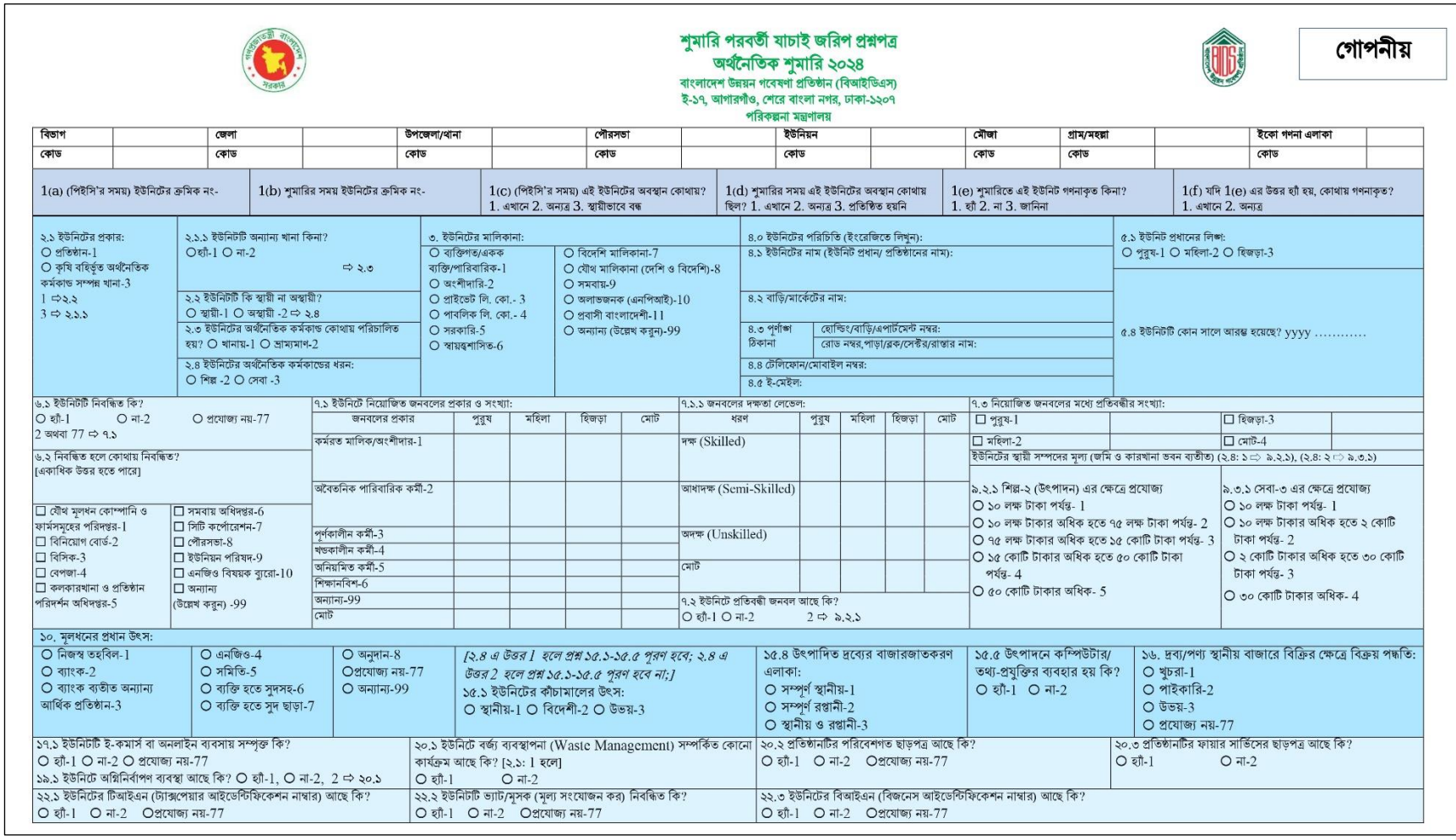
US Bureau of the Census. (1985). Evaluating Censuses of Population and Housing. Washington, DC: US Bureau of the Census.

APPENDIX A: LOCATION OF THE PEC ENUMERATION AREAS

Figure A 1: Spatial Distribution of the Enumeration Areas



APPENDIX B: PEC SURVEY QUESTIONNAIRE



শুমারি পরবর্তী যাচাই জরিপ প্রশ্নপত্র
অর্থনৈতিক শুমারি ২০২৪
বাংলাদেশ উন্নয়ন গবেষণা প্রতিষ্ঠান (বিআইডিএস)
ই-১৭, আগারগাঁও, শেরে বাংলা নগর, ঢাকা-১২০৭
পরিকল্পনা মন্ত্রণালয়

গোপনীয়

বিভাগ		জেলা		উপজেলা/থানা		পৌরসভা		ইউনিয়ন		মৌজা	গ্রাম/মহল্লা		ইকো গণনা এলাকা	
কোড		কোড		কোড		কোড		কোড		কোড	কোড		কোড	

1(a) (পিইসি'র সময়) ইউনিটের ক্রমিক নং-

1(b) শুমারির সময় ইউনিটের ক্রমিক নং-

1(c) (পিইসি'র সময়) এই ইউনিটের অবস্থান কোথায়? 1. এখানে 2. অন্যত্র 3. স্থায়ীভাবে বন্ধ

1(d) শুমারির সময় এই ইউনিটের অবস্থান কোথায় ছিল? 1. এখানে 2. অন্যত্র 3. প্রতিষ্ঠিত হয়নি

1(e) শুমারিতে এই ইউনিট গণনাকৃত কিনা? 1. হ্যাঁ 2. না 3. জানিনা

1(f) যদি 1(e) এর উত্তর হ্যাঁ হয়, কোথায় গণনাকৃত? 1. এখানে 2. অন্যত্র

২.১ ইউনিটের প্রকার:
○ প্রতিষ্ঠান-1
○ কৃষি বহির্ভূত অর্থনৈতিক কর্মকান্ড সম্পন্ন খানা-3
1 ⇨২.২
3 ⇨ ২.১.১

২.১.১ ইউনিটটি অন্যান্য খানা কিনা?
○হ্যাঁ-1 ○ না-2 ⇨ ২.৩

২.২ ইউনিটটি কি স্থায়ী না অস্থায়ী?
○ স্থায়ী-1 ○ অস্থায়ী -2 ⇨ ২.৪

২.৩ ইউনিটের অর্থনৈতিক কর্মকান্ড কোথায় পরিচালিত হয়? ○ খানায়-1 ○ ভ্রাম্যমাণ-2

২.৪ ইউনিটের অর্থনৈতিক কর্মকান্ডের ধরন:
○ শিল্প -2 ○ সেবা -3

৩. ইউনিটের মালিকানা:
○ ব্যক্তিগত/একক ব্যক্তি/পারিবারিক-1
○ অংশীদারি-2
○ প্রাইভেট লি. কো.- 3
○ পাবলিক লি. কো.- 4
○ সরকারি-5
○ স্বায়ত্বশাসিত-6
○ বিদেশি মালিকানা-7
○ যৌথ মালিকানা (দেশি ও বিদেশি)-8
○ সমবায়-9
○ অলাভজনক (এনপিআই)-10
○ প্রবাসী বাংলাদেশী-11
○ অন্যান্য (উল্লেখ করুন)-99

৪.০ ইউনিটের পরিচিতি (ইংরেজিতে লিখুন):
৪.১ ইউনিটের নাম (ইউনিট প্রধান/ প্রতিষ্ঠানের নাম):
৪.২ বাড়ি/মার্কেটের নাম:
৪.৩ পূর্ণাঙ্গ ঠিকানা — হোল্ডিং/বাড়ি/এপার্টমেন্ট নম্বর: / রোড নম্বর,পাড়া/ব্লক/সেক্টর/রাস্তার নাম:
৪.৪ টেলিফোন/মোবাইল নম্বর:
৪.৫ ই-মেইল:

৫.১ ইউনিট প্রধানের লিঙ্গ:
○ পুরুষ-1 ○ মহিলা-2 ○ হিজড়া-3
৫.৪ ইউনিটটি কোন সালে আরম্ভ হয়েছে? yyyy .....

৬.১ ইউনিটটি নিবন্ধিত কি?
○ হ্যাঁ-1 ○ না-2 ○ প্রযোজ্য নয়-77
2 অথবা 77 ⇨ ৭.১

৬.২ নিবন্ধিত হলে কোথায় নিবন্ধিত? [একাধিক উত্তর হতে পারে]
☐ যৌথ মূলধন কোম্পানি ও ফার্মসমূহের পরিদপ্তর-1
☐ বিনিয়োগ বোর্ড-2
☐ বিসিক-3
☐ বেপজা-4
☐ কলকারখানা ও প্রতিষ্ঠান পরিদর্শন অধিদপ্তর-5
☐ সমবায় অধিদপ্তর-6
☐ সিটি কর্পোরেশন-7
☐ পৌরসভা-8
☐ ইউনিয়ন পরিষদ-9
☐ এনজিও বিষয়ক ব্যুরো-10
☐ অন্যান্য (উল্লেখ করুন) -99

৭.১ ইউনিটে নিয়োজিত জনবলের প্রকার ও সংখ্যা:

জনবলের প্রকার	পুরুষ	মহিলা	হিজড়া	মোট
কর্মরত মালিক/অংশীদার-1				
অবৈতনিক পারিবারিক কর্মী-2				
পূর্ণকালীন কর্মী-3				
খন্ডকালীন কর্মী-4				
অনিয়মিত কর্মী-5				
শিক্ষানবিশ-6				
অন্যান্য-99				
মোট				

৭.১.১ জনবলের দক্ষতা লেভেল:

ধরণ	পুরুষ	মহিলা	হিজড়া	মোট
দক্ষ (Skilled)				
আধাদক্ষ (Semi-Skilled)				
অদক্ষ (Unskilled)				
মোট				

৭.২ ইউনিটে প্রতিবন্ধী জনবল আছে কি?
○ হ্যাঁ-1 ○ না-2 2 ⇨ ৯.২.১

৭.৩ নিয়োজিত জনবলের মধ্যে প্রতিবন্ধীর সংখ্যা:
☐ পুরুষ-1 ☐ হিজড়া-3
☐ মহিলা-2 ☐ মোট-4

ইউনিটের স্থায়ী সম্পদের মূল্য (জমি ও কারখানা ভবন ব্যতীত) (২.৪: ১⇨ ৯.২.১), (২.৪: ২⇨ ৯.৩.১)

৯.২.১ শিল্প-২ (উৎপাদন) এর ক্ষেত্রে প্রযোজ্য
○ ১০ লক্ষ টাকা পর্যন্ত- 1
○ ১০ লক্ষ টাকার অধিক হতে ৭৫ লক্ষ টাকা পর্যন্ত- 2
○ ৭৫ লক্ষ টাকার অধিক হতে ১৫ কোটি টাকা পর্যন্ত- 3
○ ১৫ কোটি টাকার অধিক হতে ৫০ কোটি টাকা পর্যন্ত- 4
○ ৫০ কোটি টাকার অধিক- 5

৯.৩.১ সেবা-৩ এর ক্ষেত্রে প্রযোজ্য
○ ১০ লক্ষ টাকা পর্যন্ত- 1
○ ১০ লক্ষ টাকার অধিক হতে ২ কোটি টাকা পর্যন্ত- 2
○ ২ কোটি টাকার অধিক হতে ৩০ কোটি টাকা পর্যন্ত- 3
○ ৩০ কোটি টাকার অধিক- 4

১০. মূলধনের প্রধান উৎস:
○ নিজস্ব তহবিল-1
○ ব্যাংক-2
○ ব্যাংক ব্যতীত অন্যান্য আর্থিক প্রতিষ্ঠান-3
○ এনজিও-4
○ সমিতি-5
○ ব্যক্তি হতে সুদসহ-6
○ ব্যক্তি হতে সুদ ছাড়া-7
○ অনুদান-8
○প্রযোজ্য নয়-77
○ অন্যান্য-99

[২.৪ এ উত্তর 1 হলে প্রশ্ন ১৫.১-১৫.৫ পূরণ হবে; ২.৪ এ উত্তর 2 হলে প্রশ্ন ১৫.১-১৫.৫ পূরণ হবে না;]

১৫.১ ইউনিটের কাঁচামালের উৎস:
○ স্থানীয়-1 ○ বিদেশী-2 ○ উভয়-3

১৫.৪ উৎপাদিত দ্রব্যের বাজারজাতকরণ এলাকা:
○ সম্পূর্ণ স্থানীয়-1
○ সম্পূর্ণ রপ্তানী-2
○ স্থানীয় ও রপ্তানী-3

১৫.৫ উৎপাদনে কম্পিউটার/ তথ্য-প্রযুক্তির ব্যবহার হয় কি?
○ হ্যাঁ-1 ○ না-2

১৬. দ্রব্য/পণ্য স্থানীয় বাজারে বিক্রির ক্ষেত্রে বিক্রয় পদ্ধতি:
○ খুচরা-1
○ পাইকারি-2
○ উভয়-3
○ প্রযোজ্য নয়-77

১৭.১ ইউনিটটি ই-কমার্স বা অনলাইন ব্যবসায় সম্পৃক্ত কি?
○ হ্যাঁ-1 ○ না-2 ○ প্রযোজ্য নয়-77
১৯.১ ইউনিটে অগ্নিনির্বাপণ ব্যবস্থা আছে কি? ○ হ্যাঁ-1, ○ না-2, 2 ⇨ ২০.১

২০.১ ইউনিটে বর্জ্য ব্যবস্থাপনা (Waste Management) সম্পর্কিত কোনো কার্যক্রম আছে কি? [২.১: 1 হলে]
○ হ্যাঁ-1 ○ না-2

২০.২ প্রতিষ্ঠানটির পরিবেশগত ছাড়পত্র আছে কি?
○ হ্যাঁ-1 ○ না-2 ○প্রযোজ্য নয়-77

২০.৩ প্রতিষ্ঠানটির ফায়ার সার্ভিসের ছাড়পত্র আছে কি?
○ হ্যাঁ-1 ○ না-2

২২.১ ইউনিটের টিআইএন (ট্যাক্সপেয়ার আইডেন্টিফিকেশন নাম্বার) আছে কি?
○ হ্যাঁ-1 ○ না-2 ○প্রযোজ্য নয়-77

২২.২ ইউনিটটি ভ্যাট/মূসক (মূল্য সংযোজন কর) নিবন্ধিত কি?
○ হ্যাঁ-1 ○ না-2 ○প্রযোজ্য নয়-77

২২.৩ ইউনিটের বিআইএন (বিজনেস আইডেন্টিফিকেশন নাম্বার) আছে কি?
○ হ্যাঁ-1 ○ না-2 ○প্রযোজ্য নয়-77

APPENDIX C: SUPPLEMENTARY TABLES ON CONTENT ANALYSIS

Table C.1: Type of Establishments in the Economic Census and the PEC

Economic Census	PEC			
	Permanent Establishment	Temporary Establishment	Economic Household	Total
Permanent Establishment	27844	1171	1208	30224
Temporary Establishment	1131	1197	193	2523
Economic Household	2461	762	13056	16282
Total	31436	3130	14457	49023

Table C.2: Type of Economic Activity in the Economic Census and the PEC

	PEC		
Economic Census	Manufacturing	Service	Total
Manufacturing	1480	2837	4319
Service	1098	43608	44709
Total	2578	46445	49023

Table C.3: Legal Status of Economic Units in the Economic Census and the PEC

	PEC								
Economic Census	Private/solo	Partnership	Private Limited Company	Public Limited Company	Government	Autonomous	Non-profit (NGO)	Others	Total
Sole Proprietor	44,213	674	103	21	45	46	196	156	45,455
Partnership	581	174	33	0	4	2	15	21	832
Private Limited Company	73	14	65	24	1	2	5	10	197
Public Limited Company	20	8	39	24	11	3	1	0	110
Government	48	1	3	7	519	18	17	11	629
Autonomous	14	4	5	1	32	23	7	11	103
Non-profit (NGO)	253	142	19	41	32	49	767	185	1498
Others	66	17	2	5	13	25	54	48	329
Total	45,268	1,034	269	123	657	168	1,062	442	49,023

Table C.4: Registration Status of Economic Units in the Economic Census and the PEC

	PEC			
Economic Census	Registered	Unregistered	Not applicable	Total
Registered	13443	4604	301	18349
Unregistered	6600	19097	1791	27490
Not applicable	712	2121	354	3264
Total	20755	25822	2446	49023

Table C.5: Fire Safety Status of Economic Units in the Economic Census and the PEC

	PEC		
Economic Census	Have Fire Safety System	No Fire Safety System	Total
Have Fire Safety System	1176	1068	2245
No Fire Safety System	1828	44951	46781
Total	3004	46019	49023