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Suparna Pal

Sardar Patel Institute of Economic and Social Research (SPIESR), Ahmedabad

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Phone: +91-079-26850598, 26851428 | Fax: +91-79-26851714
e-mail: anvesak@spiesr.ac.in | website: www.spiesr.ac.in

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EMERGING PERSPECTIVES OF INTRA-INDUSTRY TRADE IN INDIA'S MANUFACTURING SECTOR

RIYA DAS[1]* AND AMIYA SARMA[2]
[1]*D.H.S.K. Commerce College, Dibrugarh, Assam, India*
[2]*Gauhati University, Guwahati, Assam, India*

Abstract: This study explored India's multilateral intra-industry trade trends, noting a substantial rise, especially since 2000s. A focused examination within specific industries identifies electronic and transportation commodity groups as the principal drivers of this escalating trend. The analysis centered on factors influencing India's intra-industry trade (IIT), emphasizing on revealed comparative advantage (RCA) and an outward-oriented trade policy. The RCA-IIT relationship unveils an inverted U-shaped curve. Significantly, a positive relationship emerges between IIT and an outward-oriented trade policy, highlighting the impact of trade liberalization on enhancing IIT. These findings hold crucial policy implications, indicating the role of trade liberalization initiatives in increasing IIT in India.

Keywords: Merchandise trade; Liberalization; Intra-industry trade (IIT); Revealed comparative advantage (RCA); Tariff; Manufacturing sector.

1. Introduction

The present global economic environment has intensified the interconnectedness of nations in terms of trade and financial relations, fostering a deeper integration among countries worldwide. Trade is now widely recognized as a critical component of such global integration process. The trend of globalization has increased the participation of both developed and emerging economies in international trade through backward and forward integrations, inflows of foreign investment, growth in global competitiveness, etc. Since 1960, almost every year, the growth rate of world trade has outpaced that of global output, with the overall increase in global trade volume being nearly three times bigger than that of global output (Kose et al., 2003). Aside from the tremendous spike in volume over the previous few decades, another key unusual trend in global trade is the shift in trade composition (Stone, 2021). Earlier, trading products between countries were vastly different from each other, both in terms of consumption and manufacturing processes. However, in recent decades, differentiated manufactured goods that are mostly substitutable have accounted for the

*Correspondence to: Riya Das, Assistant Professor, Department of Economics & International Business, D.H.S.K. Commerce College, Dibrugarh, Assam 786001, India. Email: riya@gauhati.ac.in

bulk of the increase in international trade. This type of trade is termed as "intra-industry trade" (IIT) and is defined as "the situation where countries simultaneously import and export what are essentially the same products" (Sodersten and Reed, 1999). For instance, Germany engages in a two-way trade relationship with France, exporting vehicles to the French market while simultaneously importing vehicles from France. This type of trade indicates that countries operate in a smaller form of specialization, specializing in a certain product within a given sector and trading these goods for other goods from the same industry.

It was empirically evidenced that intra-industry trade constitutes a substantial share of overall trade for the majority of countries, particularly among the developed nations, spanning a wide range of manufactured products. To begin with, studies conducted on the impact of European Economic Community formation on trade flows among the member countries prompted a great deal of interest in the concept of intra-industry trade. In an investigation of the product mix of trade between each pair of founding EEC members, Grubel and Lloyd (1975) found that 71% of the rise in trade among the EEC members was intra-industry. Bergstrand's (1982) survey of 18 industries in seven OECD nations found that the share of IIT in overall trade increased by 75% between 1965 and 1976.

Explanations of intra-industry trade commonly consider elements like product differentiation, economies of scale, monopolistic competition, oligopolistic behavior, and the operations of multinational corporations (Sodersten and Reed, 1999). As economists sought to develop more encompassing models to elucidate these trade dynamics, they delved into the domain of imperfect competition, leading to the emergence of what is widely known as 'new trade theories'.

There is a growing body of literature that underscores the linkage between the rising proportion of IIT and the increased net support resulting from trade liberalization (Lipson, 1982; Manger, 2012; Milner, 2013). As nations undergo economic expansion and embrace outward-focused strategies, new markets characterized by substantial demand for unique and specialized goods start to emerge. This trend catalyzes the evolution of advanced production capabilities within domestic market frameworks, enabling the manufacturing of a broad spectrum of commodities that facilitate intra-industry trade. Engaging in intra-industry trade empowers countries to specialize in distinct subsets of production, thereby improving overall efficiency and ensuring the optimal utilization of resources. This strategic approach not only fosters economic growth but also cultivates a diversified and competitive industrial landscape. For instance, in a cross-country regression analysis, Havrylyshyn and Civan (1985) found that IIT levels across counties are closely connected with per-capita GNP levels and product diversification.

India, a rapidly emerging nation, has a long history of active participation in foreign trade and has recently forged significant multilateral and bilateral commercial relationships with various economies. The process of economic liberalization, which commenced in the early 1980s and gained momentum during the 1990s, has led to substantial structural changes in India's foreign trade sector over the past few decades. Trade policy changes in the 1990s aimed to lessen the impact of quantitative restrictions and significantly lower tariff rates along the lines proposed by the tax reform committee led by Raja. J. Chelliah. The peak rate was reduced from 40% to 10% between 2000-01 and 2011-12, and the duty structure was also rationalized. As shown in Figure A1 in the Appendix, average tariff rates considerably decreased throughout the 1990s and the decades afterward.

After economic reforms in 1991, India's merchandise trade has experienced a notable upsurge, with significant acceleration, particularly since the early 2000s. Trade liberalization, as part of a series

of economic reforms implemented in 1991, prompted India to embrace outward-oriented trade policies. Between 1991 and 2022, the value of India's merchandise trade in absolute terms expanded significantly, rising from 37.41 billion to 1.18 trillion, or an increase of approximately 32 times, may be partly due to opening up of the Indian economy to the world market (see Figure A2 in the Appendix).

Furthermore, as the Indian economy continues its journey towards liberalization, it anticipates a transformation in the pattern of specialization, driven by a greater openness to competition. Trade liberalization is likely to result in a rationalization of the product lines selected by individual manufacturing plants. This rationalization, in turn, encourages the specialization in a subset of product lines within an industry, fostering the potential for intra-industry trade to emerge. To illustrate, when striving to attain economies of scale in manufacturing, it can become unfeasible to produce and export all the diverse varieties and components within a given sector. In cases where a sector's product lines exhibit distinct characteristics and can each be manufactured more efficiently as production scales up, a nation may opt to specialize in the production and export of a specific subset of these product lines to fulfill domestic demand. Simultaneously, it may find it advantageous to import product lines that are not produced domestically. For instance, Desai et al. (1999) observed that Indian machine tool companies have refined their product offerings by narrowing their range and adopting a strategy of vertical disintegration. They phased out the production of certain components and increasingly sourced them from foreign markets following the liberalization policies initiated in 1991. In this regard, Veeramani (2004) pointed out that the reallocation of resources within these firms, shifting them from less efficient to more efficient product lines, has been a significant and plausible consequence of liberalization in India. In essence, the post-liberalization process of streamlining product lines in the Indian economy is expected to yield significant outcomes. One such result involves the expansion of IIT, marked by the simultaneous presence of both exports and imports within a given industry. This paper undertakes a comprehensive analysis of India's IIT performance, from the onset of its economic liberalization to the latest trends. This is expected to fill a notable gap in the existing literature where analysis over such an extended time frame is rather sparse, to the best of our knowledge. Our objective is to assess the economic attributes of the country and evaluate their respective significance in this context.

The rest of this paper is structured as follows. Section 2 discusses the theoretical background of intra-industry trade and outlines the paper's objectives. Section 3 elaborates on the materials and methods employed. Section 4 provides a comprehensive analysis of India's intra-industry trade in the aftermath of its economic liberalization, and Section 5 concludes the paper.

2. Theoretical Premises

Traditional Ricardian and Hecksher-Ohlin trade theories were based on the idea that every sector would produce a single, homogenous good. According to these theories, each economy will specialize and export goods where it has a comparative advantage in the production or relative factor abundance, while importing products where it has a comparative disadvantage. As a result, trade between the nations occurs in commodities belonging to different industries. Since no commodities from the same industry are traded back and forth, this kind of trade represents the case of inter-industry trade. In 1965, Bela Balassa introduced the concept of Revealed Comparative Advantage (RCA), providing an empirical framework to measure comparative advantage. RCA enabled the analysis of extensive datasets, offering insights into trade patterns (Fertö and Hubbard 2003; Serin and Civan 2008). Many economists recognize the significance of this concept not only as a theoretical framework but also as a practical tool for shaping economic policies. However, traditional theories

fall short of describing the trade in similar products known as intra-industry trade. Empirical studies in the 1960s and 1970s however highlight that a significant portion of world trade can be defined as IIT, which has prompted a large number of new theoretical models that attempt to explain this new trade phenomenon. In the late 1970s, several models were proposed in the context of New Trade Theory to investigate trade in similar goods across nations.[1] Unlike the Hecksher-Ohlin model of inter-industry trade, the intra-industry trade model established how mutually beneficial trade can occur in differentiated products belonging to the same industries.

The phenomenon of intra-industry trade was first noted empirically with the trading behaviour of the European Common Market (see Balassa, 1966; Grubel, 1967). Later, Grubel and Lloyd, (1971) developed an index called GL-index to compute IIT and demonstrated that IIT is a pure phenomenon. The foundational models that aimed to elucidate IIT, pioneered by Dixit and Stiglitz (1977), Krugman (1980, 1981), and Lancaster (1980) emphasized the importance of horizontal product differentiation, economies of scale, and the demand for variety within the framework of monopolistic competition. In contrast, Falvey (1981) presented a vertically differentiated trade model that does not rely on increasing returns to scale or imperfectly competitive markets. This model illustrates how varying factor intensities can be used to produce goods of differing qualities within the same industry, with the pattern determined by traditional relative factor abundance. Economists such as Flam and Helpman (1987) and Davis (1995) asserted that the theoretical underpinnings of vertical IIT can be effectively elucidated by employing traditional trade models like Ricardo's comparative advantage model and the Heckscher-Ohlin models. Thus, Falvey's model came to be known as the "Neo-Heckscher-Ohlin model".

While conventional idea suggests a dichotomy between intra-industry trade and comparative advantage theory, Lancaster (1980) argues that, in the case of IIT, there exists a subtle influence of comparative advantage, with Ricardian theory reflecting natural comparative advantage, whereas intra-industry trade serves as an exposition of acquired comparative advantage. Over an extended period, many of the newly emerging international trade theories have shown a sustained interest in exploring the intricate connection between comparative advantages and intra-industry trade. Faustino (2008) asserted that the vertical IIT model can be elucidated through the conventional Heckscher-Ohlin framework. Within the context of the vertical product differentiation model, the study assumed a positive correlation between IIT and RCA. Notably, the research revealed compelling evidence of an inverted-U relationship, indicating a quadratic association between IIT and RCA. Das et al. (2016), in their research, systematically investigate this relationship within the context of trade between ASEAN-6 countries and India. Their analysis delved beyond a simple linear assessment, encompassing an examination of whether changes in the rate of RCA correspond to shifts in Intra-industry trade. Their findings ultimately reveal a distinctive left-skewed pattern or positive skew in the actual relationship between IIT and RCA. Their observation suggests that India's IIT with the ASEAN+5 region experiences a notably accelerated growth rate when initial RCA values are relatively low.

In the realm of international trade, intra-industry trade has gained increasing significance, particularly in the exchange of manufactured goods among industrially developed countries. The advantages accruing to nations engaged in IIT are manifold. Balassa (1966) emphasized that industries exhibiting high levels of intra-industry trade undergo fewer structural changes in the post-liberalization period compared to those marked by low IIT levels. Essentially, the adjustment costs

[1] In contrast to the ideal competition and constant return-to-scale emphasized by the Ricardo and H-O model, new trade theories take into account monopolistic competition with increasing returns-to-scale.

associated with IIT-type trade are lower than those observed in inter-industry trade, as found in the studies carried out by Brülhart and Elliott (2002), Brülhart et al. (2006), and Greenaway and Milner (1986). Analyzing data from 22 high-income countries and 20 middle-income countries, spanning from 2001 to 2017, Sheidaei (2022) identified a bidirectional relationship between welfare gains from trade and intra-industry trade efficiency. Intra-industry trade not only reduces unit costs and allows production units to focus on a few product varieties and styles, but it also greatly benefits consumers by offering a diverse range of goods and services.

Since the early 1980s, many authors have conducted methodological and empirical studies in different countries to examine the nature and determinants of intra-industry trade. According to a study conducted by Havrylyshyn and Civan (1985), the IIT for developed countries is higher than for developing countries. In essence, theoretical studies on IIT have primarily focused on "advanced" economies, and empirical evidence on "emerging" economies like India has been sparse. However, in the past few decades, especially following economic reforms, there has been a growing body of research focusing on the trend in India's intra-industry trade indices. Notably, empirical research on India's manufacturing sector underscores the significance of two-way trade in differentiated goods, particularly in the context of trade liberalization (see Veeramani, 2001; Veeramani, 2003; Burange and Chaddha, 2008; Bagchi and Bhattacharyya, 2021). Veeramani (2001) looked at changes in the volume of multilateral IIT between several periods such as 1987-1988, 1994-1995 and 1998-1999 so as to comprehend the effects of trade liberalization on IIT. He saw a general rise in intra-industry trade in the post liberalization process, supporting the claim that "trade liberalization biases trade expansion towards intra-industry trade in the Indian context". Between 1987-1988 and 2005-2006, Burange and Chaddha (2008) conducted a study that investigated the influence of liberalization on the growth of India's overall multilateral IIT as well as the growth of IIT in relation to various nation groupings. They discovered that India's IIT grew from 23.48 per cent in 1987-88 to 32.09 per cent in 2005-06. Furthermore, they found that throughout the whole research period, 16 out of a total of 21 product divisions showed above-average growth rates. They discovered that the primary contributors to the expansion of India's intra-industry trade across the various regions were manufacturers. In light of this, they came to the conclusion that it is a glaring indication of India's expanding capacity to produce similar items through certain manufacturers, as the economy progresses on the road of liberalization.

The above highlights the growing importance of intra-industry trade throughout the world. While early studies predominantly concentrated on developed countries, there is a growing, albeit limited, body of research examining developing nations. Addressing this gap, this study focuses on the manufacturing sectors, aiming to assess India's intra-industry trade performance since the liberalization period. The research also aims to analyze the factors influencing India's intra-industry trade within the framework of comparative advantage and an outward-oriented trade policy in the manufacturing sector. Specifically, the study is guided by the following objectives.

a. To analyze the trend and pattern of India's multilateral IIT after economic liberalization since the 1990s.
b. To investigate the sector specific level of IIT and to evaluate possible relation between IIT and Comparative Advantage across diverse sectors in India.
c. To examine the relationship between India's degree of economic openness and its level of IIT

3. Materials and Methods

The study relies on trade data categorized according to the Harmonized System (HS), which classifies

items into distinct product categories. Secondary data regarding India's imports and exports with the rest of the world have been sourced from UN-Comtrade. Economic indicators, such as weighted average tariff rates, have been extracted from the available World Bank dataset.

3.1 Measurement of IIT

The Grubel and Lloyd's (1971) index is one of the first to be widely used in the literature to measure the degree of intra-industry trade. The formula for the GL-index, which determines the country's IIT share in its overall trade in a given industry *q*, is as follows:

$$GL_{qk} = \frac{\{(X_{qk}+M_{qk})-|X_{qk}-M_{qk}|\}}{(X_{qk}+M_{qk})}.100 \quad (1)$$

Here, GL_{qk} denotes the Grubel and Lloyd (1971) index of the industry *q* (at HS 4-digit level) and stands for the export value of industry *q* by home country to partner country *k* and the import value of industry *q* from partner *k* to home country, respectively.[2] The numerator of the ratio, which is calculated as the difference between the home country's total trade with partner *k* (i.e., $X_{qk} + M_{qk}$) and the absolute value of their net trade (i.e., $|X_{qk} - M_{qk}|$), actually represents the home country's intra-industry trade with trade partner *k* in industry q. So, the GL_{qk} indicates a country's proportion of IIT of industry q in overall trade with partner k. The GLI_{qk} equals 100 when all trade is intra-industry trade, i.e., when an industry's exports are equal to its imports. GL_{qk} becomes 0 when there is no IIT. As a result, as the extent of IIT rises, the index of IIT takes on values ranging from zero to 100, i.e., $0<GL_{qk}<100$. The weighted average is used to obtain the average share of IIT of all industry in country's total trade with partner k, and it is defined by the following formula:[3]

$$GL = \frac{\sum_{q=1}^{n}(X_{qk}+M_{qk})-\sum_{q=1}^{n}|X_{qk}-M_{qk}|}{\sum_{q=1}^{n}(X_{qk}+M_{qk})}.100 \quad (2)$$

Thus, equation 2 gives the average share of IIT in *n* industries as a percentage of the overall merchandise trade in a nation with country *k*. However, equation 2 is not an appropriate measure if the nation's total merchandise trade is imbalanced (surplus or deficit) with its trading partner and, therefore, is downward biased for measuring the degree of IIT. To overcome this issue, Grubel and Lloyd (1975) suggested another method which adjust the index by subtracting the total trade imbalance from total amount of trade in the denominator, defined as:

$$AGL = \frac{\sum_{q=1}^{n}(X_{qk}+M_{qk})-\sum_{q=1}^{n}|X_{qk}-M_{qk}|}{\sum_{q=1}^{n}(X_{qk}+M_{qk})-|\sum_{q=1}^{n}X_{qk}-\sum_{q=1}^{n}M_{qk}|}.100 \quad (3)$$

Here, IIT is measured in terms of total balanced trade between home and partner countries rather than total trade between the countries, and in this way, G-L claims to have addressed the downward bias of its earlier version (Vona, 1991).

In light of India's persistent trade deficit, as illustrated in Figure A2 in the Appendix, and recognizing the limitations associated with using an unadjusted G-L index in the presence of such a trade imbalance, this study employs both unadjusted and adjusted G-L indices, as determined by

[2] In the case of a multilateral IIT, the partner country is the rest of the world.

[3] The weight is determined by the proportion of trade in a particular industry in the total trade of all industries.

equations 2 and 3, to quantify the level of India's aggregate multilateral intra-industry trade.

It should be noted that *AGL* only applies to aggregate trade flows and has no counterpart at the industry level. Furthermore, when for all q either Xq surpasses Mq or falls short of it, irrespective of the magnitude of these trade imbalances, AGL = 100 (for more detail, see Grubel and Lloyd,1975). Therefore, for industry level analysis, we rely on equation 2.

3.2 Measurement of RCA

As a proxy for traditional theory, Balassa (1965)'s revealed comparative advantage (RCA) index has been calculated for the industry groups from 2001 to 2022. In ratio form, the index quantifies the extent to which a country's exports of a specific commodity, relative to its overall export volume, surpass the global exports of that same commodity relative to the total exports of all countries. The index is represented by the following formula:

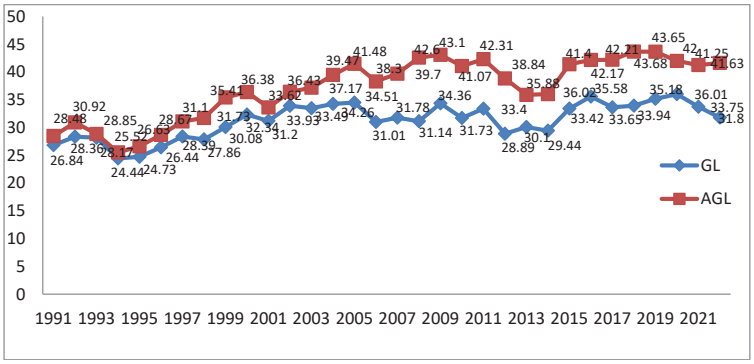
$$\mathrm{RCA_{ij}} = \frac{X_j^i / X_t^i}{X_j^w / X_t^w} \tag{4}$$

where 'X' denotes exports; 'i' signifies an individual country; and 'w' represents the overall global aggregate (summing all countries with available data). Subscripts 'j' and 't' refer to a specific commodity and all traded commodities, respectively. According to this index, a country 'i' exhibits a comparative advantage (or disadvantage) in product 'j' when the index exceeds (or falls below) unity.

4. India's Intra-Industry Trade

To calculate the extent of India's intra-industry trade, this study considers items classified under the 4-digit level of the Indian trade classification (ITC-HS) of industries. Figure 1 presents the computed values of both the GL and AGL indices, derived from equations (2) and (3), respectively, spanning the years 1991 to 2022. This graphical representation illustrates India's overall intra-industry trade with the rest of the world. The chosen time frame encompasses intra-industry trade patterns from the post-reform period to the most recent trend, offering a comprehensive analysis over a substantial time period. The analysis for such a prolonged time period is rather sparse, to the best of our knowledge.

Figure 1: India's Intra-Industry Trade with Rest of the World



Source: Authors' computation using UN Comtrade data

At the aggregate level, India's intra-industry trade (IIT) exhibited a fluctuating trend. Both indices demonstrated a consistent upward trajectory from the mid-1990s to the early 2000s, propelled by the impactful liberalization policies implemented by India and heightened competitiveness in

certain industries. However, the period between 2006 and 2014 witnessed higher fluctuations, likely influenced by the repercussions of the global financial crisis of 2008. Despite these fluctuations, a steady upward trend has emerged since 2015, indicative of a resilient recovery and potential shifts in India's trade dynamics. It is important to note that the AGL Index has consistently been higher than the GL Index, and the trade imbalance adjustment factors in the AGL Index appear to smooth out some of the volatility seen in the GL Index. Overall, the AGL index climbed from 28.48 per cent to 41.63 per cent between 1991 and 2022. In other words, despite huge increase in India's trade integration with the rest of the world, the country's overall IIT growth has been moderate. Nevertheless, the trend of the AGL index suggests that the degree of intra-industry trade registered higher values in recent years compared to the early period of economic reforms, with the highest index value of 43.65 registered in 2019.

The above findings accord with theoretical studies, suggesting a substantial growth in intra-industry trade throughout the post-liberalization period, a pattern consistent with prior studies such as Veeramani (2001) and Burange and Chaddha (2008). Growing intra-industry trade has often been linked to higher competitiveness, innovation, and increased specialization. Consequently, the observed pattern in India's trade dynamics to some extent reflects the nation's effective integration into global markets, underscoring the positive impact of economic liberalization policies. This observed growth serves as an indicator of enhanced competitiveness, specialization, and efficiency gains across diverse industries. For a more comprehensive analysis, we proceed to calculate the commodity group-specific share of intra-industry trade in manufacturing sector. This step will allow for a detailed examination of the evolving dynamics within distinct industries.

Table 1: Commodity-wise IIT

Commodity Groups	2003-06	2007-10	2011-14	2015-18	2019-22
Food Products (HS16-24)	15.30	18.77	25.76	44.28	31.02
Minerals (HS25-27)	15.44	12.98	5.94	7.66	9.85
Chemicals (HS28-38)	43.55	42.04	47.12	47.61	45.94
Plastic & Rubber (HS39-40)	58.67	54.5	51.96	53.32	50.53
Raw Skins (HS41-43)	16.28	12.78	12.71	20.23	23.43
Wood Products (HS44-49)	24.66	26.62	25.64	29.12	33.48
Textile (HS50-63)	14.73	16.16	16.75	20.64	22.30
Footwear (HS64-670	9.49	12.16	14.89	22.68	23.84
Stone (HS68-71)	52.31	44.3	47.18	50.15	46.98
Metals (HS72-83)	49.19	44.76	46.47	47.69	42.04
Electronics (HS84,85)	41.26	45.46	50.14	44.64	52.37
Transportation (HS86-89)	33.5	48.11	57.78	56.46	51.46
Miscellaneous (HS90-97)	41.04	44.96	48.53	49.59	50.72

Source: Authors' computation

Table 1 provides a comprehensive overview of India's intra-industry trade share across various sectors. Most commodity groups show a general uptrend in intra-industry trade, with Electronics, Transportation, and Miscellaneous notably standing out for having consistently significant and

increasing shares. This positive trend reflects India's growing integration into the global market, driven by specialization and advanced manufacturing in these key industries. Despite decreasing shares, Metals, Plastic & Rubber, and Stone maintain important roles, prompting the need for strategic responses to global competition in these industries. Stable shares in the Chemical sector and consistent growth in Wood Products indicate steady demand and adaptability. Traditional sectors like Food Products experience moderate shares with substantial growth until 2015-18, followed by a decrease, suggesting changing consumer dynamics. However, low and stable shares in Minerals, Raw products, Textile, and Footwear reveal challenges in achieving high specialization or global competitiveness. The increasing yet modest shares of Textile and Footwear hint at growth opportunities, emphasizing the need for targeted strategies to enhance competitiveness. These trends highlight the significance of economic diversification, strategic policymaking, and industry-specific initiatives to navigate India's evolving landscape of intra-industry trade.

In the following sections, we analyze factors influencing India's IIT, specifically focusing on Revealed Comparative Advantage (RCA) and India's outward-oriented trade policy. This analysis aims to offer valuable insights into India's IIT landscape. The RCA is derived from a country's export data for a particular product in comparison to the global export of that same product, offering insights into the country's comparative advantage. Thus, it is worth emphasizing that while IIT reflects the actual trade dynamics of India, RCAs serve as indicators for potential trade. Examining the IIT in the context of RCA will provide a linkage between new and traditional trade theories. Additionally, it is vital to assess whether the outward-oriented trade policy has contributed to increased IIT levels. This will help in offering pertinent policy suggestions for enhancing IIT across diverse industries.

4.1 Comparative Advantage and IIT: Traditional and New Trade Theories

A few studies have delved into the factors influencing IIT in the context of RCA Index (see Faustino, 2008; Das et al., 2016). These studies argue that the comprehensive understanding of IIT necessitates consideration of both traditional and new trade theories. Rather than assuming a simple linear relationship between IIT and RCA, these studies contend that a more insightful analysis involves examining whether the rate of change in IIT is contingent upon the rate of change in RCA. According to their conceptualization, the increase in RCA may initially lead to a corresponding increase in IIT up to a certain threshold. However, beyond this point, the studies posit that IIT might experience a decline. This conceptual framework aligns IIT with RCA in a quadratic form, hinting at the presence of an inverted-U-shaped curve in their relationship.

The explanation for this inverted U-shaped relationship between Intra-Industry Trade (IIT) and Revealed Comparative Advantage (RCA) lies in the dynamics of production and market competition. Initially, when the IIT index is low, it signifies a situation with limited product market competition, attributed to a lack of innovation in production processes. In such a context, companies differentiate their products primarily through pricing, and the role of quality differentiation is diminished. This sets the stage for trade dynamics influenced by traditional theories, resulting in a positive correlation between IIT and RCA. However, in the long term, technological advancements and increased innovation often lead to the emergence of new production processes. As time progresses, the knowledge of a competitor's production process becomes more widely known within the industry. Consequently, the comparative advantages based on technologies among producers lose their sustainability. In a market offering a diverse array of choices among similar products, the significance of horizontal differentiation intensifies.

In line with the theoretical studies, our analysis constructs an approach wherein IIT is considered a function of RCA, incorporating a positive first derivative. This accounts for the observed phenomenon that as RCA increases, IIT concurrently rises. Additionally, IIT is assumed as a function of the square of RCA, introducing a negative second derivative to express the notion that IIT experiences a decline after reaching a critical inflection point. We assume that this relationship can be represented by the following equation.

$$lnIIT = \beta_0 + \beta_1 lnRCA_{it} + \beta_2 (lnRCA_{it})^2 + \mu_{it} \quad (5)$$

IIT and RCA have been computed for different commodity groups from 2001 to 2022 using equations (2) and (4), respectively. In examining the relationship, we focus exclusively on industry groups demonstrating notably significant IIT value. Consequently, our analysis encompasses a total of nine industry groups: Food Products (HS16-24), Chemical (HS28-38), Plastics & Rubbers (HS39, 40), Wood (HS44-49), Stone & Glass (HS68-71), Metals (HS72-83), Machinery & Mechanical Appliances (HS84, 85), Transport Equipment (HS86-89), and Miscellaneous (HS90-97).[4] The corresponding values of IIT and RCA for these nine industry groups have been shown in Tables A1 and A2, respectively, in the appendix.

We employ a panel Tobit model to appropriately capture the characteristics of the relationship. The rationale for selecting this model is grounded in the nature of the IIT index, defined to exist within a constrained range between zero and one. To facilitate elasticity estimation, we transform the variables into natural logarithmic form. Specifically, when applying logarithms to the index, a positive lnRCA signifies comparative advantages, while a negative lnRCA indicates comparative disadvantages.

Subsequently, we derive the outcomes through the application of a panel Tobit model. For comparative analysis, we also employ a random effect panel model. While the results from both approaches exhibit similarity across all aspects, however, the Tobit model produces more robust results. Furthermore, the panel Tobit model demonstrates a higher chi-square value, indicating its suitability and goodness of fit. The detailed estimation results are provided in Table 2.

Table 2: Regression Results of IIT and RCA Relationship

Model	Dependent Variable	Constant	lnRCA	$(lnRCA)^2$	Wald Statistic	Log-Likelihood
Panel Tobit	lnIIT	3.788	.113	-.059	14.15***	22.77
Model		(41.09)***	(2.05)**	(-2.00)**		
Random Effect	lnIIT	3.786	.114	-.059	13.76***	_
Panel Model		(35.46)***	(2.00)**	(-1.98)**		

Notes: Number of observations = 198. *** statistical significance at the 1% level; **statistical significance at the 5% level.

Table 2 presents findings from two statistical models exploring the relationship between RCA and IIT in manufacturing sectors of India. In both the models—i.e., the Panel Tobit Model and the Random Effect Panel Model—the coefficient for lnRCA, representing RCA, is statistically significant, indicating its influence on IIT.

Specifically, the positive coefficient values (0.113 and 0.114) suggest that as RCA increases, so does intra-industry trade, implying that industries where a country has a comparative advantage tend to engage more in intra-industry trade. However, the negative coefficients for the squared term of

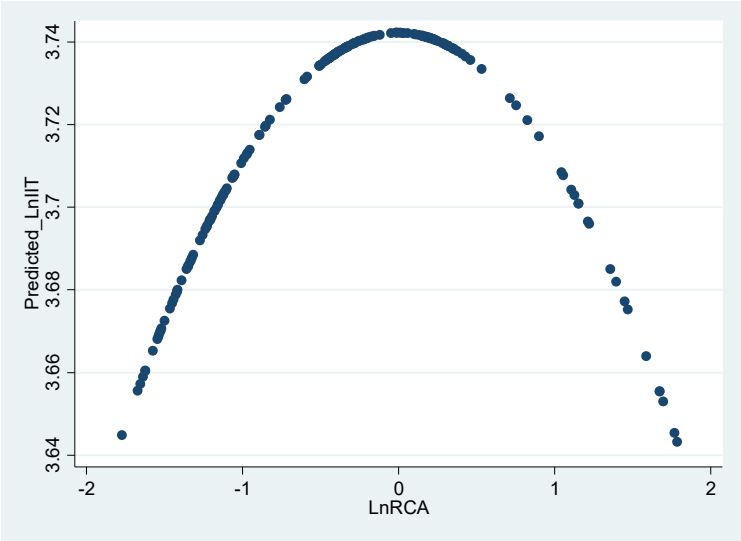
[4] These nine industry groups collectively represent approximately 55% of India's total merchandise trade.

lnRCA (-0.059 in both models) indicate a diminishing effect as RCA rises, suggesting a nonlinear relationship. This implies that while RCA positively influences IIT, this effect diminishes as the RCA increases after reaching a peak, supporting the idea of an inverted U-shaped relationship between IIT and RCA. This finding aligns with prior research, as demonstrated by Faustino (2008) and Das et al. (2016).

Moreover, the significant Wald statistic values (14.15 and 13.76) for both models reinforce the overall validity and reliability of the observed relationships between RCA and IIT. These findings provide valuable insights into the dynamics of intra-industry trade within India's manufacturing sectors, highlighting the importance of comparative advantage in driving trade pattern.

Utilizing the derived coefficients for total IIT, we compute the anticipated lnIIT values for a graphical exploration of the relationship. This involves plotting the estimated lnIIT values along the vertical axis against the actual lnRCA values along the horizontal axis.

Figure 2: RCA and Projected Value of IIT



Source: Authors' estimations

Figure 2 illustrates the relationship as per our estimations. The plot-fit validation supports our hypothesis of an inverted-U relationship between the two variables, i.e., lnIIT and lnRCA. This suggests that India's natural logarithm of IIT in selected commodity groups experiences an increase for initial values of lnRCA when lnRCA values are relatively low. Furthermore, the lnIIT peaks when lnRCA is zero, and subsequently decreases as lnRCA values increase.

The identified relationship carries significant implications for India's IIT, particularly in commodity groups like transportation and electronics, which consistently exhibit significant and increasing shares. This trend could serve as a crucial driver for India's heightened participation in global production networks, particularly considering the nature of intra-industry trade, where involvement at various production phases is pivotal for these industries. Despite this significance, these commodity groups face a comparative disadvantage, and though their RCA values are increasing, the growth rate is relatively slow. This suggests the need for critical initiatives aimed at

boosting exports in these industries, with the potential to enhance RCA levels. Moreover, in line with the observed relationship between RCA and IIT, these sectors present untapped opportunities to further enhance Intra-Industry Trade, as their RCAs have not yet reached the threshold level (defined as an RCA value equal to one, based on our estimations). Consequently, encouraging government initiatives, such as a stronger focus on innovation, technological advancements, foreign direct investment (FDI), and fostering an outward-oriented economy, become imperative to increase RCA values and subsequently enhance the level of Intra-Industry Trade. These measures may also help overcome any ceiling constraints in IIT flows as measured by RCA.

As previously discussed, a rising level of intra-industry trade (IIT) can be linked to a nation's adoption of liberalization and outward-oriented trade policies. In line with existing literature and our own estimates, which indicate a noticeable increase in India's IIT, particularly during the post-liberalization period, the subsequent section delves into an examination of India's open trade policies as a determinant of its IIT levels. This investigation provides insights into whether trade liberalization policies are instrumental in augmenting overall IIT and the level of IIT across different industries in India.

4.2 India's Economic Liberalization and IIT

In this section, our focus is on evaluating the relationship between India's IIT and outward-oriented trade policies. We rely on economic attribute of tariff rates to assess their respective significance as determinants of India's overall IIT.

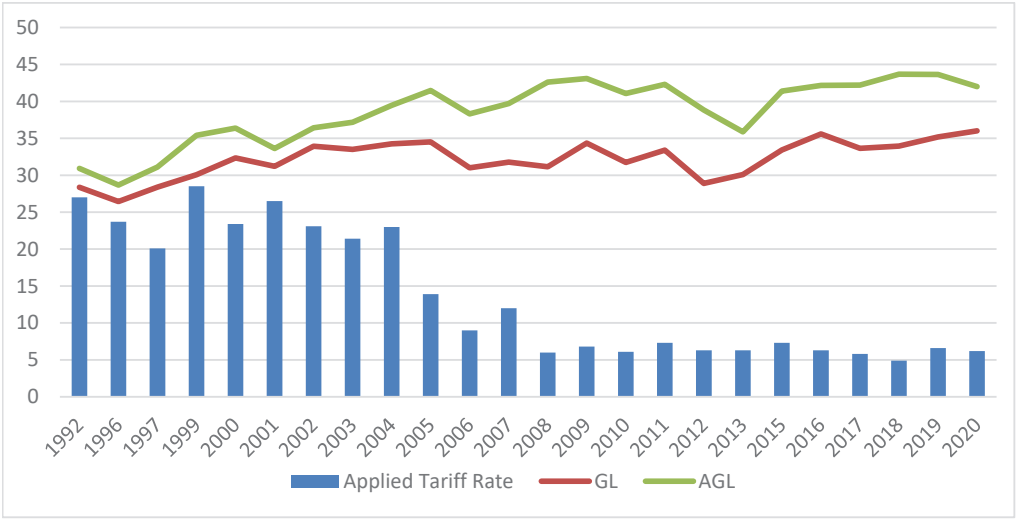
To examine whether India's trade liberalization and subsequent drop in tariff rates had any impact on intra-industry trade, the trend of weighted mean tariff rates, GL, and AGL are graphically shown. Then the correlation coefficient between the movement of weighted mean tariff rates and the degree of IIT was determined to provide more insight into the analysis.

Figure 3 presents a comparison of the trends in both the GL and AGL indices with changes in the weighted average tariff rates. Due to the absence of tariff data for every year spanning from 1991 to 2022, only the years in which the tariff data were available have been taken into consideration. Looking at Figure 3, it can be realised that the effect of decreasing tariff rates on the degree of IIT is relatively clearer more on AGL than on GL index. Initially decrease in weighted average tariff did not help in increasing the degree of IIT rather the degree of IIT decreased. But there was a noticeable increase in AGL during the mid-2000s, and during the same period, the applied tariff rate decreased significantly, suggesting a possible inverse relationship where lower tariffs coincided with a higher degree of IIT. Overall, AGL exhibits relatively higher values in the later years, albeit with some fluctuations. Meanwhile, tariff rates during the same period showed slight fluctuations but remained consistently lower than in the initial years.

For cross examination of the results in Figure 3, the effect of tariff rates on IIT degrees has again been analyzed using the correlation coefficient. Since theoretically it was believed that tariff reductions should encourage intra-industry trade, the correlation coefficient between the two is expected to be negative. Table 3 summarizes the results.

The analysis of correlation in Table 3 indicates that both the Grubel-Lloyd Index and the adjusted Grubel-Lloyd Index are negatively and significantly correlated with the weighted average tariff rates. Notably, the strength of the negative correlation is more pronounced for the adjusted Grubel-Lloyd Index, and the statistical significance of this correlation is notably higher when compared to the unadjusted Grubel-Lloyd Index. From the analysis, it can be inferred that India's intra-industry trade increases as a result of the fall in weighted average tariff rates, and this relationship is statistically robust for both indices.

Figure 3: Trends in GL, AGL and Tariff Rate



Source: Authors' computation using World Bank and UN Comtrade Datasets

Table 3: Correlation Coefficient between Weighted Average Tariff Rates and the Degree of GL and AGL

	Grubel-Lloyd Index	Adjusted Grubel-Lloyd Index
Correlation coefficient with weighted average tariff rates	-0.405**	-0.780***
Sig.	0.049	0.00001
Number of Observations	24	24

Source: Authors' computation from World Bank and UN Comtrade datasets. ** = significant at 95% CI and *** = significant at 99% CI.

Therefore, the findings from the above correlation analysis suggest that trade liberalization, which resulted in a subsequent reduction in tariff rates has contributed to the relatively higher degree of intra-industry trade over the last two decades. This suggests the importance of economic liberalization in shaping India's trade dynamics and intra-industry specialization across various sectors.

5. Conclusions

The importance of international trade in driving economic development has grown significantly across all countries worldwide. Although the concept of intra-industry trade emerged relatively late in the literature, it has steadily gained a larger share in the overall volume of trade. Following the initiation of economic reforms in 1991, India has witnessed a remarkable surge in its merchandise trade. With the anticipation of a corresponding rise in intra-industry trade, this study endeavors to analyze the trends and patterns in India's multilateral intra-industry trade. Our findings reveal that India's intra-industry trade levels have increased significantly in the post-liberalization period, especially with rapid acceleration since the 2000s. In our analysis, we focus on unraveling the intricate relationship between IIT and RCA across diverse commodity groups in India. The estimated

results align with prior studies, revealing a positive correlation between IIT and RCA until a critical threshold is reached, beyond which a negative relationship takes effect. A noteworthy observation in this context is that while the majority of commodity groups experienced an overall increase in IIT levels over the years, sectors such as transportation and electronics exhibited consistently significant and increasing IIT values. This stands out as a pivotal component in fostering the growth of the Indian economy, given the nature of IIT within these sectors, where multi-phase production plays a pivotal role. Importantly, these particular commodity groups still have untapped potential for further elevating IIT, as their RCA values have not yet reached the upper threshold. Consequently, export initiatives in these industries, aimed at improving RCA values, seems to be instrumental in enhancing IIT levels. Additionally, our analysis extended to investigating the relationship between India's liberalization policies—indexed by tariff rates—and intra-industry trade levels. Our findings reveal a positive association between liberalization initiatives and the level of IIT. Consequently, our analysis leads to the conclusion that both export initiatives, especially in industries with RCA values below one, and open trade policies are critical factors in augmenting India's IIT. Export promotion measures not only contribute to enhancing RCA values across commodity groups but also play a vital role in elevating IIT levels. Simultaneously, a more outward-oriented trade policy might be fruitful, propelling IIT levels to a new height across sectors, signaling heightened competitiveness, innovation, and specialization within India.

About the authors

Riya Das is an Assistant Professor at the Department of Economics and International Business, D.H.S.K. Commerce College, Dibrugarh, Assam, India. **Dr. Amiya Sarma** is an Associate Professor at the Department of Economics, Gauhati University, Guwahati, Assam, India.

References

Bagchi, S. and S. Bhattacharyya (2021), "Industry-level Determinants of India's Vertical and Horizontal IIT", *Indian Economic Review*, 56(1): 113-145.

Balassa, B. (1965), "Trade Liberalisation and "Revealed" Comparative Advantage", *The Manchester School*, 33(2): 99-123.

Balassa, B. (1966), "Tariff Reductions and Trade in Manufacturers among the Industrial Countries", *American Economic Association*, 56(3): 466-473.

Bergstrand, J.H. (1982), "The Scope, Growth, and Causes of Intra-lndustry International Trade", *Federal Reserve Bank Boston, WrzesieD/Pazdziernik*, 45-61.

Brülhart, M. and R.J. Elliott (2002), "Labour-market Effects of Intra-industry Trade: Evidence for the United Kingdom", *Weltwirtschaftliches Archiv*, 138(2): 207-228.

Brülhart, M., R.J. Elliott and J. Lindley (2006), "Intra-industry Trade and Labour-Market Adjustment: A Reassessment Using Data on Individual Workers", *Review of World Economics*, 142(3): 521-545.

Burange, L. and S.J. Chaddha (2008), "Growth In India' S Intra-Industry Trade", *Working Paper UDE 24/2/2008*, Department of Economics, University of Mumbai.

Das, R.U., M. Rishi and J.D. Dubey (2016), "ASEANi Plus Six and Successful FTAs: Can India Propel Intra-industry Trade Flows?", *Journal of Developing Areas*, 39-57.

Davis, D.R. (1995), "Intra-industry Trade : A Heckscher-Ohlin-Ricardo Approach", *Journal of International Economies*, 39: 201-226.

Desai, A.V., M. Lautier and H. Charya (1999), "Machine Tool Industries in India and Chinese Taipei: A Comparison". In *Competition, Innovation and Competitiveness in Developing Countries*, Krieger Mytelka Lynn (ed.), pp. 33-76, OECD.

Dixit, A.K. and J.E. Stiglitz (1977), "Monopolistic Competition and Optimum Product Diversity", *American Economic Review*, 67(3): 297-308.

Falvey, R.E. (1981), "Commercial Policy and Intra-Industry Trade", *Journal of International Economics*, 11(4): 495-511.

Faustino, H.C. (2008), "Intra-Industry Trade and Revealed Comparative Advantage: An Inverted-U Relationship". https://aquila1.iseg.ulisboa.pt/aquila/departamentos/EC

Fertö, I. and L.J. Hubbard (2003), "Revealed Comparative Advantage and Competitiveness in Hungarian Agri-food Sectors", *World Economy*, 26(2): 247-259.

Flam, H. and E. Helpman (1987), "Vertical Product Differentiation and North-South Trade", *American Economic Review*, 77(5): 810-822.

Greenaway, D. and C. Milner (1986), *The Economics of Intra-Industry Trade*, Blackwell.

Grubel, H.G. (1967), "Intra-Industry Specializtion and the Pattern of Trade", *Canadian Journal of Economics and Political Science*, 33(3): 374-388.

Grubel, H.G. and P.J. Lloyd (1971), "The Empirical Measurement of Intra-Industry Trade", *Economic Record*, 47(4): 494-517.

Grubel, H.G. and P.J. Lloyd (1975), "Intra-Industry Trade : The Theory and Measurement of International Trade in Differentiated Products", New York: John Wiley.

Havrylyshyn, O. and E. Civan (1985), "Intra-Industry Trade among Developing Countries", *Journal of Development Economics*, 18(2-3): 253-271.

Kose, M.A., E.S. Prasad and M.E. Terrones (2003), "How Does Globalization Affect the Synchronization of Business Cycles?", *American Economic Review*, 93(2): 57-62.

Krugman, P. (1980), "Scale Economies, Product Differentiation, and the Pattern of Trade", *American Economic Review*, 70(5): 950-959.

Krugman, P. (1981), "Intraindustry Specialization and the Gains from Trade", *Journal of Political Economy*, 89(5): 959-973.

Lancaster, K. (1980), "Intra-Industry Trade under Perfect Monopolistic Competition", *Journal of International Economics*, 10(2): 151-175.

Lipson, C. (1982), "The Transformation of Trade: The Sources and Effects of Regime Change", *International Organization*, 36(2): 417-455.

Manger, M.S. (2012), "Vertical Trade Specialization and the Formation of North-South PTAs", *World Politics*, 64(4): 622-658.

Milner, C. (2013), "Trade Liberalization and Specialization in Manufactured Goods". In *Structural Change in the World Economy*, Allan Webster and John H. Dunning (eds.), Routledge.

Serin, V. and A. Civan (2008), "Revealed Comparative Advantage and Competitiveness: A Case Study for Turkey towards the EU", *Journal of Economic and Social Research*, 10(2): 25-41.

Sheidaei, Z. (2022), "Intra-Industry Trade Efficiency and Gains from Trade 'Evidence from High- and Middle-Income Countries"', *SN Social Sciences*, 2(10): 213.

Sodersten, B. and G. Reed (1999), *International Economics*, Macmillan,

Stone, L.L. (2021), *The Growth of Intra-Industry Trade: New Trade Patterns in a Changing Global Economy*, Routledge.

Veeramani, C. (2001), "India's Intra-Industry Trade under Economic Liberalization: Trends and Country Specific Factors", *Working Paper* 313, Thiruvananthapuram: Centre for Development Studies.

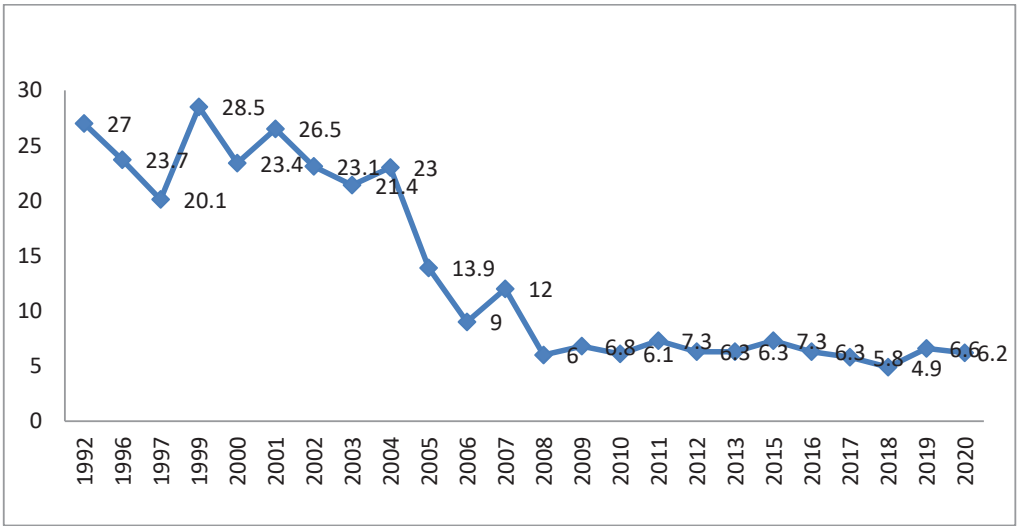
Veeramani, C. (2003), "Liberalisation Policy, Industry-specific Factors and IIT in India", *Working Paper* 97, Thiruvananthapuram: Centre for Development Studies.

Veeramani, C. (2004), "Growing Intra-Industry Trade in Manufacturing Implications for Policy", *Economic and Political Weekly*, 39(41): 4556-4559.

Vona, S. (1991), "On the Measurement of Intra-Industry Trade: Some Further Thoughts", *Weltwirtschaftliches Archiv*, 127(4): 678-700.

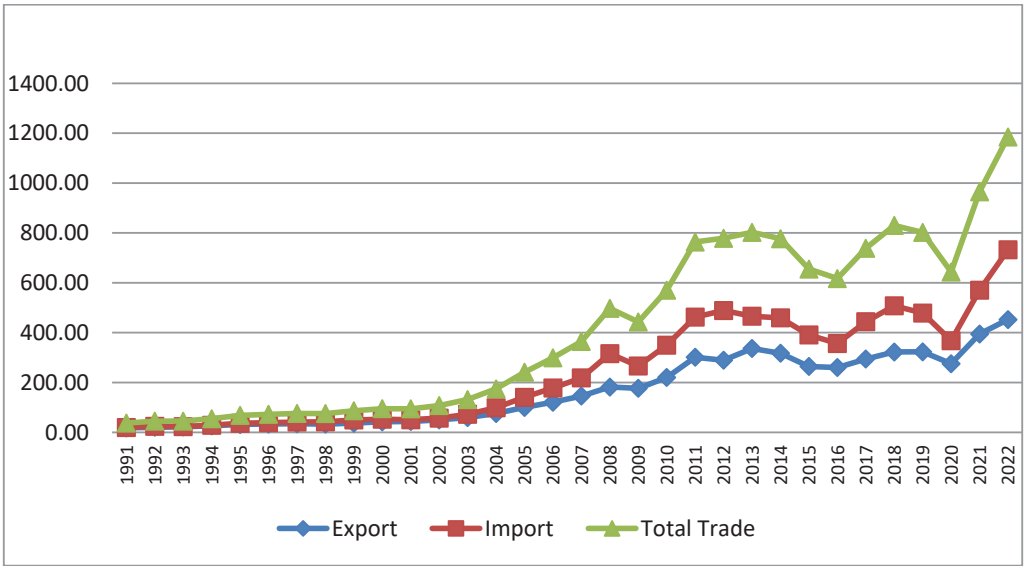
APPENDIX

Figure A1: Weighted Mean Tariff Rates



Source: World Bank

Figure A2: India's Merchandise Trade with RoW (in Billion)



Source: UN Comtrade

Table A1: IIT in Select Manufacturing Sectors, 2001-2022

Year	HS16-24	HS28-38	HS39-40	HS44-49	HS68-71	HS72-83	HS84-85	HS86-89	HS90-97
2001	12.77	40.47	51.21	21.16	54.61	42.82	51.64	38.83	38.6
2002	13.01	42.38	49.85	23.23	57.49	45.33	45.17	37.7	39.2
2003	13.23	44.65	51.35	22.47	56.62	46.92	43.13	31.6	39.86
2004	17.06	44.6	59.09	22.64	55.55	53.84	41.77	37.06	40.79
2005	18.18	42.25	63.48	26.37	54.39	46.37	40.65	35.64	39.93
2006	12.72	42.69	60.76	27.16	42.68	49.64	39.5	29.69	43.57
2007	11.67	44.39	57.18	24.75	39.16	47.38	39.54	51.4	43.21
2008	11.2	36.23	59.45	26.51	45.48	45.52	46.05	38.83	43.85
2009	14.39	43.53	51.47	27.00	47.07	46.46	50.3	52.36	46.71
2010	37.84	44.02	49.89	28.21	45.45	39.69	45.97	49.85	46.08
2011	15.99	45.65	52.76	25.94	47.22	46.11	49.51	55.27	46.97
2012	25.59	46.94	47.69	24.75	42.77	44.31	49.11	64.22	46.85
2013	25.61	48.55	59.18	26.48	48.76	47.56	53.4	57.18	50.41
2014	35.85	47.33	48.22	25.39	49.95	47.89	48.56	54.46	49.9
2015	39.96	44.99	50.71	29.82	46.97	47.38	44.66	59.16	49.22
2016	48.21	46.5	52.5	28.19	53.16	48.97	45.05	60.9	51.81
2017	47.59	49.91	52.26	27.97	49.07	45.62	43.57	52.76	47.81
2018	41.35	49.03	57.81	30.49	51.39	48.8	45.3	53.01	49.52
2019	32.91	48.64	55.85	32.32	48.62	45.72	50.81	50.35	52.01
2020	36.43	46.53	57.56	34.60	50.01	40.62	50.89	53.81	52.38
2021	30.55	45.6	49.93	32.19	43.37	38.79	52.4	54.87	46.75
2022	24.20	43.01	38.78	34.80	45.92	43.03	55.38	46.81	51.76

Source: Authors' computation from UN-Comrade

Table A2: RCA in Select Manufacturing Sectors, 2001-2022

Year	HS16-24	HS28-38	HS39-40	HS44-49	HS68-71	HS72-83	HS84-85	HS86-89	HS90-97
2001	0.81	1.197	0.667	0.197	5.324	1.058	0.230	0.197	0.280
2002	0.822	1.173	0.711	0.255	5.853	1.195	0.219	0.194	0.295
2003	0.823	1.160	0.718	0.191	5.966	1.370	0.242	0.239	0.293
2004	0.808	1.139	0.817	0.207	5.452	1.347	0.234	0.299	0.346
2005	0.679	1.169	0.748	0.223	5.327	1.336	0.249	0.349	0.318
2006	0.985	1.238	0.754	0.216	4.346	1.372	0.268	0.346	0.302
2007	1.034	1.185	0.632	0.213	4.254	1.256	0.284	0.364	0.297
2008	1.271	1.218	0.628	0.217	3.392	1.289	0.325	0.547	0.259
2009	0.656	0.999	0.484	0.197	4.896	1.012	0.377	0.602	0.241
2010	0.822	1.102	0.557	0.217	4.030	1.353	0.307	0.682	0.241
2011	0.838	1.026	0.608	0.214	3.889	0.952	0.323	0.675	0.236
2012	0.886	1.256	0.623	0.259	3.025	1.116	0.328	0.643	0.259

Contd...

Table A2 contd...

Year	HS16-24	HS28-38	HS39-40	HS44-49	HS68-71	HS72-83	HS84-85	HS86-89	HS90-97
2013	0.794	1.232	0.646	0.262	2.457	1.161	0.313	0.660	0.257
2014	0.667	1.226	0.601	0.264	2.871	1.197	0.299	0.805	0.266
2015	0.66	1.380	0.639	0.314	3.171	1.208	0.311	0.742	0.292
2016	0.662	1.414	0.66	0.319	3.363	1.164	0.320	0.707	0.325
2017	0.64	1.409	0.668	0.307	3.171	1.427	0.330	0.716	0.300
2018	0.648	1.498	0.779	0.380	3.083	1.214	0.385	0.713	0.324
2019	0.692	1.586	0.756	0.438	2.839	1.231	0.427	0.725	0.332
2020	0.849	1.70	0.772	0.424	2.040	1.457	0.41	0.722	0.349
2021	0.857	1.425	0.705	0.487	2.285	1.534	0.409	0.721	0.345
2022	0.984	1.321	0.681	0.467	2.123	1.264	0.485	0.692	0.371

Source: Authors' computation from UN-Comrade

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CONVERGENCE OF GREENHOUSE GASES IN SOUTH ASIA

SWATI SINHA BABU*
Sidho-Kanho-Birsha University, Purulia, West Bengal, India

Abstract: This study examines convergence with regard to principal anthropogenic green house gases (GHGs), i.e., carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) emissions for selected Asian countries. Beta convergence (both conditional and unconditional) and sigma convergence methods have been employed to understand the issue of convergence among the selected countries covering the time period of 1990-2022. Employing Poirier's (1974) spline function approach, we have estimated the growth rate of GHGs over three decadal periods 1990-1999, 2000-09 and 2010-22 for each country individually. Results of beta convergence indicate convergence with respect to all the emissions. Sigma convergence result also confirms the same. Spline function results show that the growth rates of all the GHGs has declined for majority of the countries in the last decade, i.e., 2010-2022.

Keywords: Convergence, Beta, Sigma, Asian countries, Spline function, Green house gases

1. Introduction

It is undeniable that the world's economy has grown by leaps and bounds in the last few decades. There has been rapid growth in the manufacturing sector, the agricultural sectors and other allied sectors simultaneously. This growth is much needed too, keeping in view of the consumption demands of the world's ever growing population. But, one aspect of this expanding production and consumption levels is its impact on the environment. Of late, there is a growing concern worldwide regarding the environmental pollution and degrading/ depleting nature of current production techniques and practices. The relationship between population growth, rising GDP and degradation/ depletion of natural resources has been elaborated by Ehrlich and Holdren (1971) in his famous expression I = PAT. Here, I is the impact on environment; P is the population growth rate; A is the affluence (measured by GDP growth); and T is the level of technology. Thus, increases in P, A or T will lead to increased detrimental impact/stress on the environment.

Studies have reported that increased usage of non-renewable energy sources particularly fossil fuels in manufacturing sector is associated with substantial emissions of GHGs, thereby having a huge bearing on environmental sustainability (Karakurt et al., 2012; UNIDO, 2018). Again, Pachauri et al. (2014) have also stated that agriculture, forestry and other land use activities are responsible for 24% of global greenhouse gases (GHGs) emissions, in which the share of methane (CH_4) and carbon dioxide (CO_2) are 30% and 49%, respectively.

*Correspondence to: Swati Sinha Babu, Assistant Professor of Economics, Sidho-Kanho-Birsha University, Purulia, West Bengal 723104, India. Email: swatisinhababu@rediffmail.com.

Further, increased production levels have been found to be directly linked with environmental degradation in the form of increased GHG emission (Ansuategi and Escapa, 2002; Vavrek and Chovancova, 2016). Moreover, it has been observed that rising population density is highly correlated with the total GHG emissions; and the greater the population density, the higher the rate of GHG emissions (Setiawan et al., 2014).

The present study focuses on eight selected Asian countries—Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan and Sri Lanka—which comprise the South Asian region. South Asia is one of the world's most climatic vulnerable region and is beset with problems of poverty, impoverishment, political instability, high population and social backwardness. To overcome these problems, the countries have adopted several developmental projects and have aimed at achieving higher growth rates. However, while the goals of reducing poverty and socio-economic upliftment are laudable, the achieved higher growth rates are often at the expense of depleting the environmental resources which is detrimental to the cause of sustainability. The countries of the region are growing at a remarkable rate (average 8.2 % in 2021) with Maldives experiencing 41.7% annual GDP growth rate, Nepal experiencing 4.2 % annual GDP growth rate, Bangladesh with 6.9% GDP growth rate, India with 9.1 % growth rate, and Pakistan with 5.70% growth rate in the region. However we also have Sri Lanka with growth rate of 3.50%, and Bhutan that has experienced the lowest GDP growth rate of -3.3 % in the region (World Bank, 2021). Thus we see that some economies of the region are relatively less developed. These variations may be due to disparity in their patterns of structural transformations across the countries.

Again, India is the third highest emitter of greenhouse gas emissions in the world, and released 2,310 megatons of GHGs in 2019. China (9,877 million tons) and United States (4,745 million tons) hold the first and the second positions, respectively (World Bank, 2021), while Bhutan and Maldives emit considerably low levels of GHGs. Figures A1, A2 and A3 in the Appendix show the per capita CO_2, N_2O and CH_4 emissions by the considered countries of the Asian region for the period 1990-2022, respectively. Thus, it will be interesting to study whether these economies—though having different growth rates, pollution/emission levels and varying levels of development—are arriving at some convergence with respect to three principal anthropogenic greenhouse gases, i.e., carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). Examination of previous studies provide conflicting conclusion regarding convergence of CO_2 emissions and results vary depending on the level of analysis, country type and method used. This investigation of Asian countries is likely to yield additional insights into the convergence process, because these countries are more likely to have similar steady-state conditions than when countries of more heterogeneous cohorts from different regions are considered.

Against this backdrop, the objectives of the study are as follows.

(1) To examine the presence of beta convergence (both conditional and unconditional) using fixed effects model and sigma convergence of green house gases, among the selected countries covering the time period 1990-2022.

(2) To estimate the growth rate of green house gases over three decadal periods 1990-1999, 2000-09 and 2010-22 for each country individually by employing Poirier's (1974) spline function approach. The contribution of the study is threefold as follows.

(i) We find few empirical studies on convergence analysis involving Asian countries and no study that exclusively involves countries of the South Asian region.

(ii) Again, convergence has been mostly studied with respect to income and CO_2 emissions

but not for pollutants like CH_4 and N_2O emissions. But CH_4 and N_2O emissions have a higher radiative forcing compared to CO_2 and therefore have huge implications for global warming and climate change. The empirical findings will yield additional insights and are particularly important for formulating mitigation policies across these countries.

(iii) Estimation of the growth rate of green house gases will provide us with an understanding of the trend of the green house gases over different decades. This is important because the region is known to be the most disaster prone region in the world making it particularly vulnerable to the impacts of climate change.

The rest of the paper is organised in the following manner. Section 2 provides an overview of the existing literature. Theoretical background of convergence analysis has been provided in Section 3. Methodology is given in Section 4. Results are presented in Section 5 and Section 6 provides the conclusions.

2. Literature Review

There is an enormous volume of literature on the per capita income convergence across countries and regions. Prior studies on income convergence of developing countries have mainly used cross-section and panel estimation methods (Khan and Kumar, 1993; Easterly and Levin, 1997; Murthy and Ukpolo, 1999; Ferreira, 2000; Yao and Zhang, 2001; Dobson and Ramlogan, 2002). Sala-i-Martin (1996a, 1996b) has observed convergence in Japan, among OECD countries, states in the US and regions in Europe. Persson (1997) confirmed the convergence hypothesis in case of Sweden, while Ferreira (2000) reported regional convergence in Brazil. Nagaraj et al. (2000) and Choi and Li (2000) have identified convergence in case of India and China, respectively. Again, Khan and Kumar (1993) have tested the convergence hypothesis among 95 developing countries in Africa, Asia, Europe (including the Middle East) and Latin America.

We also find studies investigating the environmental degradation convergence hypothesis using different indicators such as carbon dioxide emissions, ecological footprint, green house gases etc. Focussing on studies on convergence particularly in the last decade we find Runar et al. (2017) tested convergence across 124 countries for carbon dioxide emissions over the period 1985-2010. They used parametric and non-parametric methods and found evidence in support of beta convergence for the entire sample. Using the Wavelet unit root test Ahmed et al. (2017) investigated the convergence in CO_2 emissions across 162 countries over 1960-2010. They revealed existence of stochastic convergence for 38 countries. Tiwari and Mishra (2017) also observed β and α convergence across 18 Asian countries in CO_2 emissions for the period 1972-2010. Churchill et al. (2018) employed RALS-LM unit root tests to study convergence process of carbon dioxide emissions in 44 countries over 1900-2014 and found conditional convergence across countries.

Again, there are studies that do not confirm convergence hypothesis. Barassi et al. (2008) employed stationarity and unit root tests, taking into account cross-sectional dependencies within the panel to test for convergence of CO_2 in 21 OECD countries for the period 1950-2002. They did not find evidence of convergence among OECD countries during the period. Lin et al. (2018) examined convergence in CO_2 emissions per capita for G18 countries over the period 1950-2013. They used unit root tests but did not observe convergence. Using unit root tests and stochastic Kernel distribution, Kounetas (2018) also did not find convergence in CO_2 emission per GDP and other variables, in case of 23 European countries for the period 1970-2010.

In recent years, Ulucak et al. (2020) have examined convergence using club convergence approach in ecological footprint across 23 sub-Saharan countries over 1961-2014. Similarly,

Apaydin et al. (2021); Erdogan and Okumus (2021); and Tillaguango et al. (2021) have also tested convergence in ecological footprint across different countries. Their results indicate the presence of several convergence clubs across countries.

Regarding convergence of greenhouse gases, studies have been conducted by de Oliveira and Bourscheidt (2017), Wu et al. (2019), Apergis and Garzon (2020) and Ivanovski and Churchill (2020). de Oliveira and Bourscheidt (2017) have tested for the convergence of per capita greenhouse gas emissions in 39 sectors of 40 countries for the time period 1999-2007. Wu et al. (2019) have failed to obtain convergence among 30 provinces of China over 2007-2016 using beta and sigma convergence. However, Apergis and Garzon (2020) found evidence of club convergence for greenhouse gas emissions across the 19 regions of Spain over the period 1990-2017 using the Phillips-Sul methodology. While testing the convergence process of three greenhouse gas emissions; carbon dioxide, nitrous oxide, and methane emissions among regions in Australia over 1990to 2017 Ivanovski and Churchill (2020) identified multiple convergence clubs. The results show that there is a convergence in CO_2 for the agriculture, food, non-durable goods manufacturing, and services sectors. But again, El-Montasser et al. (2015) did not confirm convergence in their study involving G-7 countries. They used the pairwise test method and the period covered was from 1990 to 2011.

3. Theoretical Background of Convergence Analysis

Convergence analysis is based on the neoclassical growth theory. The neoclassical growth theory predicts convergence in the form that economies with lower capital-labour ratio tend to grow faster than the economies with higher capita-labour ratio, provided they are similar with respect to their tastes and preferences, and technology. According to the neoclassical growth theory this inverse relationship between the initial level of per capita income and its growth rate is due to the existence of decreasing returns to scale in capital (here capital includes all types of capital considered in the model). Thus, the lower the initial level of per capita income, the higher the growth rate of per capita income. We find a considerable number of studies based on this neoclassical growth framework that have examined the issue of income convergence across regions and countries (Barro and Sala-i-Martin, 1992; Baumol, 1986; Cashin and Sahay, 1996; De Long, 1988; Mankiw et al., 1992, among others).

Pollution convergence hypothesis, which is the central issue of our paper, has been formally addressed, at theoretical level by Brock and Taylor (2004) with the help of a 'Green Solow Model'. Green Solow model is a neoclassical growth model with labour-augmenting technical progress, where the saving rate and the propensity to spend in abatement are exogenously fixed. The Brock and Taylor (2004) Green Solow model and its implications have been discussed in the next section.

3.1 The Green Solow Model

Brock and Taylor (2004, 2010) have used the Green Solow model to predict convergence in emissions per capita across countries. The model provides a theoretical structure to the growth-environment relationship and enables establishing testable connection between theory and empirical work. The theory explains how differences in savings rates, abatement intensities and population growth rates affect emission growth rates. It also provides explanation for the existence of convergence in emission across developed and developing countries even in the absence of Kyoto agreement. The study by Brock and Taylor (2010) has developed an augmented Solow model where exogenous technological progress in both goods production and abatement leads to continual growth with rising environmental quality. They have further assumed a fixed savings rate (s) and abatement intensity which helps in explaining how changes in the intensity of abatement caused by changes in

environmental policy, impact emission levels and the turning point. Adopting a one sector Solow model with a strictly concave production function and constant returns to scale, the production function can be written as:

$$Y = f(K, BL) \text{ ----------} \quad (1)$$

$$\dot{K} = sY - \delta K \text{ ----------} \quad (2)$$

$$\dot{L} = nL \text{ ----------} \quad (3)$$

$$\dot{B} = g_B B \text{ ----------} \quad (4)$$

Here, K is capital which accumulates via savings and depreciates at rate δ. BL is the effective labour. The rate of labour augmenting technological progress is given by g_B, B is the labour augmenting technological progress and n is population growth.

Following Copeland and Taylor (1994), to capture the impact of pollution, it is assumed that every unit of economic activity, F, generates **Ω** units of pollution. Further, assuming abatement to be a constant returns to scale activity, the pollution amount abated is an increasing and strictly concave function of the total economic activity F and the economy's efforts at abatement F^A. Thus, if abatement at level A lowers pollution by **Ω**A units, then net pollution can be expressed as:

$$E = \Omega F - \Omega A(F, F^A) \text{ ----------} \quad (5)$$

$$E = \Omega F - [\,1 - A(1, F^A/F)] \text{ ----------} \quad (6)$$

$$E = \Omega F a(\theta) \text{ ----------} \quad (7)$$

where $a(\theta) = [\,1 - A(1, F^A/F)]$ and $\theta = F^A/F$. And $a(0) = 1$; $a'(\theta) < 0$; and $a''(\theta) > 0$ (by concavity).

In the presence of abatement, the output available for consumption or investment Y becomes:

$$Y = [\,1 - \theta]\, F \text{ ----------} \quad (8)$$

Transforming the measures of output, capital and pollution into intensive forms, we can write them as:

$$y = f(k)\,[1 - \theta] \text{ ----------} \quad (9)$$

$$\dot{k} = sf(k)\,[\,1 - \theta] - [\,\delta + n + g_B]k \text{ ----} \quad (10)$$

$$e = f(k)\,\Omega\, a(\theta) \text{ ----------} \quad (11)$$

where k = K/BL, y = Y/BL, e = E/BL and f(k) = f(k, 1).

As Solow model's exogenous technological progress in goods production raises effective labour at rate g_B, it is assumed that exogenous technological progress in abatement lowers Ω at rate g_A, where $g_A > 0$.

Further, assuming that the Inada conditions apply for F, with fixed θ, the economy converges to a unique k* starting from any $k(0) > 0$. As the economy reaches its steady state output, consumption and capital all grow at the same rate $g_B + n$, while their per capita magnitudes grow at rate g_B and thus, we have $g_y = g_k = g_c = g_B > 0$.

The growth rate of aggregate emissions g_E along the balanced growth path can be expressed as $g_E = g_B + n - g_A$ ---------- (12)

The first term $(g_B + n)$ in Eq(12) portray the scale effect of growth on emission and the second term represents the technique effect arising from technological progress in abatement.

Now, at any point of time, t, the emission per capita can be written as:

$$e^c(t) = E(t)/L(t) \text{ ----------} \quad (13)$$

and income per capita as:

$$y^c(t) = F(t)\,[1-\theta] / L(t) \text{ ----------} \quad (14)$$

From Eq(11), we can express $e^c(t)$ as:

$$e^c(t) = \Omega(t)\, a(\check{\theta})\, y^c(t), \text{ where } a(\check{\theta}) = a(\theta)/[1-\theta] \text{ ----------} \quad (15)$$

Differentiating Eq(14) with respect to time gives us

$$\dot{e}^c / e^c = -g_A + \dot{y}^c / y^c \text{ ----------} \quad (16)$$

Thus, we see that growth in emissions per capita is the sum of technological progress in abatement plus growth in income per capita. In order to transform Eq(16) into an estimating equation, first the growth rate of income per capita and emissions per capita over a discrete time period of size N is expressed as their average log changes and written as:

$$[1/N] \log[e^c_t / e^c_{t-N}] = -g_A + [1/N] \log[y^c_t / y^c_{t-N}] \text{ ----------} \quad (17)$$

Next, the growth rate of income per capita is expressed in the form of log linearization to obtain

$$[1/N] \log[y^c_t / y^c_{t-N}] = b - [\{1 - \exp(-\lambda N)\}/N] \log[y^c_{t-N}] \text{ ----------} \quad (18)$$

where b is constant and $\lambda = [1 - \alpha][n + g_B + \delta]$ is the speed of convergence towards k* akin to the Solow model.

Finally, Eq(18) is substituted into Eq(17) to obtain a simple linear equation relating emissions per capita across i countries (over a discrete period of length N) to a initial period emissions per capita. Thus,

$$[1/N] \log[e^c_{it} / e^c_{it-N}] = \beta_0 + \beta_1 [1/N] \log[e^c_{it-N}] + \mu_{it} \text{ ----------} \quad (19)$$

where β_0 is a constant and $\beta_1 = -[\{1 - \exp(-\lambda N)\}/N] < 0$.

Here, the negative sign associated with β_1 implies that the growth rate of emissions per capita will fall with higher initial period emissions per capita. Thus, the Green Solow model predicts convergence of emissions per capita across countries.

In the single cross-section analysis, Eq(18) and Eq(19) are estimated based on the assumption that production structure does not vary across countries and is rather the same for all countries. However, this assumption leads to the problem of omitting the unobserved effects, which makes the estimators imprecise. Further, it may also give rise to the problem of endogeneity. Therefore, it has been suggested by several researchers to use panel data analysis to partial out country and year fixed effects (Islam, 1995; Caselli, 1996). Considering the advantages of using panel data analysis, we have analysed the existence of convergence using panel regression techniques.

4. Methodology

4.1 Data Source

Data has been collected for 33 years from 1990-2022. Data for greenhouse gases—Carbon dioxide (CO_2) per capita, Nitrous oxide (N_2O) per capita, and methane (CH_4) per capita—for selected countries have been obtained from the Emissions Database for Global Atmospheric Research (EDGAR v7.0).[1]

Table 1 presents the detailed information about the considered variables (GHGs) that includes definitions, symbols and units adopted.

[1] Available at https://edgar.jrc.ec.europa.eu/dataset_ghg70.

Table 1: Variables and Definitions

Variable	Symbol	Definition	Unit adopted
Methane emission per capita	CH_4	Methane emissions stemming from Agriculture Buildings, Fuel Exploitation, Industrial Combustion, Power Industry, Transport, Wastes, and Processes.	t CO2eq CH4 / cap / year
Nitrous oxide per capita	N_2O	N_2O emissions include sources such as Agriculture Buildings, Fuel Exploitation, Industrial Combustion, Power Industry, Transport, Wastes, and Processes.	tCO2eq N2O / cap / year
Carbon dioxide per capita	CO_2	CO_2 emissions include sources like Agriculture Buildings, Fuel Exploitation, Industrial Combustion, Power Industry, Transport, Wastes, and Processes.	tCO2 / cap / year

4.2 Beta Convergence

To test the convergence hypothesis, we have used parametric regression with the assumption that cross-country growth is linear with identical rate of convergence across countries. The parametric estimate of the coefficient of the pollutant (P) values in the initial year under reference decides the presence/absence of convergence (Baumol, 1986; Barro and Sala-i-Martin, 1992). If the value of the obtained coefficient is negative, then we can confirm convergence.

To obtain the growth rate of each pollutant, a semi-logarithmic trend equation is fit for each of the considered country in the following form:

$\ln(P)_i = a + b\ t$, whereby the fact that $d\ln(P)_i/dt = b$ indicates the growth rate of value of the pollutant (P) for the respective country.

Next, the growth rate of pollutant for each of the country is regressed on the pollutant values in the initial year under reference. The parametric panel data model with country-specific fixed effects is specified as:

$$d\ln(P)_i/dt = \alpha + \beta \ln(P)_{i0} + u_i + v_{it}$$

where t = 1, 2, ……..33; and i = 1, 2,….9.

The individual effects, u_i, are fixed effects and are allowed to be correlated with $\ln(P)_{i0}$. To compute the fixed effects the time period has been divided into three decadal panels namely from 1990-2000, 2001-2010 and 2011-2022. The error term, v_{it}, is assumed to be i.i.d. with zero mean and finite variance. It is also mean-independent of $\ln(P)_0$, which implies that $E(v_{it} / \ln(P)_0) = 0$.

By adding some more variables in the regression, we get the conditional convergence. Here, population growth rates have been added to refer to conditional convergence.

4.3 Sigma Convergence

Sigma convergence method tests whether the dispersion of pollution tends to decrease over time. This primarily involves studying the trend of the standard deviation of pollution across countries.

Standard deviation of pollution within a group of economies (i = 1,2,3…....N) is calculated by the coefficient of variation (CV) of ln (P), where

$$CV = \Sigma\ [\ln (P)_{it} - \mu_t]^2 / N\ .\ (1/\ \mu)\ .100.$$

Here, μ_t is the sample mean of the ln(P). If CV declines over an interval of time, we can confirm sigma convergence.

4.4 Estimation of Decadal Growth Rates

Spline function method introduced by Poirier's (1974) has been employed to derive the growth rate of pollutants over three decadal periods 1990-1999, 2000-09 and 2010-22. This will help us to analyse the trends of the emissions in the three decades.

Here, a linear time trend is assumed and the model is postulated as:

$$\left.\begin{array}{ll} \text{Period 1:} & y_t = \alpha_1 + \beta_1 t + u_t \qquad 1990 < t \leq 1999 \\ \text{Period 2:} & y_t = \alpha_2 + \beta_2 t + u_t \qquad 1999 < t \leq 2009 \\ \text{Period 3:} & y_t = \alpha_3 + \beta_3 t + u_t \qquad 2009 < t \leq 2022 \end{array}\right\} \text{----------(20)}$$

If three separate regressions are performed for the three periods, the result would look like Figure A4 shown in the Appendix. Instead, if we use a linear spline or piece-wise linear function that eliminates instantaneous jumps or discontinuities in the function at the 'knots', the result would be like Figure A5 (see Appendix). The linear spline may be fitted in the following way.

The function is given as:

$W_{1t} = t$

$$W_{2t} = \begin{cases} 0 & \text{if } t \leq 2000 \\ t - 2000 & \text{if } 2000 < t \end{cases}$$

$$W_{3t} = \begin{cases} 0 & \text{if } t \leq 2010 \\ t - 2010 & \text{if } 2010 < t \end{cases}$$

The function is re-parametised as:

$$y_t = \alpha_1 + \delta_1 w_{1t} + \delta_2 w_{2t} + \delta_3 w_{3t} + u_t \quad \text{.....} \quad (21)$$

Comparing equations 20 and 21, we get:

$$\left.\begin{array}{l} \beta_1 = \delta_1 \\ \beta_2 = \delta_1 + \delta_2 \\ \beta_3 = \delta_1 + \delta_2 + \delta_3 \end{array}\right\} \text{.....} \quad (22)$$

Comparison of the values of β_1, β_2 and β_3 derived on the basis of estimation of the parameters in Eq(21) helps in analysing the increase/decrease in pollution in the three sub-periods considered in the analysis.

5. Results

Table 2 shows the descriptive statistics of the greenhouse gases including mean, median, maximum value, minimum value and standard deviation for the selected Asian countries.

Table 2: Descriptive Statistics of Greenhouse Gases

Descriptive Statistics of CO_2								
	AFGHANISTAN	**BANGLADESH**	**BHUTAN**	**INDIA**	**NEPAL**	**MALDIVES**	**PAKISTAN**	**SRILANKA**
Mean	0.153	0.346	1.127	1.250	0.208	2.706	0.847	0.684
Median	0.143	0.294	0.847	1.120	0.143	2.610	0.865	0.669
Maxi	0.397	0.661	2.420	1.910	0.516	5.610	1.070	1.130
Mini	0.039	0.125	0.336	0.690	0.058	0.402	0.603	0.245
Std. Dev.	0.097	0.177	0.603	0.417	0.151	1.548	0.120	0.262
Obs.	33	33	33	33	33	33	33	33

Contd...

Table 2 contd...

Descriptive Statistics of CH_4								
	AFGHANISTAN	**BANGLADESH**	**BHUTAN**	**INDIA**	**NEPAL**	**MALDIVE**	**PAKISTAN**	**SRILANKA**
Mean	0.153	0.346	1.127	1.250	0.208	2.706	0.847	0.684
Median	0.143	0.294	0.847	1.120	0.143	2.610	0.865	0.669
Maxi	0.397	0.661	2.420	1.910	0.516	5.610	1.070	1.130
Mini	0.039	0.125	0.336	0.690	0.058	0.402	0.603	0.245
Std. Dev.	0.097	0.177	0.603	0.417	0.151	1.548	0.120	0.262
Obs.	33	33	33	33	33	33	33	33
Descriptive Statistics of N_2O								
	AFGHANISTAN	**BANGLADESH**	**BHUTAN**	**INDIA**	**NEPAL**	**MALDIVES**	**PAKISTAN**	**SRILANKA**
Mean	0.119	0.132	0.251	0.161	0.165	0.067	0.248	0.098
Median	0.116	0.132	0.243	0.158	0.162	0.068	0.244	0.097
Maxi	0.163	0.141	0.299	0.181	0.192	0.118	0.296	0.121
Mini	0.090	0.120	0.213	0.143	0.145	0.025	0.214	0.085
Std. Dev.	0.017	0.006	0.026	0.011	0.014	0.026	0.022	0.007
Obs.	33	33	33	33	33	33	33	33

Table 3 shows the results of the Ng-Perron unit root test at level and at first difference. From the results, it can be seen that although all the variables display trends, they are stationary after first difference. We employed the Ng-Perron test to check stationary as Ng-Perron test is more powerful and more suggestive than the traditional PP test and ADF test for small sample size. The ADF test is unreliable for small samples (DeJong et al., 1992; Harris and Sollis, 2003).

Table 3: Ng-Perron Unit Root Test

CO_2 Emissions				
Level	**MZa**	**MZt**	**MSB**	**MPT**
Afghanistan	-6.18860*	-1.74995*	0.28277*	3.98811*
Bangladesh	0.72454	0.48718	0.67240	33.3891
Bhutan	0.50531	0.34364	0.68007	32.6228
India	-4.81298	-1.32064	0.27439	5.55764
Nepal	1.86891	1.42133	0.76051	49.8030
Maldives	0.20880	0.14585	0.69853	32.0803
Pakistan	-1.14437	-0.61578	0.53810	16.4775
Srilanka	-0.51600	-0.34343	0.66556	25.3904
First Difference	MZa	MZt	MSB	MPT
D (Afghanistan)	-13.0740**	-2.55528**	0.19545**	1.87963**
D (Bangladesh)	-13.1963**	-2.56145**	0.19410**	1.88430**
D (Bhutan)	-15.2909*	-2.76267*	0.18067**	1.61115*
D (India)	-800.519*	-19.9996*	0.02498*	0.03527*
D (Nepal)	-15.0582*	-2.73412*	0.18157**	1.66379**
D (Maldives)	-13.0120**	-2.55042**	0.19600**	1.88391**
D (Pakistan)	-15.4948*	-2.60075*	0.16785*	2.24131**
D (Srilanka)	-15.4496*	-2.64490*	0.17120*	2.07630**

Contd...

Table 3 contd...

CH_4 Emissions				
Level	**MZa**	**MZt**	**MSB**	**MPT**
Afghanistan	-1.54704	-0.57849	0.37394	10.7028
Bangladesh	0.13665	0.11286	0.82595	41.4812
Bhutan	-4.21323	-1.32670	0.31489	5.97503
India	0.70145	0.74961	1.06866	73.6232
Nepal	-0.01204	-0.00781	0.64809	27.3005
Maldives	-0.99604	-0.41590	0.41755	12.9735
Pakistan	-0.68303	-0.36342	0.53207	18.0346
Srilanka	-1.60652	-0.84534	0.52619	14.3162
First Difference	**MZa**	**MZt**	**MSB**	**MPT**
D (Afghanistan)	-25.1897*	-3.54797*	0.14085*	0.97576*
D (Bangladesh)	-11.0213*	-2.31132*	0.20971*	2.36208*
D (Bhutan)	-32.5606*	-4.03455*	0.12391*	0.75344*
D (India)	-14.2928*	-2.61044*	0.18264**	1.94958**
D (Nepal)	-9.48016**	-2.17713**	0.22965**	2.58451**
D (Maldives)	-117.537*	-7.66373*	0.06520*	0.21246*
D (Pakistan)	-6.15983***	-1.72198***	0.27495***	4.08179***
D (Srilanka)	-13.6405**	-2.61005*	0.19135**	1.80189**
N_2O Emissions				
Level	**MZa**	**MZt**	**MSB**	**MPT**
Afghanistan	-1.07739	-0.41701	0.38706	11.9375
Bangladesh	0.72454	0.48718	0.67240	33.3891
Bhutan	-2.56376	-1.07108	0.41778	9.26542
India	-0.43335	-0.18303	0.42236	14.4796
Nepal	-0.01204	-0.00781	0.64809	27.3005
Maldives	-0.27164	-0.17944	0.66060	26.5617
Pakistan	-0.68303	-0.36342	0.53207	18.0346
Srilanka	-1.60652	-0.84534	0.52619	14.3162
First Difference	**MZa**	**MZt**	**MSB**	**MPT**
D (Afghanistan)	-14.9493*	-2.73396*	0.18288**	1.63895*
D (Bangladesh)	-15.1466*	-2.74377*	0.18115*	1.64821*
D (Bhutan)	-14.8560*	-2.72149*	0.18319**	1.66401*
D (India)	-13.8643**	-2.63096*	0.18976*	1.77452*
D (Nepal)	-9.48016**	-2.17713**	0.22965**	2.58451**
D (Maldives)	-11.3380**	-2.38005**	0.20992**	2.16440**
D (Pakistan)	-13.6026**	-2.60641*	0.19161**	1.80694**
D (Srilanka)	-15.0928*	-2.73664*	0.18132**	1.66237*

Note: *, **, *** denote 1%, 5% and 10% levels of significance, respectively.

To examine the stability of the data we have applied Bai and Perron (1998) test for multiple structural breaks (Tables 4-6). Bai and Perron (1998) estimate multiple structural shifts in a linear model using least squares technique. Their test for structural change is applicable for the case with no trending regressors and following a sequence of tests they estimate consistently the number of break points.

Table 4: Bai-Perron Test of Multiple Break Points for Co_2 Emissions

COUNTRY	CO_2 Emissions					
	Break Test	F-statistic	Scaled F-statistic	Critical value**	Break dates	Sequential
AFGHANISTAN	0 vs. 1 *	46.36318	46.36318	8.58	1	2009
	1 vs. 2 *	13.23812	13.23812	10.13	2	2019
	2 vs. 3 *	17.87348	17.87348	11.14	3	1994
	3 vs. 4	6.559862	6.559862	11.83		
BANGLADESH	0 vs. 1 *	123.8327	123.8327	8.58	1	2010
	1 vs. 2 *	24.03914	24.03914	10.13	2	2016
	2 vs. 3 *	54.69003	54.69003	11.14	3	2001
	3 vs. 4	10.27722	10.27722	11.83		
BHUTAN	0 vs. 1 *	119.9293	119.9293	8.58	1	2010
	1 vs. 2 *	23.81037	23.81037	10.13	2	2016
	2 vs. 3 *	36.26956	36.26956	11.14	3	1996
	3 vs. 4	2.992523	2.992523	11.83		
INDIA	0 vs. 1 *	170.0498	170.0498	8.58	1	2009
	1 vs. 2 *	16.13840	16.13840	10.13	2	2004
	2 vs. 3 *	31.97234	31.97234	11.14	3	2014
	3 vs. 4 *	15.62454	15.62454	11.83	4	1996
	4 vs. 5	2.262398	2.262398	12.25		
NEPAL	0 vs. 1 *	211.2083	211.2083	8.58	1	2016
	1 vs. 2 *	49.83110	49.83110	10.13	2	2010
	2 vs. 3	10.68719	10.68719	11.14		
MALDIVES	0 vs. 1 *	77.03505	77.03505	8.58	1	2012
	1 vs. 2 *	80.72173	80.72173	10.13	2	2000
	2 vs. 3	8.131026	8.131026	11.14		
PAKISTAN	0 vs. 1 *	84.73344	84.73344	8.58	1	2004
	1 vs. 2 *	17.85093	17.85093	10.13	2	1995
	2 vs. 3 *	16.40500	16.40500	11.14	3	2016
	3 vs. 4	2.685264	2.685264	11.83		
SRILANKA	0 vs. 1 *	60.18087	60.18087	8.58	1	2011
	1 vs. 2 *	41.24562	41.24562	10.13	2	1999
	2 vs. 3 *	21.55734	21.55734	11.14	3	2015
	3 vs. 4 *	11.84336	11.84336	11.83	4	1995
	4 vs. 5	5.040376	5.040376	12.25		

Notes: * Significant at the 0.05 level. ** Bai-Perron critical values.

Table 5: Bai-Perron Test of Multiple Break Points for N_2O Emissions

COUNTRY	N_2O Emissions					
	Break Test	F-statistic	Scaled F-statistic	Critical value**	Break dates	Sequential
AFGHANISTAN	0 vs. 1 *	30.12747	30.12747	8.58	1	2000
	1 vs. 2 *	11.94159	11.94159	10.13	2	2019
	2 vs. 3 *	17.06671	17.06671	11.14	3	1994
	3 vs. 4	3.182070	3.182070	11.83		
BANGLADESH	0 vs. 1 *	90.32723	90.32723	8.58	1	2006
	1 vs. 2 *	20.03812	20.03812	10.13	2	1995
	2 vs. 3	9.519958	9.519958	11.14		
BHUTAN	0 vs. 1 *	14.70902	14.70902	8.58	1	2008
	1 vs. 2 *	95.25877	95.25877	10.13	2	1995
	2 vs. 3 *	25.80889	25.80889	11.14	3	2002
	3 vs. 4 *	28.40727	28.40727	11.83	4	2015
	4 vs. 5	7.664337	7.664337	12.25		
INDIA	0 vs. 1 *	153.8412	153.8412	8.58	1	2007
	1 vs. 2 *	19.06026	19.06026	10.13	2	2019
	2 vs. 3	3.455475	3.455475	11.14	3	2014
NEPAL	0 vs. 1 *	153.8412	153.8412	8.58	1	2007
	1 vs. 2 *	19.06026	19.06026	10.13	2	2019
	2 vs. 3	3.455475	3.455475	11.14		
MALDIVES	0 vs. 1 *	73.17645	73.17645	8.58	1	2008
	1 vs. 2 *	38.68545	38.68545	10.13	2	2000
	2 vs. 3 *	14.88326	14.88326	11.14	3	2012
	3 vs. 4	8.912716	8.912716	11.83		
PAKISTAN	0 vs. 1 *	53.82497	53.82497	8.58	1	2016
	1 vs. 2 *	44.85240	44.85240	10.13	2	2004
	2 vs. 3	10.46049	10.46049	11.14		2016
SRILANKA	0 vs. 1 *	6.074807	6.074807	8.58	-	-

Notes: * Significant at the 0.05 level. ** Bai-Perron critical values.

5.1 β-convergence Results

The use of absolute β-convergence model by fixed effects model reveals (as shown in Table 7) that there has been a significant convergence with respect to all the pollutants. This is evident from the significant negative sign associated with the estimated coefficient. The coefficients of log Initial CO_2 and log Initial N_2O are negative and significant at 1% level, while that of log Initial CH_4 is negative and significant at 10% level. The implication is that gradual uniformity has occurred with respect to emissions across the considered countries. The analysis of conditional convergence (Table 8) also yields similar results. Here, also, we find that the coefficients of log Initial CO_2 and log Initial N_2O are negative and significant at 1% level, while that of log Initial CH_4 is negative and significant at 10% level.

Table 6: Bai-Perron Test of Multiple Break Points for Ch_4 Emissions

COUNTRY	CH_4 Emissions					
	Break Test	F-statistic	Scaled F-statistic	Critical value**	Break dates	Sequential
AFGHANISTAN	0 vs. 1 *	41.10626	41.10626	8.58	1	2001
	1 vs. 2 *	23.68956	23.68956	10.13	2	2016
	2 vs. 3	1.904624	1.904624	11.14		
BANGLADESH	0 vs. 1 *	105.0133	105.0133	8.58	1	1995
	1 vs. 2	8.635291	8.635291	10.13		
BHUTAN	0 vs. 1 *	17.28494	17.28494	8.58	1	2008
	1 vs. 2	4.638512	4.638512	10.13	2	2016
INDIA	0 vs. 1 *	84.27833	84.27833	8.58	1	2000
	1 vs. 2 *	47.78620	47.78620	10.13	2	2013
	2 vs. 3 *	54.68991	54.68991	11.14	3	1994
	3 vs. 4	1.999233	1.999233	11.83		
NEPAL	0 vs. 1 *	90.16551	90.16551	8.58	1	1998
	1 vs. 2 *	12.49656	12.49656	10.13	2	1994
	2 vs. 3 *	15.26485	15.26485	11.14	3	2015
	3 vs. 4	4.254455	4.254455	11.83		
MALDIVES	0 vs. 1 *	121.5984	121.5984	8.58	1	2006
	1 vs. 2 *	28.64666	28.64666	10.13	2	2014
	2 vs. 3 *	37.57644	37.57644	11.14	3	2000
	3 vs. 4	9.817118	9.817118	11.83		
PAKISTAN	0 vs. 1 *	133.7765	133.7765	8.58	1	2006
	1 vs. 2 *	32.36026	32.36026	10.13	2	2018
	2 vs. 3	8.342990	8.342990	11.14		
SRILANKA	0 vs. 1 *	41.65330	41.65330	8.58	1	1996
	1 vs. 2 *	10.80226	10.80226	10.13	2	2008
	2 vs. 3	6.362061	6.362061	11.14		2015

Notes: * Significant at the 0.05 level. ** Bai-Perron critical values.

Table 7: Unconditional Beta Convergence Result Using Fixed Effects

Fixed Effects	Log Initial CO2	Log Initial N2O	Log Initial CH4
Coefficient	-0.0779*	-0.0522*	-0.0484***
t-Statistic	-4.5619	-4.2605	-1.8994
	(0.0004)	(0.0007)	(0.0769)
C	-0.0245	-0.0965*	-0.0090***
t-Statistic	-1.4434	-3.9510	-1.9480
	(0.1694)	(0.0013)	(0.0704)
R^2	0.6643	0.7483	0.5660
F-statistic	3.7108**	5.5768*	2.4453***
	(0.0138)	(0.0021)	(0.0644)

Notes: p-values in parentheses. *, **, *** denote 1%, 5% and 10% levels of significance, respectively.

Similar result of β-convergence for CO_2 emissions was also observed by Matsuki and Pan (2021) for 7 Asian countries. They performed unit root test on Log of per capita CO_2 emissions for the period of 1907-2011. Convergence of per capita CO_2 emissions was also reported by Payne

and Apergis (2021) for 65 developing countries for the period of 1972-2014; Acar and Lindmark (2017) for 28 OECD countries for 1973-2010; and Rios and Gianmoena (2018) for a sample of 141 countries for 1970-2014. Apergis and Garzón (2020) observed four convergence clubs while examining the existence of convergence of greenhouse gas emissions across 19 Spanish regions for the period from 1990 to 2017. Presno et al. (2021) found similar results for EU-28 countries.

Table 8: Conditional Beta Convergence Result

Fixed Effects	Log Initial CO_2	Log Initial N_2O	Log Initial CH_4
Coefficient	-0.0832*	-0.0552*	-0.03655***
t-statistic	-4.3992	-4.3172	-1.4446
	(0.0006)	(0.0007)	(0.0716)
Ini pop gwt	-0.0107**	-0.0033	-0.0053
t-Statistic	-0.7055	-0.8905	-1.6245
	(0.0492)	(0.3882)	(0.1266)
C	-0.0084	-0.0959*	0.0030***
t-statistic	-0.2949	-3.8978	0.3483
	(0.7723)	(0.0016)	(0.0732)
R^2	0.6758	0.7618	0.6348
F-statistic	3.2434**	4.9768*	2.7043**
	(0.0240)	(0.0039)	(0.0464)

Notes: p-values in parentheses. *, **, *** denote 1%, 5% and 10% levels of significance, respectively.

5.2 CV Convergence Results

Table 9 reveals the CV convergence result by fitting a semi-log linear trend equation to the estimated values of CVs. The significant negative values of the coefficients of time (T) for all the pollutants confirm the convergence results as obtained through β- convergence test. This suggests that the differences in growth rate of emissions in different countries had been diminishing over time.

Table 9: CV Convergence Result

	Log CV CO_2	Log CV N_2O	Log CV CH_4
T	- 0.0131*	-0.0086*	-0.0037**
t-statistic	-6.3360	-5.4297	-2.2604
	(0.0000)	(0.0000)	(0.0315)
C	0.3371*	-0.6882*	-0.7358*
t-statistic	8.8873	-23.6022	-24.3588
	(0.0000)	(0.0000)	(0.0000)
R^2	0.5805	0.5041	0.1497
F-statistic	40.1457*	29.4818*	5.1095**
	(0.0000)	(0. 0000)	(0.0314)

Notes: p-values in parentheses. *, **, *** denote 1%, 5% and 10% levels of significance, respectively.

5.3. Growth Rates of CO_2, N_2O and CH_4

Table 10 shows the decadal variations in growth rates of CO_2, N_2O, and CH_4. The growth rates are presented for three decades: β_1 (1990-1999), β_2 (2000-2009) and β_3 (2010-2022). In case of CO_2, it can be seen that Afghanistan, Bangladesh and India have experienced very high growth rates in the middle decade (2000-2009), while countries such as Bhutan and Srilanka had very high growth rates in the initial decade (1990-1999) which has declined in the middle decade, but again increased in the last decade. Again, countries like Maldives and Pakistan had very high growth rates in the initial decade (1990-1999), which declined in the subsequent periods. Nepal had very high growth rate in the last decade (2010-2022). Afghanistan had negative growth rate (-0.19094) in 1990-1999 which increased to 0.201362 in 2000-2009 but has further declined to -0.03026 in 2010-2022.

Table 10: Decadal Variation in Growth Rate of CO_2, N_2O and CH_4

COUNTRY	GHG	W_1	W_2	W_3	β_1 (1990-1999)	β_2 (2000-2009)	β_3 (2010-2022)
AFGHANISTAN	CO2	-0.190094*	0.392304*	-0.23162*	-0.19094	0.201362	-0.03026
		(-7.44936)	(9.27273)	(-6.18532)			
	N2O	-0.02838*	0.033394*	-0.02269**	-0.02838	0.005011	-0.01768
		(-4.16527)	(2.969064)	(-2.27953)			
	CH4	-0.01373*	0.011752	-0.01541**	-0.01373	-0.00197	-0.01739
		(-2.73416)	(1.41838)	(-2.10179)			
BANGLADESH	CO2	0.050451*	0.012619	-0.01541**	0.050451	0.06307	0.047661
		(10.66774)	(1.616558)	(-2.23025)			
	N2O	0.004219*	0.002299*	-0.00511	0.004219	0.006518	0.001407
		(3.018618)	(0.996704)	(-2.50295)			
	CH4	-0.02175*	0.026412*	-0.00742*	-0.02175	0.004658	-0.00276
		(-19.3892)	(14.26213)	(-4.5267)			
BHUTAN	CO2	0.087526*	-0.04855**	0.021809	0.087526	0.038978	0.060787
		(7.659317)	(-2.57391)	(1.306337)			
	N2O	0.030165*	-0.05012*	0.012257**	0.030165	-0.01996	-0.0077
		(7.708393)	(-7.75941)	(2.143947)			
	CH4	0.011512*	-0.03211*	0.021513***	0.011512	-0.0206	0.000917
		(1.865955)	(-3.15316)	(2.386903)			
INDIA	CO2	0.023423*	0.02319*	-0.02037*	0.023423	0.046613	0.026245
		(6.018258)	(3.609881)	(-3.58211)			
	N2O	-0.00108	0.011793*	-0.00498	-0.00108	0.010713	0.005738
		(-0.47095)	(3.114097)	(-1.48433)			
	CH4	-0.01256*	0.009767*	-0.00338*	-0.01256	-0.00279	-0.00618
		(-12.9145)	(6.085004)	(-2.38225)			
MALDIVES	CO2	0.167517*	-0.11684*	-0.01045	0.167517	0.050678	0.040231
		(11.93459)	(-5.04314)	(-0.50945)			
	N2O	0.080391*	-0.03787**	-0.0267***	0.080391	0.042521	0.015819
		(8.73817)	(-2.49391)	(-1.98674)			
	CH4	0.014875*	0.011982*	-0.01194*	0.014875	0.026857	0.014915
		(14.86653)	(7.255321)	(-8.16967)			
NEPAL	CO2	0.070958*	-0.05568*	0.108364*	0.070958	0.015282	0.123646
		(5.889842)	(-2.79987)	(6.156891)			
	N2O	-0.00947*	0.01269*	0.015788*	-0.00947	0.003216	0.019004
		(-3.08447)	(2.502923)	(3.518183)			
	CH4	-0.0159*	0.015113*	-0.00287*	-0.0159	-0.00078	-0.00365
		(-13.3467)	(7.687781)	(-1.64855)			

Contd...

Table 10 contd...

COUNTRY	GHG	W_1	W_2	W_3	β_1 (1990-1999)	β_2 (2000-2009)	β_3 (2010-2022)
PAKISTAN	CO2	0.026456*	-0.01322***	-0.00837	0.026456	0.013232	0.004865
		(6.357264)	(-1.92524)	(-1.37619)			
	N2O	0.008279*	-0.00256	0.005811	0.008279	0.005715	0.011526
		(3.101876)	(-0.58201)	(1.179354)			
	CH4	-0.00282*	0.011887**	-0.0046**	-0.00282	0.009071	0.004474
		(-2.45334)	(6.274137)	(-2.74157)			
SRILANKA	CO2	0.092917*	-0.07216*	0.013486	0.092917	0.020762	0.034248
		(11.87081)	(-5.58494)	(1.179354)			
	N2O	0.008328**	-0.00253	-0.01481*	0.008328	0.005803	-0.009
		(1.721483)	(-0.31625)	(-2.09481)			
	CH4	-0.02647*	0.036867*	-0.0134**	-0.02647	0.010401	-0.003
		(-6.73554)	(5.684481)	(-2.33468)			

Notes: t-values are in parentheses. *, **, *** denote 1%, 5% and 10% levels of significance, respectively.

In case of N_2O, Bangladesh and Maldives had experienced very high growth rates in the middle decade (2001-2009). Bhutan had the highest growth rate in the initial decade (1990-2000) which turned negative in the middle decade (2001-2009), but again increased (although negative) in the last decade (2010-2022). India had the highest growth rate in the initial decade (1990-2000) which declined in the following two decades. Afghanistan had negative growth rate of -0.02838 in 1990-1999 which increased to 0.005011 in 2000-2009 but further declined to -0.01768 in 2010-2022. Again, Nepal and Pakistan had very high growth rates in the last decade (2010-2022).

For CH_4, we see that countries such as Bangladesh had negative growth rate (-0.02175) in the initial decade (1990-1999) which turned positive (0.004658) in the middle decade (2001-2009), but again became negative (-0.00276) in the last decade (2010-2022). Again, Maldives had the highest growth rate in the middle decade (2000-2009), which subsequently went down in the following decade. Afghanistan, India and Nepal had negative growth rates in all the three decades. Bhutan had positive growth rate in the first and the last decade and negative growth rate in the middle decade. Pakistan and Srilanka had negative growth rates in the first decade and positive growth rates in the middle decade. For the last decade, while Pakistan's growth was positive, it was negative for Srilanka.

6. Conclusions

The observed convergence of the countries with lower initial emissions per-capita levels with the ones with greater emissions per-capita levels implies that they are likely to succeed in catching-up with the levels of resource and pollution-intensity experienced by the relatively rich economies. This does not indicate a healthy move for the countries and there is fear of a gradual collapse of the undertaken efforts conducive towards sustainable achievements. Hence, in the countries with initially low but later with high emissions growth rates, sound and efficient measures of pollution control need to be adopted immediately by introducing economic pollution control instruments like carbon emission tax, carbon banking, emissions trading systems (ETS) etc. for better control of Green House Gas emission. It is evident that without proactive mitigation efforts, green house gas emissions will continue to rise in these emerging Asian economies, driven by GDP growth and this will seriously undermine any efforts to attain sustainable development.

About the author

Swati Sinha Babu is an Assistant Professor at the Department of Economics, Sidho-Kanho-Birsha University, Purulia, West Bengal, India.

References

Acar, S. and M. Lindmark (2017), "Convergence of CO2 Emissions and Economic Growth in the OECD Countries: Did the Type of Fuel Matter?" *Energy Sources, Part B: Economics, Planning, and Policy*, 12(7): 618-627.

Ahmed, M., A.M. Khan, S. Bibi and M. Zakaria (2017), "Convergence of Per Capita CO_2 Emissions across the Globe: Insights via Wavelet Analysis", *Renewable and Sustainable Energy Reviews*, 75: 86-97.

Ansuategi, A. and M. Escapa (2002), "Economic Growth and Greenhouse Gas Emissions", *Ecological Economics*, 40: 23-37.

Apaydin, S., U. Ursavas and U. Koç (2021), "The Impact of Globalization on the Ecological Footprint: Do Convergence Clubs Matter?" *Environmental Science and Pollution Research*, 28(38): 53379-53393.

Apergis, N. and A.J. Garzón (2020), "Greenhouse Gas Emissions Convergence in Spain: Evidence from The Club Clustering Approach", *Environmental Science and Pollution Research*, 27(31): 38602-38606.

Bai, J. and P. Perron(1998), "Estimating and Testing Linear Models with Multiple Structural Changes", *Econometrica*, (66): 47-78.

Bai, J. and P. Perron (2003), "Critical Values for Multiple Structural Change Tests", *Econometrics Journal*, (1): 1-7.

Barassi, M.R., M.A. Cole and R.J. Elliott (2008), "Stochastic Divergence or Convergence of Per Capita Carbon Dioxide Emissions: Re-examining the Evidence", *Environmental and Resource Economics*, 40(1): 121-137.

Barro, R.J. (2015), "Convergence and Modernization", *The Economic Journal*, 125: 911-942.

Barro, R.J. and X. Sala-i-Martin (1992), "Convergence", *Journal of Political Economy*, 100(2): 223-251.

Baumol, W.J. (1986), "Productivity Growth, Convergence, and Welfare: What the Long-run Data Show", *American Economic Review*, 76(5): 1072-1085.

Brock, W.A. and M.S. Taylor (2004), "The Green Solow Model", *Social Sciences Research Institute Working Paper No. 2004-16*, Economics Department, University of Wisconsin.

Brock, W.A. and M.S. Taylor (2010), "The Green Solow Model", *Journal of Economic Growth*, 15: 127-153.

Choi, H. and H. Li (2000), "Economic Development and Growth Convergence in China", *Journal of International Trade and Economic Development*, 9: 37-54.

Churchill, S.A., J. Inekwe and K. Ivanovski (2018), "Conditional Convergence in Per Capita Carbon Emissions Since 1900", *Applied Energy*, 228: 916-927.

Caselli, D., G. Esquivel and F. Lefort (1996), "Reopening the Convergence Debate: A New Look at Cross-country Growth Empirics", *Journal of Economic Growth*, 1: 363-89.

Cashin, P. and R. Sahay (1996), "Internal Migration, Centre State Grants and Economic Growth in the States in India", *IMF Working Paper, WP/95/66*.

Copeland, B.R. and M.S. Taylor (2003), *Trade and the Environment: Theory and Evidence*, Princeton, NJ: Princeton University Press.

DeJong, D.N., J. Nankervis, N. Savin and C. Whiteman (1992), "Integration versus Trend Stationary in Time Series", *Econometrica*, 60(2): 423-433.

De Long, J.B. (1988), "Productivity Growth, Convergence and Welfare: A Comment", *American Economic Review*, 78: 1138-1155.

De Oliveira, G. and D.M. Bourscheidt (2017), "Multi-sectorial Convergence in Greenhouse Gas Emissions", *Journal of Environmental Management*, 196: 402-410.

Dobson, S. and C. Ramlogan (2002), "Economic Growth and Convergence in Latin America", *Journal of Development Studies*, 38: 83-104.

Easterly, W. and R. Levin (1997), "Africa's Growth Tragedy: Policies and Ethnic Divisions", *Quarterly Journal of Economics*, 112: 1203-1250.

Ehrlich, P.R. and J.P. Holdren (1971), "Impact of Population Growth", *Science*, 171(3977): 1212-1217.

El-Montasser, G., R. Inglesi-Lotz and R. Gupta (2015), "Convergence of Greenhouse Gas Emissions among G7 Countries", *Applied Economics*, 47(60): 6543-6552.

Erdogan, S. and I. Okumus (2021), "Stochastic and Club Convergence of Ecological Footprint: An Empirical Analysis for Different Income Group of Countries", *Ecological Indicators*, 121(107123).

Ferreira, A. (2000), "Convergence in Brazil: Recent Trends and Long-run Prospects", *Applied Economics*, 32: 79-90.

Ghatak, S. and P. De (2021), "Income Convergence Across Asian Economies: An Empirical Exploration", *Journal of Asia-Pacific Business*, 22(3): 182-200.

Harris, R. and R. Sollis (2003), *Applied Time Series Modelling and Forecasting*, New Jersey: Wiley.

Ho, T.W. (2006), "Income Thresholds and Growth Convergence: A Panel Data Approach", *The Manchester School*, 74(2): 170-189.

Islam, N. (1995), "Growth Empirics: A Panel Data Approach", *Quarterly Journal of Economics*, 110: 1127-70.

Ivanovski, K. and S.A. Churchill (2020), "Convergence and Determinants of Greenhouse Gas Emissions in Australia: A Regional Analysis", *Energy Economics*, 92(104971).

Karakurt, I., G. Aydin and K. Aydiner (2012), "Sources and Mitigation of Methane Emissions by Sectors: A Critical Review", *Renewable Energy*, 39(1): 40-48.

Khan, M.S. and M.S. Kumar (1993), "Public and Private Investment and the Convergence of Per Capita Incomes in Developing Countries", *IMF Working Paper No. WP/93/51*.

Kounetas, K.E. (2018), "Energy Consumption and CO_2 Emissions Convergence in European Union Member Countries. A Tonneau des Danaides?" *Energy Economics*, 69: 111-127.

Lin, J., R. Inglesi-Lotz and T. Chang (2018), "Revisiting CO_2 Emissions Convergence in G18 Countries", *Energy Sources, Part B: Economics, Planning, and Policy*, 13(5): 269-280.

Mankiw, G.N., D. Romer and D.N. Weil (1992), "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*, 107(2): 407-437.

Matsuki, T. and L. Pan (2021), "Per Capita Carbon Emissions Convergence in Developing Asia: A Century of Evidence from Covariate Unit Root Test with Endogenous Structural Breaks", *Energy Economics*, 99(105326).

Murthy, N.R. and V. Ukpolo (1999), "A Test of the Conditional Convergence Hypothesis: Econometric Evidence from African Countries", *Economics Letters*, 65: 249-253.

Nagaraj, R., A. Varoudakis and M.A. Veganzones (2000), "Long-Run Growth Trends and Convergence across Indian States", *Journal of International Development*, 12: 45-70.

Pachauri, R.K., M.R. Allen, V.R. Barros, J. Broome, W. Cramer, R. Christ and P. Dasgupta (2014), "Climate Change 2014: Synthesis Report". Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Payne, J.E. and N. Apergis (2021), "Convergence of Per Capita Carbon Dioxide Emissions among Developing Countries: Evidence from Stochastic and Club Convergence Tests", *Environmental Science and Pollution Research*, 28(26): 33751-33763.

Persson, J. (1997), "Convergence Across Swedish Counties, 1911-1993", *European Economic Review*, 41: 1835-52.

Poirier, J.D. (1974), *The Econometrics of Structural Change*, Amsterdam: North-Holland.

Presno, M.J., M. Landajo and P.F. González (2021), "GHG Emissions in the EU-28: A Multilevel Club Convergence Study of the Emission Trading System and Effort Sharing Decision Mechanisms", *Sustainable Production and Consumption*, 27: 998-1009.

Rios, V. and L. Gianmoena (2018), "Convergence in CO_2 Emissions: A Spatial Economic Analysis with Cross-country Interactions", *Energy Economics*, 75: 222-238.

Runar, B., K. Amin and S. Patrik (2017), "Convergence in Carbon Dioxide Emissions and The Role of Growth and Institutions: A Parametric and Non-Parametric Analysis", *Environmental Economics and Policy Studies*, 19(2): 359-390.

Sala-i-Martin, X. (1996a), "The Classical Approach to Convergence Analysis", *Economic Journal*, 106: 1019-1036.

Sala-i-Martin, X. (1996b), "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence", *European Economic Review*, 40: 1325-52.

Setiawan, R.P., E. Umilia and K.D.M.E. Handayeni (2014), "The Correlation between Residential Density and Greenhouse Gas Emissions in Surabaya City", *Indonesian Journal of Planning and Development*, 1: 29-34.

Solow, R.M. (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, 70: 65-94.

Swan, T.W. (1956): "Economic Growth and Capital Accumulation", *Economic Record*, 32: 334-361.

Tillaguango, B., R. Alvarado, V. Dagar, M. Murshed, Y. Pinzón and P. Méndez (2021), "Convergence of the Ecological Footprint in Latin America: The Role of the Productive Structure", *Environmental Science and Pollution Research*, 28(42): 59771-59783.

Tiwari, C. and M. Mishra (2017), "Testing The CO_2 Emissions Convergence: Evidence from Asian Countries", *IIM Kozhikode Society and Management Review*, 6(1): 67-72.

Ulucak, R., Y. Kassouri, S.Ç. Ilkay, H. Altıntaş and A.P.M. Garang (2020), "Does Convergence Contribute to Reshaping Sustainable Development Policies? Insights from Sub-Saharan Africa", *Ecological Indicators*, 112(106140).

UNIDO (2018), "The Annual Report 2018". Available at: https://www.unido.org/resources-publications-flagship-publications-annual-report/annual-report-2018

Vavrek, R. and J. Chovancova (2016), "Decoupling of Greenhouse Gas Emissions from Economic Growth in V4 Countries", *Procedia of Economics and Business Administration*, 39: 526-533.

Wu, H., H. Huang, J. Tang, W. Chen and Y. He (2019), "Net Greenhouse Gas Emissions from Agriculture in China: Estimation, Spatial Correlation and Convergence", *Sustainability*, 11(18).

Yao, S. and Z. Zhang (2001), "On Regional Inequality and Diverging Clubs: A Case Study of Contemporary China", *Journal of Comparative Economics*, 29: 466-484.

World Bank (2021), *World Development Indicators*. Available at: https:// data.worldbank.org.

APPENDIX

Figure A1: CO_2 Emissions Per Capita for the Period 1990-2022

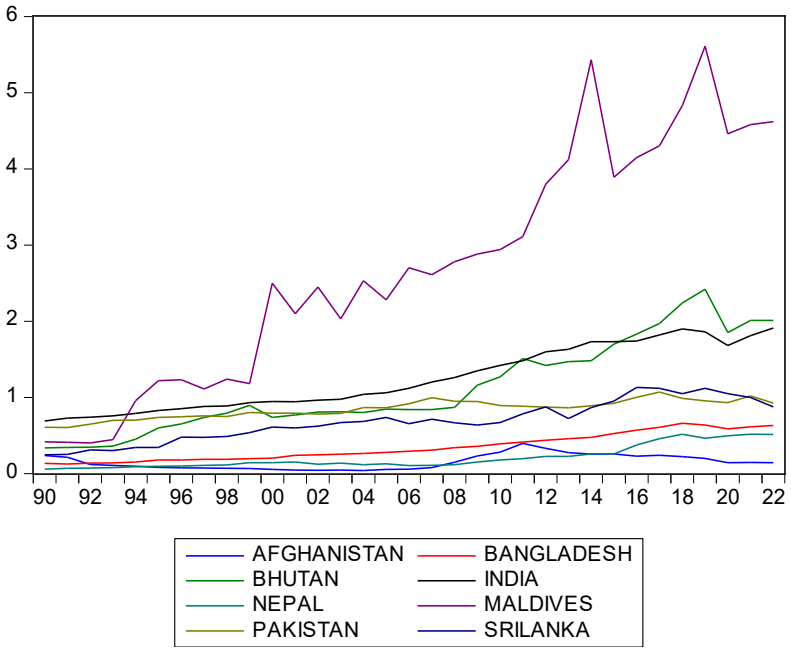


Figure A2: N_2O Emissions Per Capita for the Period 1990-2022

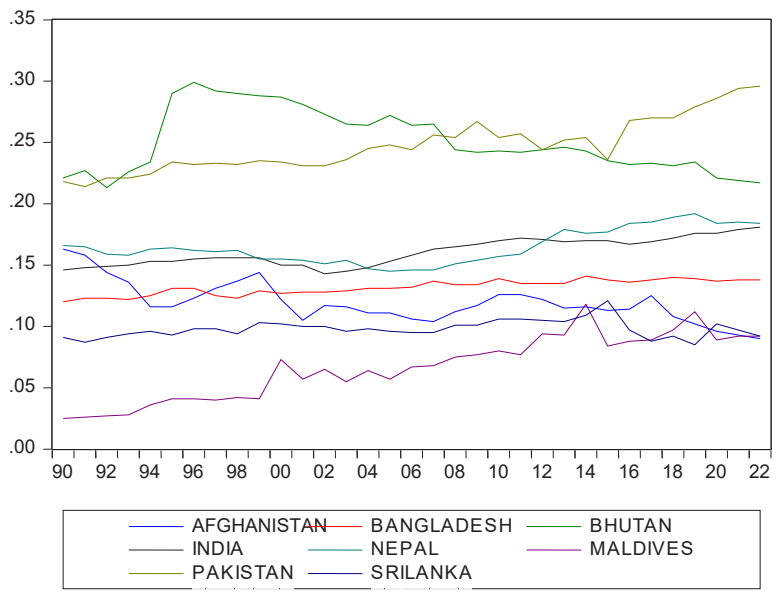


Figure A3: CH_4 Emissions Per Capita for the Period 1990-2022

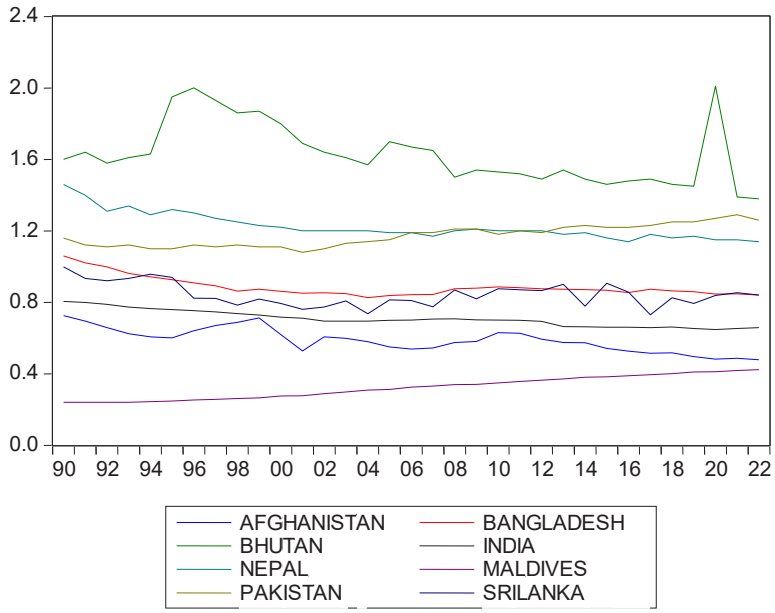


Figure A4: Unrestricted Estimation

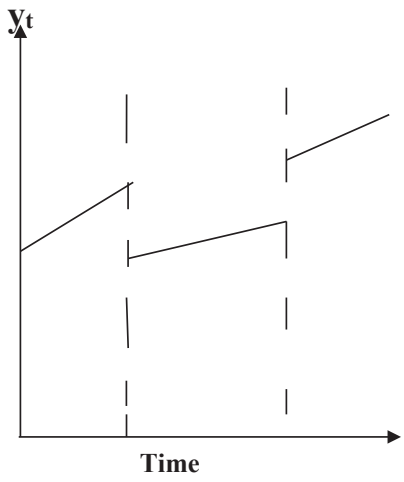
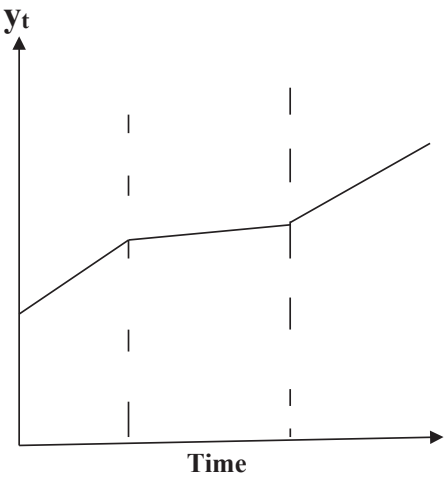


Figure A5: A Linear Spline



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DOES FORMALISATION MATTER FOR INFORMAL SECTOR ENTERPRISES? EVIDENCE FROM A PRIMARY FIRM SURVEY IN ASSAM, INDIA

ALOK RANJAN DUTTA*
Dibrugarh University, Dibrugarh, Assam, India

Abstract: This paper examines the effect of levels of formality on the performance of informal manufacturing firms. Research on the benefits of formalization on the microenterprises is scarcer, particularly in India, a country with a large informal sector. We follow prior works to argue that informal firms function at different levels of informality. Our article tries to assess the effect of the levels of formality on the firm level outcomes. It uses primary data from a survey of 205 informal manufacturing enterprises from the Indian state of Assam. Tools employed in our study include ordinary least squares (OLS) regression, and a multinomial logit regression. Findings reveal that effect of formality differs across the measures of firm performance. A higher level of formality is found to have a positive relationship with labour productivity, and growth of the enterprises, but its effect is found weak on the mixed income accruing to entrepreneur's household.[1]

Keywords: Unregistered manufacturing sector, Informal sector, Formality, Performance, Enterprise, Firm

1. Introduction

Understanding the informal sector is important both for raising incomes of those working in the sector and maximizng the sector's contribution to overall growth of an economy. There are substantial numbers of theoretical and empirical studies that analyze and document the various issues related to causes/determinants, and characteristics of informality. But research on the benefits of formalization on the microenterprises is scarcer, particularly in a country like India—a country with a large informal sector. Before we discuss the relationship between formality and firm performance in the informal sector, it is important to go through the available definitions of the informal enterprise. Available literature shows different interpretations of the term formality of enterprises. The international definition of the informal sector defines informal enterprises as unregistered or unincorporated enterprises owned by households. Incorporation or registration of enterprises refers to registration under factories or commercial acts, tax or social security laws, professional groups'

*Correspondence to: Alok Ranjan Dutta, Associate Professor, Department of Economics, Dibrugarh University, Dibrugarh, Assam 786004, India. Email: alokdutta@dibru.ac.in.

regulatory acts, or similar acts, laws, or regulations established by national legislative bodies (ICLS, 1993). This registration-based definition of informality is widely used in the literature (Amin and Islam, 2015; Aparicio, 2014; Farazi, 2014; De Andrade et al., 2013; Faznzylber et al., 2011; McKenzie and Sakho, 2010; Jaramillo, 2009). Apart from this registration-based approach to define informality of enterprises, one segment of the literature categorizes those enterprises as informal which do not maintain an account of their business separately (Bhalla, 2009). Following these approaches, the present study considers an enterprise as informal when the enterprise (i) is not registered with any of the relevant government authorities/office; (ii) is not registered with the tax authorities; and/or (iii) does not keep separate accounts of their business. A large body of literature recognizes that informal micro-enterprises exhibit varying levels of informality and most firms comply with some regulations but not others (Bruhn and McKenzie, 2013; de Villiers Scheepers et al., 2014; Williams et al., 2016; Medvedev and Oviedo, 2016).

To investigate the relationship between formality status and informal enterprise performance, the present study reports a 2017 (January-June) survey of 205 enterprises of the unregistered manufacturing sector in the Indian state of Assam. Unregistered manufacturing sector or unorganised manufacturing sector in Indian national accounting system includes all the residual manufacturing units except (a) those registered under section 2m(i) and 2m(ii) of Factories Act, 1948 and (b) those run by government (Central Government, State Governments, Local Bodies) which are called Public Sector Enterprises. Factory Act in India regulates the conditions of work in the organised manufacturing sector, including minimum safety, sanitary, health, and welfare standards, as well as stipulating regulations on hours of work, leave with wages, holiday provisions for workers which employers in the organised sector need to follow or face stiff penalties (NCEUS, 2008). In the Indian context, these enterprises are also called informal enterprises (Kulshreshtha, 2011; Sasidharan and Raj, 2014). India's unregistered manufacturing sector is also a heterogeneous one, ranging from enterprises with no official identity to small scale enterprises with some form of registrations. This motivates us to look into the relationship between the levels of formality of these firms with their performance indicators.

Sharing around 3% of India's population, Assam is located in the northeastern part of India. Its unregistered manufacturing sector (98% of the total) generates around 21% of the value addition in the manufacturing sector, and accommodates around 69% of manufacturing workers (NSSO, 2017; GOI, 2016). Considering the importance of the unregistered manufacturing sector in the industrial map of the state, present study tries to investigate whether formalisation has any effect on their performance.

The rest of the paper is organized as follows. Section 2 describes the existing literature. Data and methodology used in the study are explained in the section 3. Section 4 presents the results and discussion. Conclusions with policy implications are summarised in the last section.

2. Literature Review

Plenty of studies are there on the relationship between formality and small firm performance. Formality, defined in terms of registration, enhances firms' profit and value added (Boly, 2018). Newly created firms that opt for formal operation show higher levels of revenue and profits and employ more workers (Fajnzylber et al., 2011). Another common finding supported by literature is that registered enterprises have a higher labour productivity than unregistered enterprises (Taymez,

2009; Araujo and Rodrigues, 2016; de Paula and Scheinkman, 2011). Contrary to these findings, De Mel et al. (2013) find no statistically significant effects of formalization on profits. Some other studies offer suggestive evidence that the effect of formalizing differs across firms (McKenzie and Sakho, 2010) and measures of firm performance (Kasseeah, 2016). In the Indian context, limited studies are found on the impact of formalization on firm performance, particularly for the micro or household firms. For example, Williams and Kedir (2016) examined the impact of business registration on the performance (annual sales, employment, and productivity growth rates) of India's micro-enterprise sector by using data from the World Bank enterprise survey. Sharma (2013) tried to evaluate the impact (in terms of sales per employee and value-added per employee) of registration under the District Industries Centre (DIC) by using data from the World Bank Investment Climate Survey of Micro Enterprises conducted in 2006. We add to this growing body of research related to formality and small firms' performance in India in the following ways. First, along with registration status, we include firms with the practice of separate record keeping of their business as another variable to define them as formal firms. Secondly, instead of formality, we attempt to examine the effect of the degree of formality on the firm performance in the informal sector. As far as we know, no such studies have been carried out, particularly with the data on the unorganized manufacturing sector in India.

3. Data and Methodology

3.1 Primary Data and Sampling Design

The study uses a multi-stage sampling technique. All the 27 districts were first distributed into three strata equally based on the contribution of the unregistered manufacturing sector to district domestic product.[1] The first stratum included the districts with a higher proportion than the state average. The second stratum included the districts with a proportion close to the state figure, and the last stratum included the districts with a lower proportion than the state figure. Two districts from each stratum and a total of six districts of the state were randomly selected. At the second stage, one to two urban centers/municipalities and 20-30 percent community development blocks from each district were selected purposively based on the concentration of the selected enterprises. Four sub-sectors or industry groups of unregistered manufacturing enterprises were selected. They are manufacture of furniture (wood and cane), manufacture of textile and wearing apparel, manufacture of food and beverages, and fabricated metal products. Around 71 percent of the total value added of the unregistered manufacturing sector in Assam is contributed by these 4 sub-sectors (NSSO, 2013). Ultimate sample enterprises have been selected using non-random methods of accidental sampling. Utmost care was taken to minimize the limitations of non-random sampling. Information about the sample enterprises was collected from various informed sources. Some initial contacts were established with the officials from the different offices like the office of the labour commissioner, district industries and commerce office, community development blocks/municipalities, and other knowledgeable persons of the locality concerned. In the last stage, 205 manufacturing enterprises were interviewed through a field survey during January-June 2017. District-wise distribution of the sample enterprises is presented in Table 1.

[1] In 2016, Assam has 33 administrative districts. But the last data on district-wise contribution of the unregistered manufacturing sector to district domestic product before field survey was available only in the Statistical Handbook of Assam, 2011 (GOA, 2011).

Table 1: Distribution of the Sample Enterprises

Districts	Industry Groups				
	Textile and wearing apparel	Food product and beverages	Furniture (wood and cane)	Fabricated metal	Total manufacturing sector
Tinsukia and Lakhimpur	21	20	23	15	79 (38.53)
Dibrugarh and Darrang	19	17	18	20	74 (36.09)
Dhubri and Goalpara	9	17	14	12	52 (25.37)
Total	49 (23.90)	54 (26.34)	55 (26.82)	47 (22.92)	205 (100)

Note: Figures in parentheses indicate % share
Source: Field Survey

3.2 Construction of Key Variables

3.2.1 Dependent Variable(s)

We use different indicators to represent or measure the performance of an enterprise. First, we attempt to check the relationship between formality and labour productivity of the firms. Productivity of labour is generally defined as output divided by number of person engaged. In the present study, output or production is defined in terms of Gross Value Added (GVA). GVA is defined as revenue from the sale of goods minus cost of raw material, electricity consumed, traveling cost, and other intermediate costs (e.g., telephone bills).

We have tried to examine the effect of formality on the income of the informal entrepreneur. A large portion of unregistered manufacturing firms cannot be separated from the owners or the entrepreneurs. Barring a few, almost all the sample entrepreneurs are found working in their respective enterprises as workers; so, queries arise regarding the income of the entrepreneur. The income of the informal entrepreneur is termed as the mixed-income of the self-employed person. Moreover, many sample enterprises were found to employ family labour and family-owned other resources in the enterprise. So, it would be better to categorize 'mixed income of the informal entrepreneur' as 'Mixed Income Accruing to Entrepreneurs' Households' (MIEHH). We have calculated it as follows. The mixed-income accruing to Entrepreneur's Household = Net Value Added – Factor Payments – Fees to the Government and Indirect Taxes (if any).[2]

The growth of the sample enterprise is used as another indicator or measure of firm performance. There are different definitions of growth. We consider growth as a change in size during a determined time (Dobbs and Hamilton, 2007). In the field survey, a question was asked to the enterprises' owners as to whether they had perceived expansion/stagnation/decline in their volume of business (mainly in terms of sales) in the past four to five years. Sample firms, based on their growth experience, were categorized into three ordinal categories, i.e., expanded or experienced growth (26.34 percent), stagnated (43 percent), and declined or contracted (30 percent). The score given to an enterprise according to its growth status is as follows: 1 = if the firm has been facing contraction, 2 = if the firms facing stagnation and 3 = if the firms have been experiencing growth.

[2] The net value added is calculated by deducting depreciation from Gross Value Added. The depreciation cost is calculated as 10 percent of the cost of capital by following the report of 'Cost of Cultivation of Principal Crops in India' (GOI, 2007).

3.2.2 Independent Variables

The main independent variable used in the study is the (in)formality level of firms. As mentioned in the introductory section, formality in this study is defined on the basis of three parameters: two of them relate to registration issue and one is related to maintaining separate accounts. We have broadly classified firm registration into two groups. The first is the general business registration. Under this category, we include firms with licence of operation (e.g., municipality/trade licence), registration in District Industries and Commerce Centre (DICC), and specific industry office registration. Some studies have shown that being registered with the District Industries Centre (DIC) gives the firm access to benefits such as easier access to institutional credit, preferential rates of interest, various types of exemptions and subsidies and marketing assistance (Sharma, 2014). Similarly, municipality/ trade license is the basic requirement for a firm to have access to institutional credit. Our second category of registration includes firms with some form of general business registration along with registration in the tax office. There are a number of possible channels through which tax registration can have a positive impact on firm outcome. These channels include, for example, access to credit, greater opportunities to engage with large firms and the government, or greater access to training and support programmes (Joshi et al., 2012), or opportunity to enlarge customer base and lower the costs of corruption (McKenzie and Sakho, 2010).

Table 2: Levels of the (in)formality of the Sample Enterprises

Informality level	General business registration	Tax registration	Separate accounts	Score
Formal	Yes	Yes	Yes	3
Low level of Informality				2
Possible situation A	Yes	No	Yes	
High Level of informality				1
Possible situation B	Yes	No	No	
Possible situation C	No	No	Yes	
Informal	No	No	No	0

Source: Field Survey

Whether businesses maintain separate account from those of the households is another criterion of formality used in some studies (Kasseeah, 2016). We have also taken this criterion in the present study. There is evidence that record-keeping has a positive impact on firm growth (Khadim and Chouduri, 2019).

The firms based on their level of (in)formality status are categorized into four ordinal categories, i.e., informal, high level of informality, low level of informality and formal (Table 2). Of these four, formal is considered the best. Formal firms meet all the formality criteria outlined in the study and receive the highest score 3. It may be noted here that, in the sample data set, all enterprises with tax registration are found to have business registration and maintain separate accounts of their business. So, in our case, a number of possible situations get reduced. In our data set, firms operating at a low level of informality include those that have some form of business registration and practice of keeping separate accounts, but are not registered with the tax authority. The high level of the informal category includes firms that either have business registration but not separate accounts, or the firms that started maintaining separate accounts but are not registered with any office or authority. Informal firms are those that have neither any registration, nor the practice of maintaining separate accounts. Taking informal firms as reference category, we have tried to

assess the effect of the firms' (in)formality level on their performance. Apart from formality level, some other factors that may influence the performance of the firms identified from the literature are—age of the enterprise, sex of the owner (Pfeifer and Wagner, 2012; Deshpande and Sharma, 2013), scale/size of the enterprise (Benjamin and Mbaye, 2012; Amin and Islam, 2015), access to institutional credit (Fanta et al., 2017), urban location of the enterprise, formal education of the owner (with illiterate or schooling up to class IV as reference category), and training of the enterprise owner. Incorporating the above mentioned control variables, a multiple regression model has been developed to explain whether there is any influence of the level of formality on the selected indicators of firm performance. Additionally, the model includes three-sector dummies (with manufacturing of fabricated metal as a reference category) to capture possible variations in the four sub-sectors or categories of manufacturing on the sample enterprise performance. The definition of the explanatory variables along with their expected impact on the performance of the enterprises is given in Table 3.

Table 3: Definition of the Explanatory Variables along with Their Expected Impact

Sl. No.	Variables used in the model	Notation	Definition	Expected sign
1	Formality	(i) (H.inf.))	= 1 for the firms belonging to high level of informality, or 0 otherwise	+/-
		(ii) (L. inf.)	= 1, enterprises belonging to the category of low level of informality, or 0 otherwise	
		(iii) (Fml)	= 1, enterprises falling under formal category, or 0 otherwise	
2	Firm size (sales per thousand ₹)	(MS.)	Monthly sales revenue of the enterprise as a measure of firm size	+/-
3	Age of the firm	(AGE)	Years of operation as on 2017 since the year of initial operation	+/-
5	Education of the owner	(EDN1)	Dummy variable, =1 if the owner completes a minimum 5 years of schooling and less than 10 years and zeroes otherwise	+
6	Education of the owner	(EDN2)	= 1 if the owner completes 10 years of schooling or more and 0 otherwise	+
7	Training (both institutional and non-institutional)	(TNG.)	Dummy variable, =1, If the owner has training and zeroes otherwise	+
8	Textile and wearing apparel	(S1)	= 1, if the firm is in the manufacturing of textile and wearing apparel sector and 0 otherwise	+/-
9	Food and beverage	(S2)	= 1, if the firm is in the manufacturing of the food and beverage sector or otherwise zero	+/-
10	Furniture (wood and cane)	(S3)	= 1, if the firm is in the manufacturing of Furniture (wood and cane) and 0 otherwise	+/-
11	Location	(LOCN.)	Dummy variable , = 1, if the enterprise is located in urban areas and 0 otherwise	+
12	Access to institutional credit	(IC)	Dummy variable, = 1, if the firm is having institutional credit and zero otherwise	+
13	Sex of the owner	(SEX)	Dummy variable, = 1, if the firm owner is male and 0 otherwise	+/-

3.3 Methods and Tools Used

The effect of degree of formality on the labour productivity and mixed income accruing to entrepreneurs' household per unit of fixed asset are analyzed with the help of multiple regression technique. The dependent variable Yi may take any positive or negative value. Hence, a linear specification is appropriate.[3] Using ordinary least square (OLS) regression, the models may be written as:

$$Y_i1 = \beta0 + \beta1FS_i + \beta2EDN1i + \beta3EDN2i + \beta4TNGi + \beta5S1i + \beta6S2i + \beta7S3i + \beta8LOCN_i + \beta9IC_i + \beta10REG_i + \beta11SEX_i + \beta12\ AGE_i + \mu_i \quad (1)$$

$$Y_i2 = \beta0 + \beta1FS_i + \beta2EDN1i + \beta3EDN2i + \beta4TNGi + \beta5S1i + \beta6S2i + \beta7S3i + \beta8LOCN_i + \beta9IC_i + \beta10REG_i + \beta11SEX_i + \beta12\ AGE_i + \mu_i \quad (2)$$

A multinomial logit model has been used to investigate the effect of formality on the growth of the enterprises. We find this model being used in some other studies to investigate the growth determinants of informal firms (Sasidharan and Raj, 2014). In the multinomial logit model, out of j^{th} (j = 1…m) categories of the dependent variable, one category is considered as a reference category and the probability of choosing other categories is compared to the probability of choosing the reference category. If the first category is the reference category, for j = 2…m, the predicted log-odds are given by

$$\text{Ln}\,[p\,(Y_{j=2\ldots..m})/p\,(Y_{j=1})] = \alpha_j + \sum_{(k=1)}^{K} \beta_{jk}\, X_{ik}$$

where X_{ik} is a set of explanatory variables; β_{jk} are corresponding unknown population parameters; α is the constant term; and Y_j is the categories of growth status (Giri and Goswami, 2017). The exponentiation of predicted log-odds for j = 2…m gives the respective probabilities. By deducting the sum of probabilities for j = 2…m from one, the probability of the reference category is obtained.

4. Results and Discussion

4.1 Descriptive Findings

4.1.1 Formality Status of the Enterprises

While examining the registration status of the enterprises, we find that 16.59 percent of the firms are registered with District Industries and Commerce Centre (DICC) as small scale industry; 40 percent have a trade license either from municipalities or community development block office; 14 percent are registered with the tax office; and 15 percent of the enterprises have license from district labour commissioner office. Besides, some sample firms have registration or license in some other offices like Directorate of Handloom and Textile, Food Safety and Standards Authority of India, etc. Some 45.37 percent of the enterprises are not in government official records; so, they can be identified as complete informal enterprises. Regarding maintenance of separate regular accounts of business, we find that 34 percent of the enterprises have separate accounts of their business.

Table 4 presents the nature and characteristics of the sample enterprises and their owners by their degree of formality. We find that access to institutional credit is higher for formal enterprises than for informal firms. Enterprises located in urban areas are relatively formal. Level of formality increases with firm size (measured in monthly sales volume). A relatively high percentage of female-owned enterprises are informal. Formal firms have more educated owners.

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[3] We run semi-log regression with labour productivity as dependent variable. The results are the same as that of linear regression. To save space, the results are not reported.

Table 4: Firms and Entrepreneurs: Characteristics by Their Levels of Informality

Characteristics	Informal	High level of informality	Low level of informality	Formal
All enterprises/entrepreneurs (%)	41	29.75	15.60	13.65
Male owner (%)	83	90	94	93
Firm owner below primary or no education (%)	24	18	9	4
Firm owners up to primary education (%)	31	25	31	4
A firm owner who completed 10^{th} and more than 10^{th} grade education (%)	45	57	59	93
Training of the owner (formal and informal) (%)	36.90	37.70	34.36	28.57
Mean age of the firm (years)	11.67	15.34	14.93	14.25
Enterprises located in urban areas (%)	33.33	50.81	59.38	67.86
Access to institutional Credit (%)	8.33	11.03	31.25	50
Average monthly sales (₹)	60516	82759	188076	432557

Source: Field Survey

4.2 Effects of Formality on Productivity and Income: Regression Results

Two dependent variables, i.e., labour productivity, and monthly mixed income accruing to entrepreneur's household per unit of the fixed asset are regressed separately on the key variable of formality along with the bundle of explanatory/independent control variables as discussed in section 3.2.2 by applying ordinary least squares (OLS) regression. Summary statistics of the variables considered in the regression models are presented in Table 5.

Table 5: Summary Statistics of the Variables (Excluding Dummies)

Variables	N	Mean	Std. Dev.	Min.	Max.
Labour productivity (₹)	205	9798	4831.81	975	40500
Monthly income to owners per unit of fixed asset (₹)	205	0.5478	0.67270	0.02	3.99
Age of the firm (in years)	205	13.624	11.101	1	54
Monthly sales of the enterprise (₹)	205	137860	192409	2800	1500000

Source: Field Survey

After checking and correcting heteroscedasticity with the help of Breusch-Pagan test, estimates of the parameters are obtained using 'STATA' software. As we can see (results are presented in Table 6), labour productivity of the formal firms are significantly higher than the informal firms. Firms that possess all necessary registrations, including general business and tax registration, and also maintain separate accounts of their business, perform better than informal firms, whereas firms with partial formality (firms with high informality or low informality level) have not experienced any significant impact on their labour productivity compared to informal firms. We get a negative relationship between the degree formality and mixed income of the entrepreneur's household. As the degree of formality increases mixed income of the entrepreneur's household per unit of fixed asset decreases.

Table 6: Results of Regression Analysis for Labour Productivity, and Mixed Income Accruing to Entrepreneurs' Household

Dependent Variables →	Labour productivity	Labour productivity	Mixed-income (per unit of fixed asset)	Mixed-income (per unit of fixed asset)
Independent Variables ↓	Estimates of the Coefficients			
High informality	1,256	917.7	-0.0943	-0.0388
	(0.624)	(800.6)	(0.0957)	(0.112)
Low Informality	(814.5)	13.66	-0.252*	-0.170
	(793.2)	(986.3)	(0.133)	(0.131)
Formal	4,567***	2,480**	-0.326***	-0.114
	(1,268)	(1,225)	(0.0961)	(0.135)
Firm size	-	3.092	-	-0.000202
		(2.732)		(0.000215)
Firm age	-	1.911	-	0.000425
		(43.59)		(0.00298)
Training of the owner	-	841.5	-	-0.0337
		(613.4)		(0.0952)
Sector 1	-1,920**	-1,557	0.0496	0.0456
	(784.1)	(954.7)	(0.0489)	(0.0694)
Sector 2	-906.1	-656.5	0.125**	0.114*
	(674.2)	(738.3)	(0.0627)	(0.0607)
Sector 3	-74.95	330.1	0.914***	0.899***
	(933.9)	(1,074)	(0.138)	(0.141)
Rural/urban Location	-	689.2	-	-0.113
		(747.0)		(0.0952)
Institutional Credit	-	2,070***		0.00622
		(719.1)		(0.0809)
Sex of the owner	-	876.3	-	-0.0888
		(948.1)		(0.0842)
Education of the owner- 1	-	141.6	-	0.0931
		(865.0)		(0.166)
Education of the owner- 2	-	218.3	-	-0.144
		(1,041)		(0.120)
Constant	9274***	1.818**	0.382***	0.547***
	(0.266)	(0.709)	(0.0682)	(0.176)
F	4.47***	2.74***	12.47***	5.61***
	[6,198]	[14,190]	[6, 198]	[14,190]
Observations	205	205	205	205
R-squared	0.13	0.19	0.38	0.41

Notes: Figures within ( ) and [ ] are robust standard errors and degrees of freedom, respectively. ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively.

However, the result is not robust as this association becomes insignificant when we include the control variables in the model.

Table 7: Multinomial Logit Regression for the Determinants of Growth

Explanatory Variables	Model 1		Model 2	
	Declining	Growing	Declining	Growing
High informality	0.519	-0.419	0.417	-0.602
	(0.386)	(0.540)	(0.393)	(0.578)
Low Informality	0.234	1.226**	0.0639	0.889
	(0.534)	(0.592)	(0.672)	(0.673)
Formal	0.772	2.711***	0.986	1.926**
	(0.673)	(0.618)	(0.898)	(0.777)
Firm size	-	-	-0.00233	0.00123
			(0.00304)	(0.00118)
Firm age	-	-	0.0135	-0.0153
			(0.0157)	(0.0199)
Sector 1	0.0296	2.075***	-0.129	1.974***
	(0.542)	(0.578)	(0.593)	(0.721)
Sector 2	-0.0575	-0.452 (0.445)	-0.00504	-0.650
	(0.387)		(0.419)	(0.505)
Sector 3	0.404	-0.302 (0.673)	0.414	-0.0604
	(0.445)		(0.489)	(0.731)
Rural/urban location	-	-	0.0924	0.464
			(0.357)	(0.510)
Institutional credit	-	-	0.340	0.0901
			(0.453)	(0.507)
Sex of the owner	-	-	0.0408	-0.854
			(0.714)	(0.730)
Education of the owner 1	-	-	0.110	1.666*
			(0.513)	(0.936)
Education of the owner 2	-	-	0.392	2.047**
			(0.502)	(0.840)
Training of the owner	-	-	0.188	-0.00793
			(0.370)	(0.496)
Constant	-0.786*	-1.552***	-1.150	-2.530**
	(0.411)	(0.509)	(0.893)	(1.271)
Number of observations = 205			Number of observations = 205	
Log pseudo-likelihood = -193.145			Log pseudo-likelihood = -183.375	
Wald chi2(8) = 41.62			Wald chi2(24) = 65.13	
Prob > chi2 = 0.0000			Prob > chi2 = 0.0000	
Pseudo R^2 = 0.12			Pseudo R^2 = 0.17	

Notes: p < 0.1; ** p < 0.05; *** p < 0.01; figures in the parentheses are standard errors.

Regarding other variables, it is found that the institutional credit has a positive impact on labour productivity of the firms. Significant variations of performance are also observed among the categories of manufacturing.

4.3 Effect of Formality on the Enterprises' Growth

Table 7 presents the relationship between the levels of formality and the growth status of the firms. Probability of the enterprises to grow increases when they become formal. This means probability of firms to grow is higher when a firm has a tax registration (tax identification number),

general business registration and separate accounts of business. The result remains robust even after incorporating other relevant control variables. Like in the case of labour productivity, low and high level of informality is found with no impact on firm growth.

5. Conclusions with Implications for Policy

Findings in the paper have shown mixed results. That is, formal firms perform better than informal firms along some dimensions, and vice versa along with other dimensions. Controlling for key determinants of firm performance, regression analysis reveals a negative but weak association between levels of formality and the mixed income accruing to the entrepreneurs' household per unit of fixed asset. This implies that mixed income accruing to the entrepreneurs' household is not strongly related to levels of formality of the firms. A positive association has been established between formality and the growth of the firms only at the higher level of formality. Only the firms meeting all the formality criteria used in the study are experiencing growth compared to informal firms. After incorporating the relevant control variables, our estimates reveal that compared to complete informal firms, lower level of formality does not influence firm growth. Same finding holds good for labour productivity. Labour productivity improves only when firms attain higher level of formality. As discussed in the section four, formal firms relatively enjoys comparative advantage in terms of access to institutional credit and human capital. These are the channels through which formality exerts influence on firm outcomes. In the regression models also, these variables are found to be the significant factors contributing to labour productivity and growth of the enterprises. What transpires from the findings is that lower level of formality or partial formality may not help improving performance of the micro enterprises. It is the higher level of formality that facilitates productivity increase, and firm growth in the informal sector at least at least for the sample of firms considered in this study. Policies meant for the formalisation of informal enterprises need to be tailored, keeping this context in mind.

About the author

Alok Ranjan Dutta is an Associate Professor at the Department of Economics, Dibrugarh University, Dibrugarh, Assam, India.

Reference

Amin, M. and A. Islam (2015), "Are Large Informal Firms More Productive than Small Informal Firms? Evidence from Firm-level Surveys in Africa", *World Development*, 74: 374-385.

Aparicio, G. (2014), "Does Formality Improve Firm Performance? Evidence from a Quasi-Experiment in Mexico", *Boston University Working Paper*, Boston, MA: Boston University

Araujo, J.P. and M. Rodrigues (2016), "Taxation, Credit Constraints and the Informal Economy", *EconomiA*, 17(1): 43-55.

Benjamin, N.C. and A.A. Mbaye (2012), "The Informal Sector, Productivity, and Enforcement in West Africa: A Firm-level Analysis", *Review of Development Economics*, 16(4): 664-680.

Bhalla, S. (2009), "Definition and Statistical Issues Relating to Workers in Informal Employment", *NCEUS Working Paper No. 3*, National Commission for Enterprises in the Unorganised Sector.

Boly A. (2018), "On the Short- and Medium-Term Effects of Formalization: Panel Evidence from Vietnam", *Journal of Development Studies*, 54(4): 641-656.

Bruhn, M. and McKenzie, D. (2013), "Entry Regulation and Formalization of Microenterprises in Developing Countries", *World Bank Policy Research Working Paper No. 6507*, World Bank.

De Andrade G.H., B. Miriam and D. McKenzi (2013), "A Helping Hand or the Long Arm of the Law? Experimental Evidence on What Governments Can Do to Formalize Firms", *Policy Research Working Paper 6435*, World Bank.

De Mel, S., D. McKenzie and C. Woodruff (2013), "The Demand for, and Consequences of, Formalization among Informal Firms in Sri Lanka", *American Economic Journal: Applied Economics*, 5(2): 122-150

de Paula, Á. and J.A. Scheinkman (2011), "The Informal Sector: An Equilibrium Model and some Empirical Evidence from Brazil", *Review of Income and Wealth,* 57(s1): S8-S26.

de Villiers Scheepers, M.J., M.L. Verreynne and D. Meyer (2014), "Entrepreneurial Configurations of Small Firms", *International Journal of Entrepreneurial Behaviour and Research*, 20(6): 562-583.

Deshpande, A. and S. Sharma (2013), "Entrepreneurship or Survival? Caste and Gender of Small Business in India", *Economic and Political Weekly*, 48(28): 38-49.

Dobbs, M. and R.T. Hamilton (2007), "Small Business Growth: Recent Evidence and New Directions", *International Journal of Entrepreneurship Behaviour and Research*, 13(5): 296-322.

Fajnzylber, P., W.F. Maloney and G.M. Rojas (2011), "Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program", *Journal of Development Economics*, 94(2): 262-276.

Fanta, A.B., K. Mutsonziwa, B. Berkowitz, O. Maposa, A. Motsomi and J. Khumalo (2017), "Small Business Performance: Does Access to Finance Matter? Evidence from SADC Using FinScope Surveys", *Policy Research Paper No. 0/2017*, FinMark Trust.

Farazi, S. (2014), "Informal Firms and Financial Inclusion: Status and Determinants", *World Bank Policy Research Working Paper No. 6778*, World Bank.

Giri, M. and B. Goswami (2017), "Determinants of Households' Choice of Energy for Lighting in Nepal", *Economics and Business Letters*, 6(2): 42-47.

GOA (2011), "Statistical Handbook of Assam", Directorate of Economics and Statistics, Dispur, Guwahati, Government of Assam (GOA), Assam.

GOI (2007), "Report on Cost of Cultivation of Principal Crops in India", Directorate of Economics and Statistics and Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India (GOI), New Delhi.

GOI (2016), "Annual Survey of Industries Summary Results for Factory Sector (2015-16)", CSO, Ministry of Statistics and Programme Implementation, Government of India (GOI), New Delhi.

ICLS (1993), "15th International Conference of Labor Statisticians", Geneva: International Labor Organization.

Jaramillo, M. (2009), "Is there Demand for Formality among Informal Firms? Evidence from Micro Firms in Downtown Lima", *Discussion Paper No 12/2009*, German Development Institute.

Joshi, A., W. Prichard and C. Heady (2012), 'Taxing the Informal Economy: Challenges, Possibilities and Remaining Questions", *ICTD Working Paper 4*, Brighton: Institute of Development Studies.

Kasseeah, H. (2016). "The Performance of Small Firms: Does Formality Matter?" *Journal of Small Business & Entrepreneurship*, 28(6): 431-448.

Khadim, M.E.H. and S.R.D. Choudhury (2019), "Impact of Record Keeping on the Growth of Micro- and Small-scale Enterprises: An Analytical Study", *Small Enterprises Development, Management, and Extension Journal*, 46(2): 70-81.

Kulshreshtha, A.C. (2011), "Measuring the Unorganised Sector in India", *Review of Income and Wealth*, pp. S123-S134.

McKenzie D. and Y.S. Sakho (2010), "Does it Pay Firms to Register for Taxes? The Impact of Formality on Firm Profitability", *Journal of Development Economics*, 91: 15-24.

Medvedev and A.M. Oviedo (2016), "Informality and Profitability: Evidence from a New Firm Survey in Ecuador", *Journal of Development Studies*, 52(3): 412-427.

NCEUS (2008), "Definitional and Statistical Issues, Task Force Report", New Delhi: National Commission for Enterprises in the Unorganized Sector (NCEUS), Government of India.

NSSO (2013), "Economic Characteristics of Unincorporated Non-Agricultural Enterprises (Excluding Construction) in India", (NSS 67th Round, July 2010 - June 2011), report no. 549 (67/2.34/2), New Delhi: National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation Government of India.

NSSO (2017), "Key Indicators of Unincorporated Non-Agricultural Enterprises (Excluding Construction) in India", (NSS 73rd Round, July 2015 - June 2016), NSS KI (73/2.34)). New Delhi: National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation Government of India.

Pfeifer C. and J. Wagner (2012), "Age and Gender Composition of the Workforce, Productivity, and Profits: Evidence from a New Type of Data for German Enterprises", *IZA Discussion Paper No. 6381*.

Sasidharan, S. and Rajesh S.N. Raj (2014), "The Growth Barriers of Informal Sector Enterprises: Evidence from India", *The Developing Economies*, 52(4): 351-75.

Sharma, S. (2014), "Benefits of a Registration Policy for Microenterprise Performance in India", *Small Business Economics*, 42(1): 153-164.

Tamez E. (2009), "Informality and Productivity: Productivity Differentials between Formal and Informal Firms in Turkey", *ERC Working Papers* 0901, Economic Research Center, Middle East Technical University.

Williams, C.C. and A.M. Kedir (2016), "Business Registration and Firm Performance: Some Lessons from India", *Journal of Developmental Entrepreneurship*, 21(3): 1-19.

Williams, C.C., M.S. Shahid and A. Martinez (2016), "Determinants of the Level of Informality of Informal Micro-enterprises: Some Evidence from the City of Lahore, Pakistan", *World Development*, 84: 312-325.

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ESTIMATING INCOME AND PRICE ELASTICITIES FOR SERVICES EXPORTS AND IMPORTS: EVIDENCE FROM INDIA

BIMAL JAISWAL AND ANANYA DIXIT*
University of Lucknow, Lucknow, India

Abstract: This paper aims to estimate the income and price elasticities of services exports and imports for India during the post-GATS period, i.e., 1995-2019. For this purpose, the study uses the ARDL cointegration approach and finds that in the long-run, the services exports of India are positively and significantly income elastic, while the price elasticity is negative and insignificant. However, Indian services imports are found to be positively and significantly elastic to income as well as prices in the long- run. Also, Indian imports are more responsive to income than to prices. The implication of the empirical findings has been explored on India's Current Account Deficit.

Keywords: Services exports, Post-GATS, Income and price elasticities, ARDL approach to cointegration, Current account deficit, Services imports

1. Introduction

India's trade in services has received a significant acceleration between 1995 and 2019 with the total value of trade having increased from US $1.3 trillion to US $6.1 trillion. Although developing countries now account for a significant proportion of global trade in services with their share increasing to one-fourth of the total, developed countries still dominate services trade. Developed countries account for 63% of the world's services exports and 54% of the world's services imports in 2019 (UNCTAD 2020). Becoming a signatory to the General Agreement on Trade in Services (GATS) of WTO in 1995 has provided India's international trade in services immense benefits and boost. India has shown a stronger revealed comparative advantage in Services as compared to goods. India had an RCA index of 1.8 for services and 0.6 for goods for 2019. Between 1995 and 2019, India's RCA Index for Services increased by 93% while the RCA index for goods declined by 14% (World Bank 2021). India ranked eighth in the world's services exports and twelfth in world's merchandise exports in 2019. India's share in global services exports was 3.5% as compared to its 1.7% share in global merchandise exports in the same year. Similarly, India's share in global services imports was 3.3% while its share in global merchandise imports was 2.4% for the same year. The share of services trade in India's total international trade was 20.5% (Ministry of Commerce and Industry, Government of India 2021).

*Correspondence to: Ananya Dixit, PhD student, Department of Applied Economics, Faculty of Commerce, University of Lucknow, Uttar Pradesh 226007, India. E-mail: dixitananyaa@gmail.com.

The Compound Annual Growth Rate (CAGR) of India's services and Merchandise exports and imports clearly reflects the growing importance of services trade over goods trade where the CAGR of 13.4% was witnessed by services exports during the study period of 1995 to 2019 in contrast to CAGR of 11.7% witnessed by merchandise exports during the same period. Similarly, the services imports exhibited a CAGR of 5.6% in contrast the to 6.2% CAGR exhibited by merchandise imports during the study period (Table 1).

Table 1: CAGR for Services and Merchandise Exports and Imports

Year	Services Exports	Merchandise Exports	Services Imports	Merchandise Imports
1995-2000	14.7%	10.3%	5.3%	6.1%
2000-2005	24.0%	20.3%	7.4%	8.6%
2005-2010	17.6%	20.8%	14.5%	18.6%
2010-2015	6.1%	6.8%	1.1%	0.1%
2015-2019	3.3%	2.2%	-0.8%	-0.9%
Overall	13.4%	11.7%	5.6%	6.2%

Source: Authors' calculation based on data from UNCTAD World Investment Report 2020

This data indicates that India has a stronger presence in global services trade than in global merchandise trade (WTO, 2021). India's stellar performance in services trade has been a game-changer for its economy. The growing dominance of the services sector in global trade as against goods trade calls for a strategic shift in research focus among scholars and policymakers. Understanding the dynamics of services trade will enable India to leverage its strengths, address challenges, and seize opportunities in this dynamic sector.

India's balance of payments distinguishes between merchandise transactions (visibles) and non-merchandise transactions (invisibles) within its current account. The non-merchandise transactions include three sub-categories, primary income, and transfers. The non-factor services component refers to all the receipts and payments that are not related to any conventional factors such as labor and capital, including activities such as education, tourism and financial services. This non-factor services component is what defines international trade in services on a global level. In recent years, net exports of non-factor services have played a crucial role in India's external stabilization by reducing the country's current account deficit (CAD) as a percentage of GDP. In 2019, India's actual CAD was 1.0% of GDP. However, if net exports of non-factor services were not accounted for, India's CAD would have been 2.9% of GDP in 2019. This highlights the significant contribution of net exports of non-factor services in India's external sector (Reserve Bank of India, 2021).

There are numerous and multidimensional factors which influences services trade by either promoting or retarding it as measured in terms of services exports and imports. The objective of this study is however to estimate empirically the responsiveness or elasticity of services exports and imports to income and prices only for the period of 1995 to 2019. All the data has been collected from World Bank Indicators dataset.[1] The implications of the empirical findings will also be explored on India's Current Account Deficit. It will be helpful to gain valuable insights regarding the export and import demand functions of services.

Income elasticity means the responsiveness of the quantity demanded of a good or service to changes in income levels. Or in other words, income elasticity basically refers to the percentage

[1]World Bank Indicators dataset (World Bank, 2019).

change in services exports due to 1 per cent change in world's income in the context of this study. A positive income elasticity greater than 1 indicates that services are income elastic, meaning that as world's income rises, the exports for the services from India increases at a proportionately higher rate and vice versa.

While price elasticity measures the responsiveness of the quantity demanded of a good or service to changes in its price. Or in other words, in the context of this study we can say that price elasticity basically refers to the percentage change in services exports/imports due to 1 per cent change in their relative prices. A price elasticity value greater than 1 indicates that the services are price elastic, meaning that changes in their relative prices have proportionately higher effect on the quantity exported/imported from/to India. By relative prices it means the price of a particular service in India in contrast to its price in the other exporting countries of the world.

The rest of the paper is organised as follows. Section 2 gives the Review of Literature. Section 3 provides the Empirical Analysis whereas Section 3.1 gives the Overview of the Growth Trend in the two key determinants of Services Trade analysed in this paper namely, prices and income. Section 3.2 provides the Empirical model for estimating income and price elasticities for services exports and imports. It also discusses the techniques of estimation. Section 4 provides the empirical results while Section 5 gives the conclusion and major policy implications of the study.

2. Review of Literature

Various economic theories have suggested that a country's current account balance is heavily influenced by the income and price elasticities of its exports and imports. One such theory, known as the Marshall-Lerner condition, links the price elasticities of international trade to external imbalances. It states that for a country's trade deficit to decrease following a depreciation of its domestic currency, the sum of the absolute values of the price elasticity of export demand and the price elasticity of import demand must be greater than 1. If this sum is less than 1, the foreign exchange market becomes unstable, while a sum of 1 indicates that a change in the exchange rate will not affect the balance of payments.

Another theory, proposed by Prebisch (1950, 1959), links a country's balance of payments to the income elasticity of its exports and imports. Prebisch argued that less developed countries (LDCs) tend to specialize in activities with diminishing returns and export primary products, which have a low-income elasticity of demand in world markets. In contrast, developed countries tend to specialize in activities with increasing returns and export manufactured goods, which have a high-income elasticity of demand in world markets. In a two-country model where both countries grow at the same rate, this would result in a perpetual balance of payments deficit for the LDC and a perpetual balance of payments surplus for the developed country because the income elasticity of export demand for the LDC is less than the income elasticity of import demand for the LDC.

Hooper et al. (2000) conducted a study to examine the stability of income and price elasticities of international trade for the G7 countries. Their analysis used quarterly data on goods and services trade from 1994-1997 and they employed Johansen's cointegration technique to estimate long-run elasticities and the error-correction model to estimate short-run elasticities. The study revealed that, with the exception of France and Germany, the price elasticities of all the other countries satisfied the Marshall-Lerner condition. However, they found that the income elasticities for the United States was asymmetric. In addition, the study discovered that the trade elasticities of Germany, as well as the export elasticities of France and Italy, exhibited substantial parameter instability around the time of Germany's unification.

Marquez (2005) conducted a study on the income and price elasticities for US trade in services. He addressed the issue of aggregation and simultaneity biases by estimating trade elasticities for four categories of services and comparing them with total services trade. Using quarterly data from 1987-2001, he found that the income elasticity for US exports of services was greater than the income elasticity for US imports of services, and disaggregation was crucial to this reversed asymmetry.

Banga et al. (2011) analyzed the impact of the global recession on India's services exports from 1970 to 2008. They estimated the income and price elasticity of demand for India's services exports using OLS regressions and co-integration. Their study found that the income elasticity of demand for India's services exports was higher than the price elasticity of demand, although both determinants had a significant influence.

There have been various studies which have used autoregressive distributed lag (ARDL) modelling approach to cointegration in order to estimate income and price elasticities for exports and imports like Rashid and Razzaq (2010) where they have developed a structural econometric model for Pakistan with binding foreign exchange constraint. The ARDL and DOLS methods were employed to assess the long-term coefficients of price and income elasticities. The findings from both the ARDL bound testing approach and Johansen's cointegration method provide robust evidence supporting the presence of a stable, long-term relationship among the variables in the import demand model. Moreover, the estimated price and income elasticities exhibit the expected signs and demonstrate statistical significance.

Similarly, Waliullah et al. (2010) conducted a study to investigate the short and long-run relationship between the trade balance, income, money supply, and real exchange rate in Pakistan's economy. The inclusion of income and money variables in the model allowed them to explore the monetary and absorption approaches to the balance of payments, while the real exchange rate was used to evaluate the conventional approach of elasticities, specifically the Marshall Lerner condition. To examine the existence of a long-run equilibrium relationship between the trade balance and its determinants, the researchers employed the bounds testing approach to cointegration and error correction models within an autoregressive distributed lag (ARDL) framework. They analyzed annual data covering the period from 1970 to 2005. The findings from the bounds test suggest a stable long-run relationship between the trade balance and the income, money supply, and exchange rate variables. Notably, the estimated results indicate a positive correlation between exchange rate depreciation and the trade balance in both the short and long run, which aligns with the expectations of the Marshall Lerner condition. The results of the study strongly support the significance of money supply and income in influencing the behavior of the trade balance. While the exchange rate regime can contribute to improving the trade balance, its impact is relatively weaker compared to the effects of economic growth and monetary policy.

In harmony with the previous studies, another study Oskooee and Kara (2006) employ cointegration technique, i.e., ARDL approach to cointegration that does not require pre-testing for unit root and estimate income and price elasticities of import and export demand for 28 countries. The results indicate that price elasticities in most instances are high enough to conclude that real depreciation could improve the trade balance.

In sync with the former, in a study conducted by Caporale and Chui (2002), they aimed to estimate income and price elasticities of trade for 21 countries using a cointegration framework. To achieve this, they employed the ARDL modelling approach and the DOLS procedure to derive

long-run estimations. The empirical findings of their research revealed the presence of a systematic relationship between growth rates and income elasticity estimates. Specifically, they observed that economies with higher growth rates tend to exhibit higher income elasticities of demand for their exports but lower import elasticities. This interesting pattern suggests that faster-growing economies experience greater responsiveness in the demand for their export goods concerning changes in income levels. However, at the same time, their imports are less sensitive to changes in income. Consequently, this phenomenon implies that despite rapid economic growth, there is no pronounced secular trend in real exchange rates. In summary, Caporale and Chui's study sheds light on the complex dynamics between economic growth, income elasticity, and price elasticity of trade. It highlights how different economies respond differently to changes in income and how this interaction can impact real exchange rates over time.

In a study conducted by Narayan and Narayan (2005), the authors examined the import demand model for Fiji by employing the bounds testing approach to cointegration. The research covered the period from 1972 to 1999. To estimate the long-run elasticities, they utilized three approaches: the autoregressive distributed lag (ARDL) model, the dynamic ordinary least squares (DOLS) approach, and the fully modified ordinary least squares technique. Their results confirmed the existence of a long-run cointegration relationship among the variables, particularly when import volume was considered as the dependent variable. Notably, they found that the coefficient on income exhibited elasticity, while the coefficient on relative prices (import price relative to domestic price) demonstrated unitary elasticity in the long run. The error correction mechanism analysis revealed that equilibrium after any shocks to the determinants of import demand was achieved after approximately 2 and 1/2 years.

Another study conducted by Ziramba and Chifamba (2014) aimed to assess the behavior of South Africa's trade balance concerning a depreciation of the real effective exchange rate, known as the J-curve phenomenon. They used aggregate trade data spanning from 1975 to 2011 and employed the bounds test approach to cointegration developed by Pesaran et al. (2001) to analyze the long-run relationship among the variables. The empirical results indicated the presence of cointegration between the trade balance and the real effective exchange rate, as well as domestic and foreign income. In the long run, the real effective exchange rate showed a negative sign but was statistically insignificant. While the short-run results initially showed negative values in earlier quarters, followed by positive values as the lag length increased, most of these coefficients lacked statistical significance. Consequently, the study did not find substantial support for the J-curve phenomenon they tested, based on the elasticities approach to the balance of payments, with the coefficients being interpreted as elasticities.

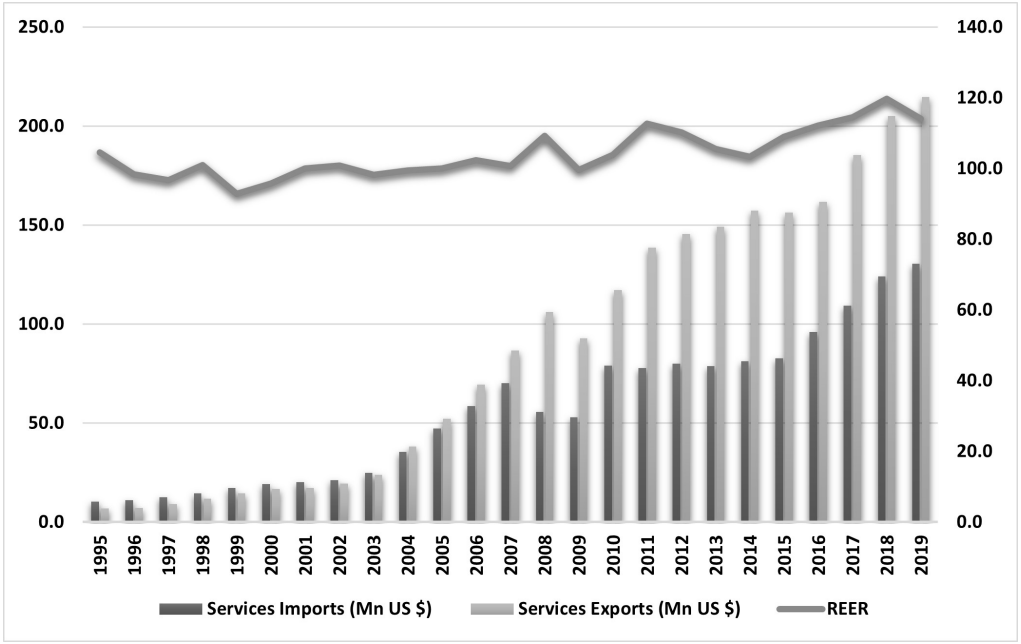
Lastly, Raissi and Tulin (2015) conducted a study to estimate the short-term and long-run price and income elasticity of Indian exports. Their investigation also delved into the role of supply-side bottlenecks in shaping India's export demand relationship. They utilized disaggregated export volume data for 45 Indian industries over the period 1990-2013, along with industry-specific international relative prices for estimation. The Panel ARDL approach was employed to estimate short-run and long-run income and price elasticity of export demand, with the long-run effects derived from OLS estimates of the short-run coefficients. The results highlighted that Indian exports were sensitive to international relative-price competitiveness, world demand, and energy shortages. Additionally, the study found that binding supply-side constraints, notably energy shortages, reduced price responsiveness in the short term.

3. Empirical Analysis

3.1 Overview

Figure 1 gives an overview of the growth trend in India's services exports and services imports since 1994-95, considered along with the movements in Real Effective Exchange Rate (REER). When comparing the movements in services imports and exports to REER, it is important to note that changes in REER can affect a country's trade balance, including the imports and exports of services. A decrease in REER can make a country's exports more competitive and imports more expensive, which can lead to an increase in services exports and a decrease in services imports. On the other hand, an increase in REER can make a country's exports less competitive and imports less expensive, which can lead to a decrease in services exports and an increase in services imports. However, for such a relationship to exist, it is important that the exports and imports should be highly price elastic so that they actually respond to changes in Exchange rate.

Figure 1: Growth Trend in India's Services Exports and Services Imports Considered along with the Movements in Real Effective Exchange Rate (REER)



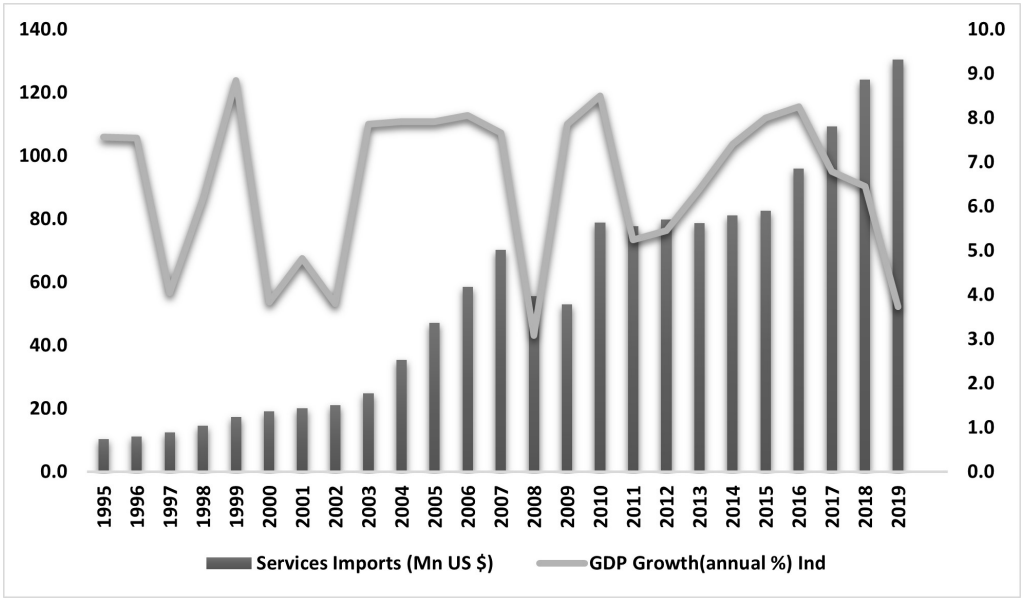
Source: Authors' calculation

Therefore, we can see that there is no consistent relationship between REER and services imports and exports over the period from 1995 to 2019. While the REER decreased from 1995 to 1999, the services imports and exports increased. From 1999 to 2002, while the REER increased, the services imports and exports remained relatively stable. From 2002 to 2008, the REER increased again, and the services imports and exports increased as well. However, from 2008 to 2010, while the REER increased again, the services imports and exports decreased. From 2010 to 2019, the REER continued to increase, but the services imports and exports continued to increase as well. Factors such as economic growth, changes in trade policies, and shifts in global demand can all play a role in the movements of services imports and exports.

Such an uncorrelated relationship between REER and services exports and imports can be because of the fact that the availability of time-series data on price indices for services exports and imports in India is limited. This is due to the fact that customs records, which are the primary source of information for export and import price indices, typically only cover goods and not services. As a result, export and import price indices that are currently produced generally do not include services. Furthermore, there are significant challenges in measuring the prices of services such as finance, insurance, and entertainment (IMF, 2009). Therefore, in this study, we have used the exchange rate as an indicator of relative prices for services exports and imports.

Figure 2 gives an overview of the growth trend in Services Imports to India from 1995 to 2019 when considered along movements in GDP growth rate of India for the same time period. It is believed that when we consider an open economy with international trade like India, an increase in domestic income as measured by GDP leads to increase in aggregate demand and thus can also lead to an increase in imports. As the economy grows, consumers may have a higher disposable income, leading to greater demand for both domestic and foreign goods. This increased demand for foreign goods contributes to higher imports. Thus, we expect a positive relationship between GDP growth and imports. However, for such positive relationship to exist the underlying condition is that the imports should be highly income elastic so that there is responsiveness in imports due to changes in India's GDP.

Figure 2: Growth Trend in Services Imports to India When Considered along Movements in GDP Growth Rate of India



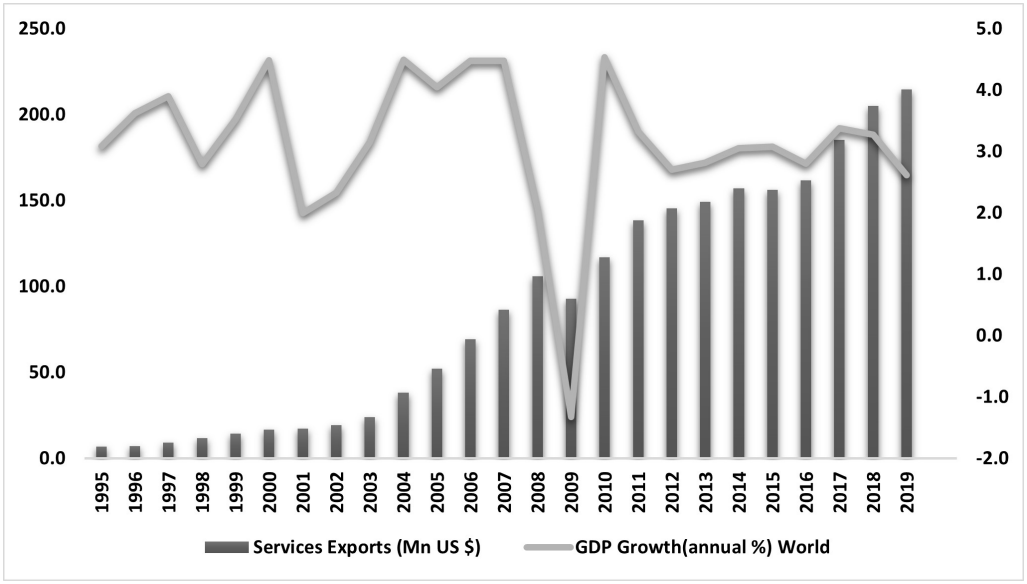
Source: Authors' calculation

Now, in Figure 2, it can be seen that services imports in India have consistently increased between 1995 and 2019, rising from 10.27 billion USD in 1995 to 130.535 billion USD in 2019. Besides, we see that the GDP growth rate in India has been variable over the same time period. It has ranged from a low of 3.086% in 2008 to a high of 8.845% in 1999. In recent years, the growth rate has been around 6-7%.

It is worth noting that there does not seem to be a direct correlation between the two variables. For example, in 2008, when the GDP growth rate was low, services imports actually increased slightly from the previous year. Similarly, in 2019, when the growth rate was also low, services imports were at their highest level in the entire time period. Overall, it seems that services imports have been increasing steadily over the years, regardless of fluctuations in the GDP growth rate. This may reflect the increasing importance of services in the Indian economy as well as the increasing globalization of services trade in general.

Figure 3 gives an overview of the growth trend in services exports from India from 1995 to 2019 when considering along movements in the GDP growth rate of World for the same time period. It is believed that a country's exports are directly influenced by global demand for its goods and services. When the world GDP experiences robust economic growth, there is an increase in overall global demand for various products and services. This heightened demand can positively impact a country's exports, as it finds more opportunities to sell its goods and services to other countries. However, for such a relationship to exist it is important that exports should be highly income elastic in global market so that they respond to such movements in World's GDP.

Figure 3: Growth Trend in Services Exports from India When Considering along Movements in the GDP Growth Rate of World



Source: Authors' calculation

In Figure 3, we see that India's services exports have generally been increasing over time, with a few dips in between. From 1995 to 2019, India's services exports increased from approximately 6.77 billion US dollars to 214.76 billion US dollars, which is a substantial increase. In contrast, the world GDP growth rate has been more stable over the same time period, with a few fluctuations. We can see that the world GDP growth rate generally stayed between 2-5% per year, with the exception of a dip in 2009 during the global financial crisis. Overall, it appears that India's services exports have been growing at a faster rate than the world GDP growth rate over the past few decades.

3.2 Empirical Model and Technique of Estimation

The study outlines that India's services export demand (SerX) is determined by the Annual Growth rate of World's GDP (MGDPGr) and REER, as per Equation 1. In the same vein, India's services import demand (SerM) is linked with Annual Growth rate of India's GDP (GDPGr) and REER, as per Equation 2. The income elasticities of demand for services exports and imports are expected to have a positive sign, while the price elasticities of demand for services exports are anticipated to be negative while for imports it is anticipated to be positive.

$$SerX_t = f(MGDPGr_t, REER_t) \quad \ldots(1)$$

$$SerM_t = f(GDPGr_t, REER_t) \quad \ldots(2)$$

The study estimates income and price elasticities of India's trade in services through time-series methodology. This methodology can be used for measuring income and price elasticity in the context of economic analysis. Time series data, which is collected over successive time intervals, is particularly well-suited for studying the relationship between variables over time and estimating elasticities. It allows for dynamic analysis, capturing how changes in one variable affect another variable over different time periods. This is crucial when studying elasticities, as they measure how the quantity demanded or supplied responds to changes in income or price over time. In this paper, time series data on have been taken on variable in their natural logarithm (log) form. So, the coefficients basically represent the percentage change in services exports and imports resulting from 1% change in income and prices. These coefficients provide valuable insights about the relationship and responsiveness of services exports and imports to income and prices.

The stationarity properties and order of integration of each macroeconomic variable are tested using the Augmented Dickey-Fuller (ADF) test and Phillips-Perron test.

The bound testing approach to the Auto-Regressive Distributed Lag (ARDL) model is then used to determine if the variables are co-integrated. The ARDL approach is preferred over Johansen's approach because the variables of interest are not purely I (1), and the direction of causality is given a priori. Additionally, different variables can be assigned different lag lengths in the ARDL model. The ARDL approach to cointegration is a well-established method for estimating income and price elasticities in time series data. This approach has been widely used in various economic studies to analyze the long-run and short-run relationships between variables. It is particularly suitable when dealing with mixed order of integration in the data and allows for the estimation of elasticities in a cointegrated system (Pesaran et al., 2001).

The following ARDL models are estimated to check for the presence of cointegration:

$$\Delta LnSerX_t = \alpha_1 + \Sigma_{i=1}^{m}\beta_{1i}\Delta LnSerX_{t-i} + \Sigma_{i=0}^{n}\ \beta_{2i}\Delta LnMGDPGr_{t-i} + \Sigma_{i=0}^{p}\beta_{3i}\Delta LnREER_{t-i} + \beta_4\Delta LnSerX_{t-1} + \beta_5\Delta LnMGDPGr_{t-1} + \beta_6\Delta LnREER_{t-1} + \cup_1 t \quad \ldots(3)$$

$$\Delta LnSerM_t = \alpha_2 + \Sigma_{j=1}^{q}\ \beta_{1j}\Delta LnSerM_{t-j} + \Sigma_{j=0}^{r}\beta_{2j}\Delta LnGDPGr_{t-j} + \Sigma_{j=0}^{s}\ \beta_{3j}\Delta LnREER_{t-j} + \beta_7\Delta LnSerM_{t-1} + \beta_8\Delta LnGDPGr_{t-1} + \beta_9\Delta LnREER_{t-1} + \cup_2 t \quad \ldots(4)$$

The existence of long-run cointegrated relationship between variables in the ARDL models is determined through F statistic in Bound test. The joint null hypothesis of zero cointegration is tested (in case of Equation 3, H0: β4 = β5 = β6 = 0; and in case of Equation 4, H0: β7 = β8 = β9 = 0), against the alternative hypothesis of cointegration. Critical values are computed for a given level of significance using the Bound test Approach by Pesaran, Shin, and Smith (2001). The Bound Test helps determine whether the ARDL model is appropriate for estimating the long-run

relationship between the variables. If the computed F statistic is above the upper critical bound, the null hypothesis of zero cointegration or no long run relationship is rejected. Conversely, if the F statistic is below the lower critical bound, the null hypothesis cannot be rejected. However, if the calculated F-statistic falls within the bounds, the test is inconclusive. When the null hypothesis is rejected, the error correction representation of the ARDL model is estimated to study short-run dynamics. The error correction term in the model measures the speed at which deviations from the long-run equilibrium are corrected and is expected to have a negative sign.

After estimating the ARDL models as per equations 3 and 4, regression diagnostic tests are performed. The LM test checks if the estimated ARDL models suffer from residual serial correlation, while the Breusch-Pagan-Godfrey Test checks for homoskedasticity and independence of errors. The Jarque-Bera test checks if the residuals are normally distributed. The CUSUMSQ test is also carried out to check for parameter instability in the estimated ARDL model. If the movement is outside the pair of 5 percent critical lines, it indicates parameter instability. CUSUMSQ test is a variant of CUSUM (cumulative sum of recursive residuals) test. The results of all the regression diagnostic tests have been presented in the Appendix.

4. Empirical Results

To begin with, firstly, the log-linear forms of the macroeconomic variables—SerX (Services exports), SerM (Services imports), REER, MGDPGr (Annual Growth rate of World's GDP), and GDPGr (Annual Growth rate of India's GDP)—are initially examined for their unit-root properties. For this purpose, the study employs ADF and Phillips-Perron test. Table 2 gives the results of ADF test for examining the stationarity properties of the macroeconomic variables required to estimate the income and price elasticities of India's trade in services. The optimal lag length for carrying out the ADF test for each of the variables is chosen based on the Schwarz Info Criterion (SIC). In the case of Phillips-Perron test, Bartlett Kernel spectral estimation method has been used. Based on the statistical significance of the test statistic, it is found that in the level form, the null hypothesis of presence of unit root can be rejected only in the case of LnREER and LnGDPGr. This implies that the variable LnREER and LnGDPGr is stationary in the level form, i.e., I (0). All other variables are found to be stationary only in first difference, i.e., they are integrated of order 1 or I (1).

Table 2: Results of ADF Test for Stationarity

Variable	Level		First Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept
LnMGDPGr	0.9919	0.5250	0.0007*	…
LnGDPGr	0.0021*	...	…	...
LnSerM	0.6446	0.8002	0.0081*	…
LnSerX	0.2531	0.9851	0.0497*	…
LnREER	0.6082	0.0059*	…	…

Note: * denotes significance at 5% level
Source: Authors' calculation

To re-confirm the unit-root properties of the macroeconomic variables required for the estimation, the Phillips Perron test is also carried out and results are reported in Table 3. Table 3 reveals that, only in the case of LnREER and LnGDPGr, the null hypothesis of stationarity cannot be rejected in the level form. This implies that LnREER and LnGDPGr is I (0), which reinforces the earlier findings of the ADF test. All the other variables become stationary only at the first difference,

i.e., they are I (1). Since the macroeconomic variables are found to be a mix of I (1) and I (0), the bound-testing approach to the ARDL model is implemented to check for the presence of any co-integrating relationship among these variables and subsequently estimate the services export and import demand functions. This approach cannot be used if any of the variables are found to be I (2).

Table 3: Results of Phillips Perron Test for Stationarity

Variable	Level		First Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept
LnMGDPGr	0.1082	0.0676	0.0008*	…
LnGDPGr	0.0024*	…	…	…
LnSerM	0.6274	0.7398	0.0103*	…
LnSerX	0.346	0.9746	0.0482*	…
LnREER	0.5884	0.0007*	…	…

Note: *Denotes significance at 5% level
Source: Authors' calculation

4.1 Estimation of India's Services Exports Demand Function

Services export demand function is estimated in the log-linear form as per Equation 3, and the ARDL (2,0,0) model is chosen based on the Akaike Info Criterion (AIC). In ARDL (2,0,0) model, lag 2 corresponds to the variable LnSerX; lag 0 corresponds to LnMGDPGr; and lag 0 corresponds to LnREER. The long run coefficients estimated from ARDL (2,0,0) model are reported in Table 4. When the Long-Run Bound test is performed for the ARDL (2,0,0) model, the F-statistic is found to be = 7.54. Assuming a model with Restricted Constant and no trend, and with 2 regressors (k = 2), the asymptotic lower and upper bound values of F-statistic are 2.63 and 3.35 at 10% level of significance. Since the computed F-statistic exceeds the critical upper bound at 10% significance level, the null hypothesis of zero cointegration or no long-run relationship can be rejected in this case. This implies a long-run equilibrium relationship exists between services exports, World's GDP and REER for the Indian economy, during the post-GATS period.

The income elasticity of services export demand is estimated to be 4.23. It has predicted sign and is statistically significant at 10% level of significance. This implies that, given the exchange rate, a one per cent increase in GDP growth of importing countries will lead to a growth in India's services exports by 4.23 per cent. The price elasticity of services exports is estimated to be -8.07. It also has predicted sign, but is found to be statistically insignificant. This implies that, in the long-run, India's exports of services are significantly responsive only to changes in world's income, and not relative prices. From this, we can infer that as global income levels rise, consumers in other countries of the world have more disposable income, which leads to an increased demand for various services offered by India. It indicates that India's services are perceived as valuable and sought after by consumers in the world when they have higher incomes to spend. And the result of India's services exports being not price elastic implies that the demand for these services is relatively insensitive to changes in their prices. Even if the prices of India's services become cheaper or more expensive compared to other countries' services, it does not significantly influence the demand for these services from the global market. This can be due to various reasons such as uniqueness of Indian produced services, its better quality and lack of close substitutes in global market.

Table 4: Long-Run Determinants of Services Export Demand Function: Estimates from ARDL Approach to Cointegration

Dependent Variable: LnSerX		
Regressor	**Co-efficient**	**T-Ratio (p-value)**
LnMGDPGr	4.23	1.905 (0.07)*
LnREER	-8.07	-1.34 (0.19)
C	-6.844	-0.569 (0.57)
R-squared=0.99; F-statistic=953.64(0.000)		

Notes: Lag Length is chosen on the basis of Akaike Info Criterion (AIC); * Denotes significance at 10% level
Source: Authors' calculation

The Error Correction Representation of ARDL (2,0,0) model gives the short-run dynamics. The estimation results are reported in Table 5. The short-run income elasticities of demand for services exports are also found to be statistically significant whereas the price elasticity is statistically insignificant. However, the short-run elasticities are not found to have the predicted signs. The error correction term (ECT) is found to be negative and statistically significant, providing further empirical evidence in support of presence of cointegration between services exports, GDP of World and REER. The fact that ECT= -0.058 implies that about 5.8 per cent of the short-run disequilibrium between these variables is corrected every year.

Table 5: Estimation Results of Error Correction Representation of ARDL (2,0,0) Model

Dependent Variable: LnSerX		
Regressor	**Coefficient**	**T-Ratio (p-value)**
LnSerX(-1)	1.19*	7.929 (0.0000)*
LnSerX(-2)	-0.25	-1.76 (0.0951)
LnREER	0.47	0.87 (0.3929)
LnMGDPGr	0.25**	3.23 (0.0049)**
C	-0.39	-0.47 (0.6397)
ECT (-1)	-0.058*	-5.96 (0.0000)*

Note: * and ** denote significance at 1% and 5% levels, respectively
Source: Authors' calculation

4.2 Estimation of India's Services Import Demand Function

The Services Import Demand function is estimated in the log-linear functional form as per Equation 4, and ARDL (1,0,2) model is chosen based on Akaike Info Criteria (AIC). In ARDL (1,0,2) model, lag 1 corresponds to the variable LnSerM, lag 0 corresponds to LnGDP and lag 2 corresponds to LnREER. The long run coefficients estimated from ARDL (1,0,2) model are reported in Table 6. When Long-Run Bound test is performed for this ARDL (1,0,2) model, the F-statistic is found to be = 12.48. Assuming a model with restricted constant and no trend, and with 2 regressors (k =2); the lower and upper bound critical values of F-statistic are 2.63 and 3.35 at the 10 per cent level of significance. Since the computed F-statistic exceeded the critical upper bound at the 10 per cent level of significance, the null hypothesis of zero cointegration or long run relationship can be rejected.

This establishes the presence a long-run equilibrium relationship between services imports, GDP and REER for the Indian economy, during the post-GATS period.

The income elasticity of demand for services imports is estimated to be 2.58 (Table 6). It is found to have predicted sign and is statistically significant. The economic implication is that given the exchange rate, a 1 per cent increase in India's GDP will lead to a rise in India's services imports by 2.58 per cent. The positive and significant income elasticity for India's services imports suggests that they are considered normal goods. As the Indian economy grows and incomes rise, there is a greater demand for various services from foreign countries. This could be driven by several factors, such as increased consumer purchasing power, expanding businesses seeking specialized services, or India's growing integration with the global economy, leading to more cross-border service transactions.

The price elasticity of services imports is estimated to be 2.32 and is statistically significant. This implies that given India's GDP, a 1 per cent appreciation in the REER will lead to a rise in India's services imports by 2.32 per cent. In the long run, India's services imports are found to be more responsive to income, compared to prices. The higher income elasticity suggests that economic growth in India has a more substantial effect on the demand for services imports than price changes. As the Indian economy expands, there is an increased demand for various services, including specialized or higher-quality services that may not be adequately met domestically. While price changes still influence the demand for services imports, they do not have as strong of an effect as income changes. This may be due to the essential nature of certain services, the lack of close substitutes, or the perceived value of foreign services in meeting specific needs.

Theoretically, The Real Effective Exchange Rate (REER) is the weighted average of a country's exchange rate with its trading partners, adjusted for inflation. An appreciation of the REER means that a country's currency has become stronger compared to the currencies of its trading partners.

When a country's REER appreciates, its exports become costlier while imports become cheaper. This is because, in the foreign market, buyers would need to exchange a larger amount of their currency to purchase the same amount of the country's goods and services. This would make the country's exports more expensive in foreign markets, which can lead to a decline in demand for the country's exports, as foreign buyers may switch to cheaper alternatives.

While when REER of a country appreciates it has a opposite effect on its imports. Imports increase due to rise in REER because in the foreign market country's citizens would need to exchange lesser amount of their currency to purchase the same amount of goods and services, this would make imports cheaper and citizens would prefer buying foreign goods instead of home country's goods. Accordingly, in this study, price elasticity of services exports is empirically found to be negative (Table 4), whereas price elasticity of services imports is empirically found to be positive (Table 6).

The Error Correction Representation of the ARDL (1,0,2) model gives the short-run dynamics. The estimation results are reported in Table 7. The Error Correction Term (ECT) is found to be negative and statistically significant, re-affirming the presence of cointegration between the variables. The ECT is found to be equal to -0.13 and is statistically significant, implying that about 13 per cent of the short-run disequilibrium between services imports, India's GDP and REER is corrected every year. The short-run income and price elasticities of demand for India's services imports are found to be statistically significant and possess the same signs as the long-run elasticities.

Table 6: Long-Run Determinants of Services Import Demand Function: Estimates from ARDL Approach to Cointegration

Dependent Variable: LnSerM		
Regressor	**Co-efficient**	**T-Ratio (p value)**
LnGDPGr	2.58	2.20(0.0415)*
LnREER	2.32	2.32(0.0326)*
C	-3.91	-0.76(0.45)
R-squared=0.98; F-Statistic=305.40(0.000)		

Note: * denotes significance at 5% level
Source: Authors' calculation

Table 7: Estimation Results of Error Correction Representation of ARDL (1,0,2) model

Dependent Variable: LnSerM		
Regressor	**Coefficient**	**T-Ratio (p value)**
LnSerM(-1)	-0.13	-2.66 (0.0162)**
LnGDPGr(-1)	0.34	2.72 (0.0143)**
LnREER	0.84	1.44 (0.0470)**
dLnGDPGr	0.28	4.32 (0.0005)*
dLnGDPGr(-1)	0.10	1.51 (0.1487)
C	-0.52	-0.66 (0.5172)
ECT (-1)	-0.133	-7.66 (0.0000)*

Notes: Lag Length is chosen on the basis of Akaike Info Criterion (AIC); * and ** denote significance at 1% and 5% levels, respectively.
Source: Authors' calculation

5. Conclusions, Discussions and Policy Implications

The study utilized the ARDL approach to cointegration and found that the demand elasticity of India's services exports due to price changes was negative, low, and statistically insignificant. However, income elasticity of services export demand was observed to be high, positive, and statistically significant. In contrast, income and price elasticity of demand for India's services imports were positive and statistically significant. In the long-term, the income elasticity of demand for services exports was significantly higher than the price elasticity of services imports for the Indian economy. These findings support the arguments of Prebisch and Johnson regarding India's international trade in services. Prebisch and Johnson in their theory argued that if a country's exports have high income elasticity that is when global income rises, demand for the country's exports will increase then it exhibits characteristics of developed economy. The study revealed that, despite the fact that India is recognised globally as developing economy, India's service trade does exhibits characteristics of a developed country, which is why India gains when it engages in international trade in services. Now, having high income elasticity of services exports implies that this sector has immense potential to promote the growth of the country by focusing on developing and exporting more services to capitalize on the rising demand as global income levels increase. Therefore, the need is to prioritize services exports as part of their overall trade strategy. For this, the government and policymakers need to invest in developing their service sectors, promoting innovation, education, and skills training to ensure a continuous supply of high-quality services that can meet increasing global demand and also reduce trade barriers and regulatory hurdles that hinder the cross-border flow of services.

Also, a high-income elasticity of services exports suggests that countries may experience increased demand for innovative and technology-driven services as income levels rise. Therefore, governments should promote research and development in technology-intensive service sectors to stay competitive in global markets and foster innovation-driven economic growth.

Furthermore, favourable income elasticities of services trade where income elasticity of exports is much higher than imports contribute significantly to reducing India's current account deficit, given the fact that merchandise trade is persistently in deficit. The finding of higher income elasticity of exports as compared to imports basically implies that as income levels expands globally including that of India, its exports rise at a higher rate than imports resulting in trade surplus in services trade.

However, the study indicates that the growth of India's services exports is highly dependent on the economic performance of other countries in the world. The drawback is that an economic recession in the developed countries will severely impact upon India's services exports. Since the dependence on world market is high and so there is a need to encourage diversification of exports across various sectors and markets to reduce dependency on a single market's economic performance. Diversification can help mitigate risks associated with fluctuations in the world GDP and ensure sustained trade growth even when certain markets face economic challenges.

While higher income elasticity of demand for services exports is more capable of acting as a powerful engine of economic growth for the Indian economy. Low and statistically insignificant price elasticity of services exports implies that services export growth cannot be easily propelled through improvements in price competitiveness which can be because India's services exports may already be quite price competitive and have a comparative advantage in the world market. Hence, fluctuations in exchange rates may not significantly impact services export demand. In this scenario, of low exports price elasticity when the changes in the price of these exported services result in relatively small changes in the quantity demanded by foreign consumers or businesses, the exporters and government should focus on adding value to their services through quality improvements, innovation, or additional feature to remain competitive. The goal is to maximize the value proposition of less price-sensitive services and create an environment conducive to their sustainable growth in international markets.

The study also that services imports have high price and income elasticity, it means that changes in the price and income levels have a significant impact on the quantity of services imported. In such scenario importers may consider diversifying their sources of services to mitigate the potential negative effects of price changes from a single supplier. This can help reduce vulnerability to supply shocks and price fluctuations. Also, due to high income elasticity of imports policymakers should emphasize domestic investment to stimulate income growth and encourage consumption of domestically produced services and for this government should consider supporting and developing domestic service industries to meet the rising demand for services as income increases, potentially reducing the reliance on imports.

The study also indicated that rupee depreciation as a policy instrument will only reduce India's CAD if the sum of the price elasticities of services exports and imports (in absolute terms) is greater than 1 in the long run, as per the Marshall Lerner Condition. However, the REER was used as the common measure of relative prices for services exports as well as services imports due to the unavailability of separate price indices for India's services exports and imports. Therefore, Marshall-Lerner condition cannot be strictly applied for empirical testing purposes in this study.

About the authors

Bimal Jaiswal is a Professor at the Department of Applied Economics, Faculty of Commerce, University of Lucknow, Uttar Pradesh, India. **Ananya Dixit** is a PhD student at the Department of Applied Economics, Faculty of Commerce, University of Lucknow, Uttar Pradesh, India.

References

Banga, R., A. Das and R. Kumar (2011), "Determinants of India's Services Exports: A Panel Data Analysis", *Indian Journal of Economics*, 91(362): 200-216.

Caporale, G.M. and M.K.F. Chui (2002), "Estimating Income and Price Elasticities of Trade in a Cointegration Framework", *Review of International Economics*, 7(2): 254-264.

Government of India (2021), "India's Foreign Trade 2019-20", Ministry of Commerce and Industry, Govt. of India.

Hooper, P., R. Johnson and J. Marquez (2000), "Trade Elasticities for G-7 Countries", *Princeton Studies in International Economics*, 87: 1-48.

IMF (2009), "International Monetary Fund Annual Report 2009", Washington, D.C.: IMF

Marquez, J. (2005), "Income and Price Elasticities for US Trade in Services", *Review of International Economics*, 13(1): 27-50.

Narayan, P.K. and S. Narayan (2005), "Estimating Income and Price Elasticities of Imports for Fiji in a Cointegration Framework", *Economic Modelling*, 22(3): 423-438.

Oskooee, M.B. and O. Kara (2006), "Income and Price Elasticities of Trade: Some New Estimates", *International Trade Journal*, 19(2): 165-178.

Pearsan, M.H., Y. Shin and R.J. Smith (2001), "Bounds Test Approach to the Analysis of Levels Relationship", *Journal of Applied Econometrics*, 16(3): 289-326.

Prebisch, R. (1950), *The Economic Development of Latin America and its Principal Problems*, New York: United Nations Department of Economic Affairs.

Prebisch, R. (1959), "Commercial Policy in the Underdeveloped Countries", *American Economic Review*, 49(2): 251-273.

Raissi, M. and V. Tulin (2015), "Price and Income Elasticity of Indian Exports: The Role of Supply-side Bottlenecks", *IMF Working Paper No. 2015/161*.

Rashid, A. and T. Razzaq (2010), "Estimating Import Demand Function in ARDL Framework: The case of Pakistan", *MPRA Paper No. 23702*, Munich Personal RePEc Archive (MPRA).

Reserve Bank of India (2021), *Handbook of Statistics on the Indian Economy 2021-22*, Mumbai: Reserve Bank of India.

UNCTAD (2020), *Key Statistics and Trends in Trade Policy 2019-2020*, Geneva: United Nations Conference on Trade and Development.

Waliullah, M.K. Kakar, R. Kakar and W. Khan (2010), "The Determinants of Pakistan's Trade Balance: An ARDL Cointegration Approach", *Lahore Journal of Economics*, 15(1): 1-26.

WTO (2021), World Trade Statistical Review 2021, World Trade Organisation.

Ziramba, E. and R.T. Chifamba (2014), "The J-Curve Dynamics of South African Trade: Evidence from the ARDL Approach", *European Scientific Journal*, 10(19): 346-358.

APPENDIX

Appendix 1

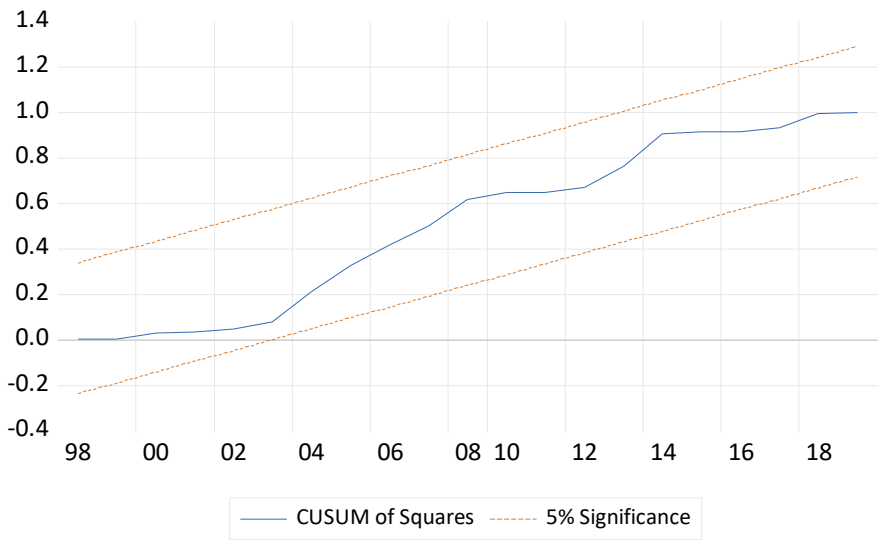
Regression diagnostic tests performed for the estimated ARDL (2,0,0) model are reported in Table A1. From Table A1, it is found that none of null hypotheses of LM test, Jarque Bera test and Breusch-Pagan-Godfrey Test can be rejected in case of ARDL (2,0,0) Model, we consider the F version of test statistic. Hence, it can be concluded that the services export demand function estimated as ARDL (2,0,0) model is free from serial correlation, heteroskedasticity and non-normality. Figure A1 plots the results of CUSUMSQ test for ARDL (2,0,0) model. The CUSUM of squares of recursive residuals is found to lie well within the 5 per cent critical lines, indicating parameter stability.

Table A1: Diagnostic Tests for Services Exports Demand Function: ARDL (2,0,0) Model

Diagnostic Tests	Null H0	Statistic	Probability Value
Jarque-Bera Test	Normality (normally distributed residuals)	3.800	0.149
Lagrange-Multiplier Test	Zero-serial correlation	1.207	0.326
Breusch-Pagan-Godfrey Test	Homoskedasticity	0.327	0.8555

Source: Authors' calculation

Figure A1: CUSUMSQ Test Results for ARDL (2,0,0) Model



Source: Authors' calculation

Appendix 2

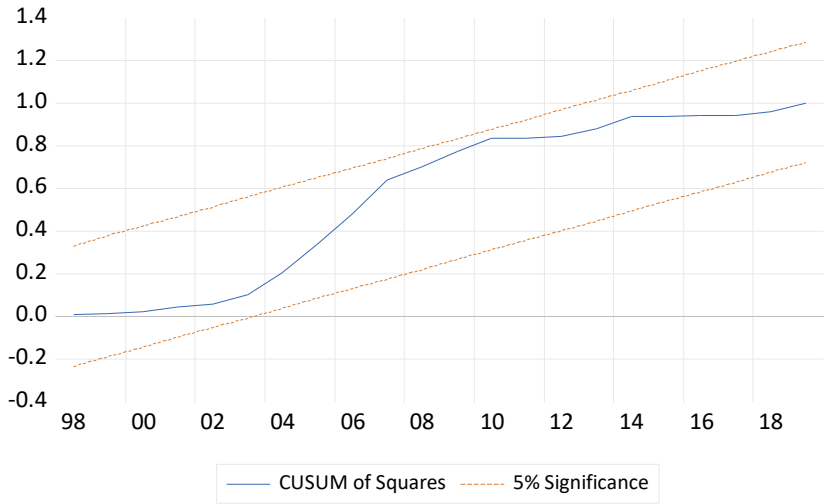
Regression diagnostic tests performed for ARDL (1,0,2) model are reported in Table A2. From Table A2, it is found that none of null hypotheses of LM test, Jarque Bera test and Breusch-Pagan-Godfrey Test can be rejected in case of ARDL (1,0,2) Model. This implies that services import demand function estimated as ARDL (1,0,2) model neither suffers from serial correlation, non-normality or heteroskedasticity. Figure A2 plots the results of CUSUMSQ test for ARDL (1,0,2) model. Here again, cumulative sum of squares of recursive residuals is found to lie within the 5 per cent critical lines, indicating parameter stability.

Table A2: Diagnostic Tests for Services Imports Demand Function: ARDL (1,0,2) Model

Diagnostic Tests	Null H0	Statistic	Probability Value
Jarque-Bera Test	Normality (normally distributed residuals)	0.297	0.861
Lagrange-Multiplier Test	Zero-serial correlation	0.025	0.975
Breusch-Pagan-Godfrey Test	Homoskedasticity	1.098	0.397

Source: Authors' calculation

Figure A2: CUSUMSQ Test Results for ARDL (2,0,0) Model



Source: Authors' calculation

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MEASURING FINANCIAL INCLUSION IN HARYANA BY USING WROCLAW TAXONOMIC METHODOLOGY: AN EVIDENCE FROM COMMERCIAL BANK

MAMTA RANI* AND MANOJ SIWACH
Chaudhary Devi Lal University, Sirsa, Haryana, India

Abstract: The main aim of this paper is to study the extent of financial inclusion in Haryana. Secondary data has been used to construct financial inclusion indexes for the periods of 2012 and 2022. Financial inclusion in Gurugram district was at a high level with a Financial Inclusion Index (FII) value of 0.14 in 2012 and once again held the first position in 2022 with an FII value of 0.23. However, the situation is alarming in Nuh district. Nuh remained at the bottom of the rankings in both 2012 and 2022, with FII values of 0.76 and 0.79, respectively. In the year 2022, Gurugram, Panchkula, Ambala, Faridabad and Kurukshetra are the top performing districts in Haryana. On the other hand, Nuh, Palwal, Jind, Bhiwani, and Mahendragarh are classified as poor-performing districts.

Keywords: Banking system, Financial inclusion, Credit, Index, Initiatives, Wroclaw taxonomic.

1. Introduction

Financial inclusion means making sure that everyone in society, including low-income and vulnerable groups, has access to financial products and services at a fair and transparent price through regulated institutions (Chakrabarty, 2011). This includes providing suitable financial services to everyone (Hayton et.al, 2007). The term "Financial Inclusion" encompasses all types of programmes that make formal financial services available, accessible and affordable to all sections of the population (Triki and Faye, 2013). Financial inclusion, which involves using formal financial services, was recognized as a crucial component of the global development agenda at the G20 Summit in Seoul in 2010. Financial inclusion means having an account with a recognized financial institution. This allows individuals to legally save money, borrow money, purchase insurance, and use payment services. Having a financial stake in society can provide economic benefits, particularly for disadvantaged individuals, who can earn more money and have an increased likelihood of finding work (Bruhn and Love, 2014). The availability of finance to small enterprises would increase the level of regional economic activity, which is a benefit of financial inclusion for an economy. Furthermore, financial inclusion will open

*Correspondence to: Mamta Rani, PhD Student, Department of Economics, Chaudhary Devi Lal University, Sirsa, Haryana 125055, India. Email: mamtachoudhry23852@gmail.com.

up financial markets to all citizens who want to participate in economic and financial activities (Cull et al., 2014). Undeniably, the absence of inclusive financial systems in a nation can create poverty traps and impede economic growth because having access to financial instruments allows individuals to engage in financial transactions, education, and business endeavours (Demirgüc-Kunt and Klapper, 2012). Inequalities and poverty rates are higher in nations where a sizable segment of the population is not part of the formal financial systems (World Bank, 2006, 2008). Financial exclusion is seen by Carbo et al. (2005) and Leyshon and Thrift (1995) as a symptom of the bigger issue of social exclusion. Accordingly, attaining complete financial inclusion has its ultimate goal of eradication of social exclusion from the economy, rather than only addressing the financial and financial crisis of the poor and marginalised (Rangarajan, 2008).

If people are denied credit from institutions, it puts certain groups at risk of being exploited by loan sharks and money lenders. This can have negative effects on society. Additionally, a financial system that does not include everyone makes it harder to quickly and sustainably grow the economy (Mehrotra et al., 2009). An increasing understanding of the importance of the financial system has led to a consensus that financial inclusion is a public benefit. Researchers have identified several socioeconomic factors that contribute to financial exclusion. For instance, Topoworski (1987) found that distance from banking services significantly affects the access of clients. People who are living in rural or hilly areas are more likely to experience economic exclusion (Kempson and Whyley, 1998). Additionally, Goodwin et al. (2000) and Kempson and Whyley (1999) found that immigrants, jobless individuals, the elderly, low-income individuals, members of ethnic minorities, and those working in the unorganized/informal sector are at a higher risk of exclusion. Mehrotra et al. (2009) have highlighted the constraints to financial inclusion on both the supply and demand sides.

Financial inclusion supply issues are caused by several things, including inadequate outreach by current institutions, subpar banking infrastructure, security-based lending policies, protracted form-filling, account-maintenance procedures, etc. The issues on the demand side include poor physical infrastructure (roads, bridges, irrigation structures, etc.), excessive service costs, and low financial literacy. While addressing supply issues is part of banks' and policy-making authorities' social responsibilities, addressing demand-side limitations requires a strong partnership among the government, banks, nonprofit organisations, non-governmental organisations, etc.

1.1 Financial Exclusion

Various authors have defined financial exclusion in different ways. According to Leyshon and Thrift (1995), financial exclusion happens when certain socially disadvantaged groups or individuals are unable to access the formal financial system. Mohan (2014) describes financial exclusion as the lack of access by certain segments of society to appropriate, low-cost, fair and secure financial products and services. The argument is that financial exclusion creates a barrier to obtaining credit, increases unemployment, enhances social exclusion, increases crime, and reduces investment. Exclusion can take on many different forms, and various factors contribute to it. Therefore, no single factor can entirely explain this phenomenon. Physical access, high charges as well as penalties, product conditions that are unsuitable or complex, and perceptions of financial service institutions that are unfriendly to low-income individuals are commonly identified as the primary obstacles in the expansion of financial services (Sinclair, 2001).

Financial exclusion remains a formidable barrier to inclusive economic growth and social development. Financial exclusion manifests in various dimensions, encompassing limited access to banking services, credit, insurance, and investment opportunities. According to Demirguc-Kunt and

Klapper (2012), approximately 1.7 billion adults worldwide lack access to formal financial services, perpetuating a cycle of poverty and limiting economic mobility.

The financial services industry is structured in a way that unintentionally creates barriers to inclusion. In their analysis, Kempson et al. (2000) identified several physical and geographical obstacles to financial inclusion, as well as a variety of other factors that can lead to financial exclusion for specific products and individuals in certain situations. Self-exclusion, where individuals choose not to opt for a financial product due to fear of being denied access by service providers. These dimensions of financial exclusion were identified in the studies by Kempson and Whyley (1999), Kempson et al. (2000), and Connolly and Hajaj (2001).

Financial exclusion has profound consequences on both individual livelihoods and broader economic systems. Individuals without access to formal financial services often resort to informal and predatory alternatives, leading to increased vulnerability and exploitation (World Bank, 2017). From a macroeconomic perspective, financial exclusion hampers economic growth, hindering investment and entrepreneurship in marginalized communities (Beck et al., 2007).

1.2 Factors Responsible for Financial Exclusion

Financial inclusion has become increasingly important in recent years as governments, policymakers, and financial institutions recognize its role in promoting economic development and reducing poverty. However, a significant portion of the global population still faces financial exclusion, which limits their access to essential financial services. Financial exclusion refers to the limited access to mainstream financial services by certain segments of the population. This exclusion can have significant implications for economic development and individual well-being. The factors contributing to financial exclusion are complex and have been extensively explored in the literature.

One of the primary determinants of financial exclusion lies in socioeconomic factors. Low-income households, lack of education, and limited employment opportunities have been consistently identified as key contributors to financial exclusion (Leeladhar and Paul, 2012). Individuals with lower income and education levels often face barriers to accessing and utilizing financial services. Similarly, Financial exclusion often has roots in economic disparities. Low income, unemployment, and lack of assets are frequently cited as barriers to accessing financial services (Kempson and Whyley, 1999). People with limited financial resources may struggle to meet the criteria set by traditional financial institutions.

The geographical location and infrastructural limitations play a crucial role in financial exclusion. Rural areas and remote regions often lack proper banking infrastructure, making it difficult for individuals residing in these areas to access banking services (Kumar and Yadav, 2016). The absence of physical bank branches and ATMs exacerbates the financial exclusion problem in such regions. Rural areas often face challenges due to the limited presence of banks and financial institutions, making it difficult for residents to access banking services (Demirgüç-Kunt and Klapper, 2012). The regulatory environment and government policies also contribute significantly to financial exclusion. Stringent regulations, high documentation requirements, and the lack of tailored policies for marginalized populations can create barriers to financial inclusion (World Bank, 2015). Governments and regulatory bodies need to create an enabling environment that promotes inclusive financial practices.

In the era of digital finance, technological barriers can exacerbate financial exclusion. Limited access to smartphones, lack of digital literacy, and inadequate internet connectivity are challenges

that impede individuals from participating in the digital economy (Demirgüç-Kunt et al., 2018). Efforts to bridge the digital divide are essential for promoting inclusive financial services. Social and cultural factors also contribute to financial exclusion. Discrimination, lack of financial literacy, and cultural norms can deter individuals from engaging with formal financial institutions (Johnson and Anagol, 2012). Cultural norms and social practices can influence financial behavior and contribute to exclusion. Gender disparities, for instance, may lead to women facing more significant challenges in accessing financial services (Duflo, 2012). Cultural sensitivities and the need for tailored financial products are crucial considerations for promoting inclusivity.

2. Literature Review

Financial inclusion enables people to start small enterprises and invest in education, which can reduce poverty and stimulate the economy to grow (Bruhn and Love, 2014; Beck et al., 2007). Emerging countries can reduce poverty and raise living standards by emphasizing inclusion, as noted by CGAP (2011). Han and Melecky (2013) also point out that financial inclusion gives people a secure location to save their money in a bank, which helps increase the bank's deposit base and ensure stability in times of trouble. Financial inclusion plays a vital role in supporting bank stability, especially for banks with greater market power and those operating in nations with stronger political stability, rule of law, and regulatory environments (Ahamed and Mallick, 2019). Han and Melecky (2013) also state that financial inclusion further encourages the stability of finance, which leads to a strong economy. To promote economic growth, governments all across the world are putting a lot of emphasis on financial inclusion. Recent years have seen a rapid increase in the adoption of technology in the financial services sector. Develop a revolutionary digital financial inclusion index to systematically and thoroughly evaluate the degree and evolution of financial inclusion facilitated by technology. This index is based on payment data for 52 developing nations between 2014 and 2017, taking into account both access and usage factors for digital financial services (DFSs). To create a comprehensive index of financial insanity, this index is then added to the standard metrics of financial inclusion found in the literature. Fintech adoption has been a major factor in increasing financial inclusion (Khera et al., 2022).

King and Levine (1993) also highlight financial inclusion as one of the techniques for national economic development and growth because it effectively distributes productive resources and reduces expenses. In order to provide marginalized groups with a better position in society, it's essential to include them in the mainstream by extending financial products and services. One such initiative by the government of India is the Pradhan Mantri Fasal Bima Yojana (PMFBY), which protects against agricultural financial losses produced by unpredictable events such as crop failure and loss. Its objective is to promote sustainable production by minimizing crop loss, supporting farmers' income, promoting modern agricultural practices, and ensuring access to agricultural credit. This will promote crop diversification, boost the agricultural industry's expansion, and, most crucially, shield farmers from production risk (Rai, 2019).

Agarwal and Panda (2018) found that financial inclusion level varies across Indian states, with low-income states having less inclusion than high-income states. However, it can be argued that the level of financial inclusion that fosters growth has increased over time in various Indian states. The majority of Indian states are considered to have medium levels of inclusion, which leaves opportunities for expansion and inclusiveness. In addition, the paper emphasises the significance of income level for enhancing financial inclusion, as mentioned by Raichoudhury (2020). Based on the global findex database, an evaluation was conducted to determine the gender gap in account ownership in South Asian nations. The results revealed that women in these countries

have lower account ownership rates when compared to men, and this gap has been increasing over time. Various factors, including changes in interest rates, economic reforms, and policy measures implemented by the RBI and the government have influenced this trend (Rani, 2022). Furthermore, the introduction of the Goods and Services Tax (GST) in 2017 has impacted the financial system as well (Garg et al., 2023). Pitt et al. (2006) created indices of women's empowerment using multiple indicators like finances, purchasing power, fertility and parenting, mobility networks, transaction management, activism, husband's behaviors, and household attitudes. The study discovered that, in contrast to men's credit, women's credit significantly influences the majority of these empowerment indicators. In contrast to wives of male members, female borrowers do not perceive any significant improvement in their sense of empowerment after taking out a loan, according to Montgomery and Weiss (2011) study in Pakistan. However, they found that there were specific areas where women feel more powerful such as decisions about household finances and fertility.

It is commonly known that an inclusive financial system contributes to a country's overall development and growth. The article gives a demand-side examination of elements related to financial inclusion, in contrast to most research on the topic, which uses supply-side data. Based on cross-country data on the financial inclusion status and individual characteristics of adults, an econometric analysis has shown that the financial inclusion of individuals is significantly impacted by their characteristics and economic circumstances, even after accounting for other national factors. Three financial inclusion metrics are used in the article, along with a number of explanatory factors including GDP per capita, individual characteristics, and the economic circumstances of adult persons from various nations. The results found that a person's financial inclusion is generally impacted negatively by being a woman, having less education, being unemployed, and being impoverished. The possibility of financial inclusion is generally increased with higher income and education levels.

Mukhopadhyay (2016) also examined the situation of financial inclusion from the demand-side perspective in 22 Indian states. Goa consistently remains at the top. In terms of financial inclusion, the states of Odisha, Bihar, and the northeast fall behind. It is crucial to speed up the financial inclusion process in these states by seeking advice from Goa's experience and implementing it. Merely granting access to financial services may not lead to satisfactory outcomes, as it often does not involve actual use of those services. It is vital to increase the poor's access to formal financing nationwide, particularly in states like Uttarakhand, Uttar Pradesh, and Himachal Pradesh. Despite the hazards, people in many states continue to save in chit funds and at home for more than 40 years following the nationalization of banks (Yangdol and Sarma, 2019).

The idea that development should not be primarily viewed in terms of an increase in the level of national income since it is a multifaceted issue has been the driving force behind the growth of financial inclusion, especially towards the end of the twentieth century. The Global Partnership for Financial Inclusion (GPFI), which was founded in 2010 in response to the global financial crisis, has as its main objective to increase financial inclusion throughout the Group of Twenty (G20) and other non-G20 countries globally (GPFI, 2020). According to Eldomiaty et al. (2020), the GPFI released guidelines for fostering innovative financial inclusion through the promotion of financial literacy, the creation of an institutional environment with clear lines of accountability, and effective government coordination. After the GPFI was established, efforts were made to improve the poor's access to credit, encourage savings, ease financial transactions, and offer insurance through legitimate financial institutions (Alhassan et al., 2021; GPFI, 2020). Finance theory emphasizes the significance of financial institutions and markets in efficiently allocating capital resources, assuming no information asymmetry, transaction costs, or other market imperfections. The flow

of funds framework expands on this theory to elucidate how capital resources are allocated among households and firms, ultimately driving economic growth. The evidence from both developed and developing economies confirms that the flow of funds, interest rates, and asset prices are closely linked to incomes and expenditures (Murinde, 2012).

Chongloi and Singh (2021) pointed out that increasing per capita income will expand the gap between the rich and the poor. The benefit of a strong GDP can spread to the lowest rungs of society through a mechanism known as financial inclusion. Despite this, a significant portion of the rural population nevertheless experienced financial exclusion. The level of financial inclusion in rural areas is relatively low. Branch penetration occurs more quickly in semi-urban regions than in rural ones, according to a working paper from the RBI as well. Further investigation reveals that the mismatch between cost and volume anticipated is the root cause of low branch penetration in rural areas. If the rural-urban discrepancies are not addressed under the scenario, it is feared that they will likely increase. The study found that the rural sector lagged substantially behind the urban sector when it used normalised inverse Euclidean distance from an ideal location. After reviewing various related articles, it's clear that financial inclusion is incredibly important.

3. Research Gap

While there have been several studies conducted to know the extent of financial inclusion, there has been little district-level work done using the Wroclaw taxonomic method. The index is developed to measure the changes in financial inclusion status in districts of Haryana. While this is an intriguing aspect, further details on the methodology and expected outcomes of this study would strengthen the narrative. The text discusses the rapid increase in technology adoption in the financial services sector and its impact on financial inclusion. However, it could benefit from a more detailed exploration of how fintech adoption specifically contributes to inclusive practices. While there is a brief mention of variations in financial inclusion levels across Indian states, particularly the lower inclusion in low-income states. A more in-depth analysis of regional disparities and a state-level breakdown could provide valuable insights into the specific challenges faced by different regions. Some studies focus on gender disparities in account ownership, but a more detailed examination of the root causes and potential solutions to address this gap could enhance the discussion.

The objectives of this research are:

1. To assess the level of financial inclusion in Haryana by using the Wroclaw taxonomic method.
2. To provide further research gap for future study in this domain
3. To provide policy implications for govt., the policymakers and different stakeholders to correct the financial inclusion index in Haryana.

4. Research Methodology

4.1 Sample of the Study

This paper utilizes secondary data acquired from the statistical abstracts of Haryana in 2012 and 2022. The total population of the study includes 21 districts for making the financial inclusion index at the sub-state level in Haryana using the Wroclaw Taxonomic methodology. However, Charkhi Dadri district was established on November 1, 2016, which means that data from 2012 to 2016 is unavailable. To enhance accuracy, Charkhi Dadri was merged with the Bhiwani district. Charkha Dadri had been a part of Bhiwani before becoming a separate district. Similarly, the data has been

assembled from the Statistical Abstract of Haryana from 2012 to 2022. The population data for the year 2012 was obtained from the Statistical Abstract of Haryana. For the year 2022, projected data on population was utilized. The study analyzed the period from 2012 to 2022, which was chosen because of the implementation of various policy interventions in India such as Pradhan Mantri Jan Dhan Yojana (PMJDY), Demonetization, Kisan Samman Yojana, etc.

4.1 Indicators to Construct Financial Inclusion Index

To measure financial inclusion, the banking services offered by a country are taken into consideration. For this study, three indicators have been used to create a financial inclusion index for Haryana on a sub-state level. These indicators are explained below:

i) Deposit (X1)

The amount of money deposited in commercial banks is a way to measure the savings and services offered by the bank in each district. This is determined by calculating the total deposit per 100000 individuals in a district, which is known as the demographic deposit penetration. A higher value indicates a greater level of financial service inclusion in that district.

ii) Bank Branches (X2, X3)

To measure the accessibility of financial services to the population, the number of bank branches in a commercial bank is used as a base. Bank branch penetration is estimated based on geography and demographic factors, such as the number of bank branches per 1000 km and the size of the population. This indicator is expected to have a positive correlation with financial inclusion.

iii) Credit (X4)

The ability to obtain credit from commercial banks is a sign of loan capacity and credit creation power. A higher credit ratio is a positive indication of progress. The credit indicator value is calculated based on demographics, specifically the total credit per 100,000 population.

Table 1: Calculation of the Value of Financial Inclusion Indicators

Sr. No.	Indicators	The formula for calculation
1.	Deposit	X1 = (Total deposits in commercial banks*100000) / total population
2.	Bank branches	X2 = (Total commercial bank branches*100000) / total population X3 = (Total commercial bank branches*1000) / total areas
3.	Credit	X4 = (total credits*100000)/total population

Source: Authors' compilation

4.2 Method to Construct Financial Inclusion Index

Creating a financial inclusion index requires a multi-dimensional approach and cannot be determined through a single indicator. To accurately measure financial inclusion, a composite index using diverse indicators is necessary. Various methods, such as aggregation, monetary index, ranking, principal component analysis, ratio index, and multiple factor analysis, can be used to develop the index while considering the impact of numerous indicators. However, these methods have their limitations.

The Wroclaw taxonomy is a method that was originally developed at the University of Wroclaw. Over time, it has become popular in Italy, particularly for measuring economic and social indicators. The method was proposed by Florek et al. (1952) and is based on simple principles. The benchmark

is the unit with the smallest distance from the "ideal" unit that performs best on all metrics. By calculating the (Euclidean) distances of all units from the "ideal", we can generate a list that orders various units according to their distance from the optimal situation. These steps were followed to formulate the financial inclusion index for Haryana state:

First, we develop a data matrix [Xij] in which i = 1, 2, 3, 4, 5, 6…...n (number of units) and j = 1, 2, 3, 4, 5…..., k (number of indicators). Then, Xij matrix is converted into Zij as follows:

$$[Zij] = \frac{Xij - Xj}{Sj} \quad (1)$$

Zij = matrix of standardized indicators,

Sj = standard deviation (jth indicator), and

Xj = mean of jth indicator.

Each indicator has a best value represented by [Zij], which we call Zoj. The value of Zojdepends on whether the indicator of financial inclusion is a maximum or minimum value.

$$Pij = (Zij - Zoj)^2 \quad (2)$$

where Pij = pattern of development, and

Zoj = the best value of the indicator.

$$Ci = [\sum_{j=1}^{k} Pi/(CVj)^{1/2} \quad (3)$$

where CVj = Coefficient of Variation (jth indicator in Xij).

$$Di = Ci/C \quad (4)$$

where

D = composite index

C = mean (Ci) + 3*S.D.(Ci)

The Di value represents all four indicators as a single value. The range of the Di value is between 0 and 1, with 0 indicating complete financial inclusion and 1 indicating full financial exclusion. Table 1 outlines the financial inclusion indicators.

4.4 Criteria and Categorization for Development Stages

A recent study identified the four stages of financial inclusion development based on the value of Di, namely high-value, high-middle level value, low-middle level value and low level. If the value of FII is less than or equal to (Mean - S.D.), it indicates a high-level development stage of financial inclusion, while a value greater than or equal to (MEAN + S.D.) shows a low development stage. If the FII value is between (MEAN) and (MEAN + S.D.), it means the inclusion of financial services is at a low-middle level development stage. Similarly, if the value of FII lies between (Mean) and (Mean - S.D.) then financial inclusion shows a high-middle level (Shee and Maiti, 2017; Ohaln, 2013).

Table 2: Criteria for Development Stage

Stages	Category	Criteria for Evaluation
I	High	FII value ≤ Mean - S.D.
II	High-Middle	FII value between (Mean) and (Mean - S.D.)
III	Low-Middle	FII value between (Mean) and (Mean + S.D.)
IV	Low	FII value ≥ Mean + S.D.

Source: Authors' compilation

5. Results

Utilizing information from bank branches, credit and deposits of commercial banks, the district-level financial inclusion index is created. The number of bank branches per million adults has dramatically expanded during the last ten years, rising from 97.4 to 180.1. Additionally, the number of deposit accounts has increased from 843.3 to 1867.5 per 1,000 people, while the number of credit accounts has expanded from 79.3 to 243.2 per 1,000 people. Furthermore, the per capita deposit has shown a significant increase from 43,633.8 to 163,901.1. Similarly, there has been a noticeable growth in the per capita availability of credit (Arora and Kumar, 2022).

Table 3: Financial Inclusion Index of Haryana 2012

District	X1	X2	X3	X4	Di/FII	Rank	Stages
Gurugram	0.00	0.05	0.00	2.67	0.14	1	1st
Panchkula	1.32	0.00	4.05	0.08	0.20	2	1st
Faridabad	7.04	18.42	0.11	6.39	0.48	3	2nd
Ambala	9.08	10.75	7.84	7.77	0.50	4	2nd
Sonipat	10.37	17.61	10.06	0.00	0.52	5	2nd
Rohtak	8.91	14.85	10.23	7.25	0.54	6	2nd
Kurukshetra	10.81	15.03	10.01	7.84	0.56	7	2nd
Panipat	10.75	19.26	7.90	6.59	0.56	8	3rd
Karnal	10.76	17.18	10.90	6.22	0.57	9	3rd
Rewari	10.11	17.42	11.32	8.35	0.58	10	3rd
Yamunanagar	10.68	19.69	10.53	7.98	0.59	11	3rd
Jhajjar	10.77	20.09	12.34	7.93	0.60	12	3rd
Hisar	11.27	23.41	13.83	6.53	0.62	13	3rd
Kaithal	12.48	21.98	13.32	7.89	0.63	14	3rd
Fatehabad	12.51	21.03	14.18	8.21	0.63	15	3rd
Sirsa	12.27	21.76	15.05	8.09	0.64	16	3rd
Bhiwani	12.06	25.54	15.10	8.44	0.66	17	3rd
Jind	12.55	27.58	13.99	8.29	0.67	18	3rd
Mahendragarh	12.04	28.50	14.21	8.75	0.67	19	3rd
Palwal	12.53	30.52	12.39	8.73	0.67	20	3rd
Nuh	13.17	43.04	15.41	9.09	0.76	21	4th
Mean					0.56		
SD					0.15		

Source: Compiled by the authors using the data available at Statistical Abstract of Haryana, 2012-13.

The state has seen significant improvements in financial inclusion across all districts. Gurugram has particularly stood out with notable growth, followed by Panchkula. Using an integrated approach of the Wroclaw taxonomic method, performance scores for each district were calculated. While some districts, like Hisar and Sirsa, experienced a decline in scores, others, such as Nuh, Palwal, Jind, Bhiwani and Mahendragarh, had consistently low scores. These results indicate significant disparities in financial inclusion levels among districts.

Table 4 shows the financial inclusion index scores for each district. With a performance value of 0.23 in 2022, Gurugram received the highest rank. In 2022, Jind and Faridabad respectively held the second and third places.

Table 4: Financial Inclusion Index of Haryana 2022

District	X1	X2	X3	X4	Di/FII	Rank	Stages
Gurugram	0.00	1.92	0.00	5.35	0.23	1	1st
Panchkula	1.17	0.00	7.22	5.81	0.32	2	1st
Ambala	8.98	11.01	10.74	6.10	0.51	3	2nd
Faridabad	6.95	23.16	1.84	5.99	0.52	4	2nd
Kurukshetra	10.44	14.13	11.93	6.11	0.55	5	2nd
Rohtak	9.57	17.83	13.14	6.07	0.58	6	2nd
Sonipat	10.19	19.08	12.45	6.14	0.58	7	2nd
Karnal	10.84	19.11	13.08	6.03	0.59	8	2nd
Panipat	11.04	23.00	9.93	6.04	0.60	9	2nd
Rewari	10.26	21.04	13.82	6.14	0.60	10	3rd
Yamunanagar	10.90	23.07	12.99	6.13	0.61	11	3rd
Jhajjar	10.69	22.21	14.78	6.14	0.62	12	3rd
Hisar	11.18	29.03	16.15	6.09	0.67	13	3rd
Fatehabad	12.23	28.42	16.59	6.14	0.67	14	3rd
Kaithal	12.13	29.37	15.96	6.14	0.67	15	3rd
Sirsa	11.96	29.73	17.39	6.13	0.68	16	3rd
Mahendragarh	11.75	34.47	16.30	6.19	0.70	17	3rd
Bhiwani	12.00	36.69	17.59	6.18	0.72	18	3rd
Jind	12.30	37.98	16.55	6.17	0.72	19	3rd
Palwal	12.39	42.09	15.35	6.21	0.73	20	3rd
Nuh	13.16	52.10	17.02	6.24	0.79	21	4th
Mean					0.60		
SD					0.13		

Source: Compiled by the authors using the data available at Statistical Abstract of Haryana, 2012-13.

In Haryana, Table 5 presents a comparison of districts based on their rank and FII value from 2012 to 2022. Gurugram held the top position in both years. Panchkula's rank saw a decrease of two positions, securing the 4th position in 2022. Jind district, on the other hand, improved its position from 3rd to 2nd.

Certain districts may experience an improvement in their position, while others may see a decline in their position. Ambala, Karnal and Fatehabad have seen a slight improvement in their ranks by 1 point each. However, Sonipat's financial inclusion has drastically fallen from 5th to 7th position. Faridabad has slipped from 3rd to 4th position and Panipat's score has decreased from 8th to 9th position. Similarly, Kaithal, Bhiwani and Jind have also moved downward. Nine districts have held the same position with no changes, including Gurugram, Panchkula, Rohtak, Rewari, Yamuna Nagar, Jhajjar, Hissar and Sirsa. On the other hand, Nuh and Palwal have scored quite low in both years, showing a vast inter-district disparity in financial inclusion.

Table 5: Comparative Analysis of FII for the Years 2012 and 2022

District	2012			2022			Change in rank
	FII	Ranking	Stages	FII	Ranking	Stages	
Gurugram	0.14	1	1st	0.23	1	1st	0
Panchkula	0.20	2	1st	0.32	2	1st	0
Faridabad	0.48	3	2nd	0.52	4	2nd	-1
Ambala	0.50	4	2nd	0.51	3	2nd	1
Sonipat	0.52	5	2nd	0.58	7	2nd	-2
Rohtak	0.54	6	2nd	0.58	6	2nd	0
Kurukshetra	0.56	7	2nd	0.55	5	2nd	2
Panipat	0.56	8	3rd	0.60	9	2nd	-1
Karnal	0.57	9	3rd	0.59	8	2nd	1
Rewari	0.58	10	3rd	0.60	10	3rd	0
Yamunanagar	0.59	11	3rd	0.61	11	3rd	0
Jhajjar	0.60	12	3rd	0.62	12	3rd	0
Hisar	0.62	13	3rd	0.67	13	3rd	0
Kaithal	0.63	14	3rd	0.67	15	3rd	-1
Fatehabad	0.63	15	3rd	0.67	14	3rd	1
Sirsa	0.64	16	3rd	0.68	16	3rd	0
Bhiwani	0.66	17	3rd	0.72	18	3rd	-1
Jind	0.67	18	3rd	0.72	19	3rd	-1
Mahendragarh	0.67	19	3rd	0.70	17	3rd	2
Palwal	0.67	20	3rd	0.73	20	3rd	0
Nuh	0.76	21	4th	0.79	21	4th	0
Mean	0.56			0.60			
SD	0.15			0.13			

Source: Compiled by the authors

Table 6: Different Stages of Development

Stages	Categories	Criteria	Value of FII		Number of Districts	
			2012	2022	2012	2022
I.	High	FII Value ≤ MEAN-S.D.	0.41	0.47	2	2
II.	High Middle	FII Value Between (MEAN) AND (MEAN-S.D.)	0.56-0.41	0.60-0.47	5	7
III.	Low Middle	FII Value Between (MEAN) AND (MEAN+S.D.)	0.56-0.71	0.60-0.74	13	11
IV.	Low	FII Value ≥ MEAN+S.D.	0.71	0.74	1	1

Source: Authors' compilation

The financial inclusion in Haryana districts has expanded, as shown in Table 6. The data reveals that the minimum FII value was 0.41 and 0.47 for 2012 and 2022, respectively, while the maximum was 0.71 and 0.74. Two districts were in the top tier for both 2012 and 2022, and the high middle group increased from five to seven districts in 2022. In 2012 and 2022, there were 13 and 11 districts in the low-middle group, respectively, and only one district in the low group in 2012 and 2022. This indicates a significant disparity between the high and low groups.

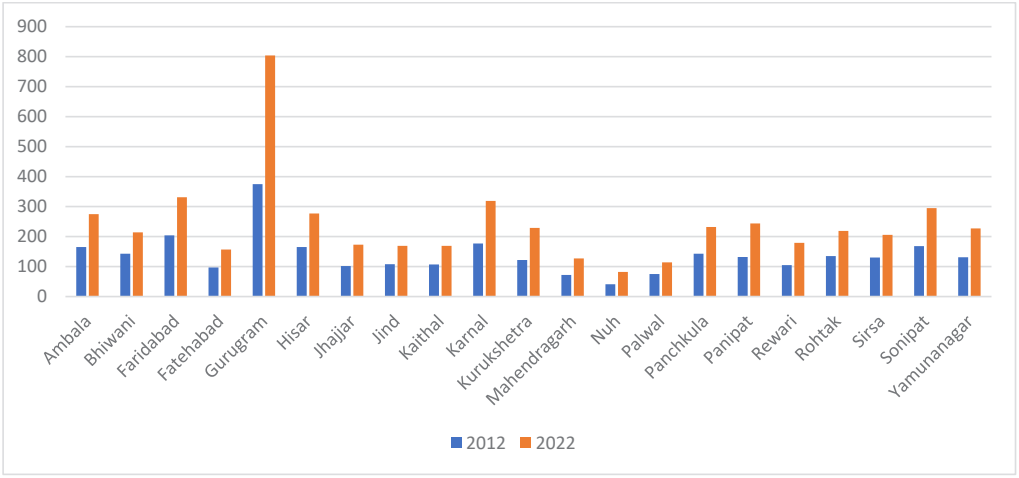
Table 7: Categories and Stages of Districts

Categories	Stages	Districts (2012)	Districts (2022)
High	I.	Gurugram, Panchkula,	Gurugram, Panchkula
High Middle	II.	Faridabad, Ambala, Sonipat, Rohtak, Kurukshetra	Ambala, Faridabad, Kurukshetra, Rohtak, Sonipat, Karnal, Panipat,
Low Middle	III.	Panipat, Karnal, Rewari, Yamunanagar, Jhajjar, Hisar, Kaithal, Fatehabad, Sirsa, Bhiwani, Jind, Mahendragarh, Palwal	Rewari, Yamunanagar, Jhajjar, Hisar, Fatehabad, Kaithal, Sirsa, Mahendragarh, Bhiwani Jind, Palwal
Low	IV.	Nuh	Nuh

Source: Authors' compilation

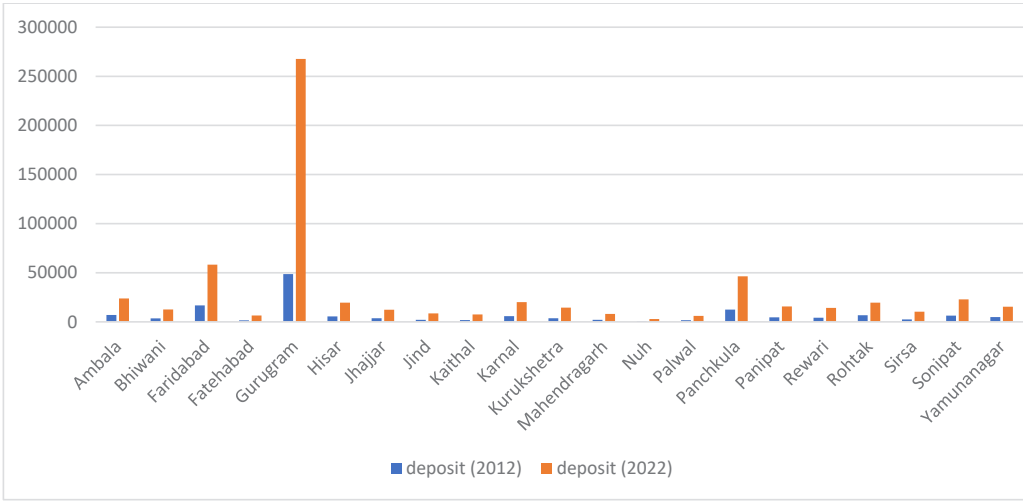
The district-wise financial inclusion parameters performance in Haryana is shown in Figures 1 to 3. Among all the districts, Gurugram stands out for having high levels of bank deposits, bank credit, and bank offices. This is explained by the city's proximity to the national capital, Delhi, and by the fact that it is an IT hub. Additionally, Gurugram has the highest literacy rate, which contributes to greater financial inclusion (Arora and Kumar, 2022). In contrast, Mewat has consistently been the least financially included district in both 2022 and 2012, with disappointing figures.

Figure 1: District-wise Bank Branches in Haryana



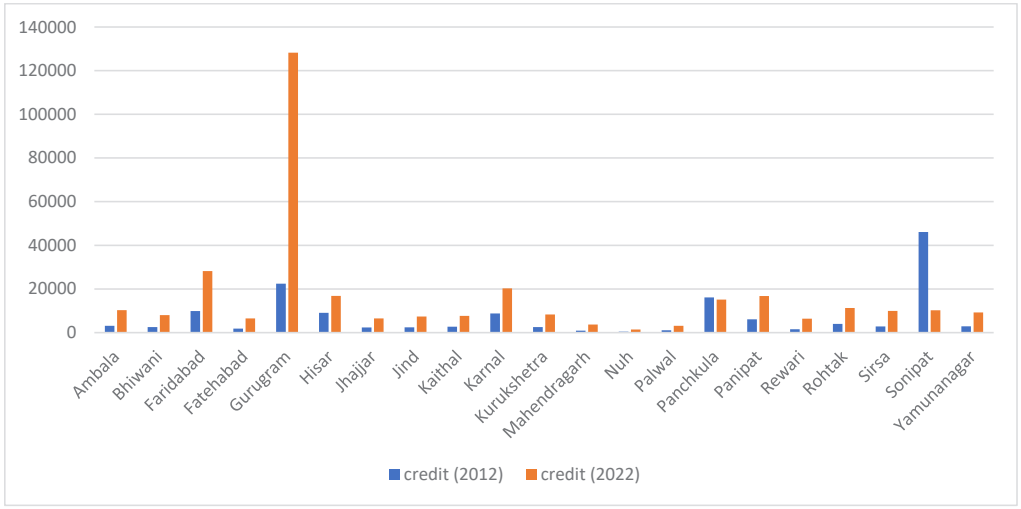
Source: Authors' compilation

Figure 2: District-wise Bank Deposits in Haryana



Source: Authors' compilation

Figure 3: District-wise Bank Credit in Haryana



Source: Authors' compilation

6. Policy Implications and Suggestions

The findings of this study will help policymakers identify the districts that are highly financially excluded. By identifying these districts, policymakers and the government can diagnose the major problems causing financial exclusion and devise appropriate policies and strategies to address them. The study's findings suggest that the government should create and enforce regulations that encourage the growth of inclusive financial services, making sure that they are accessible and affordable to all members of the population. Additionally, the government and banking sector should invest more in physical and digital infrastructure to expand access to banking services,

especially in underserved areas, by promoting the development of branches, ATMs, and mobile banking solutions. The banking system should focus not only on increasing access to banking services for unserved segments of society but also on ensuring that these financial services are used regularly and sustainably by these segments. Therefore, these findings will be a valuable resource for financial institutions, policymakers, and development organizations to design targeted interventions and policies to promote inclusive growth and financial inclusion at the sub-district level in Haryana.

Implement targeted interventions and focused initiatives in these districts to address specific challenges hindering financial inclusion. Prioritize the development and enhancement of digital infrastructure in rural and remote areas. Promote the expansion of reliable and accessible digital banking services to ensure financial inclusion across all regions. Establish more financial literacy centres, especially in areas with lower financial inclusion, to educate and empower individuals regarding the benefits and usage of formal financial services. Develop and implement an inclusive policy framework that addresses the diverse needs of various segments of society. Consider the unique challenges faced by marginalized communities, women, and other vulnerable groups in the design and implementation of financial inclusion policies. Adopt liberal credit policies to facilitate easier access to credit for individuals and businesses, particularly in districts with lower financial inclusion. Provide incentives to banks and financial institutions that actively contribute to increasing financial inclusion, such as opening branches in underserved areas or developing innovative products for the unbanked population.

Although the current study provides valuable insights into the financial inclusion scenario in Haryana, it is essential to acknowledge certain limitations of the findings that can be addressed in the future studies:

1. The study covers the period from 2012 to 2022. While this time frame allows for an assessment of trends over a decade, it may not capture more recent developments or short-term fluctuations in financial inclusion. The dynamics of financial inclusion can change rapidly, and a longer or more current time frame could provide a more comprehensive understanding.
2. The study appears to primarily rely on quantitative data to measure financial inclusion. A more comprehensive understanding of the factors influencing financial inclusion in different districts would benefit from qualitative data, such as interviews, focus group discussions, or surveys to capture the perspectives and experiences of individuals and communities.
3. The summary does not delve into the contextual factors that may influence the observed levels of financial inclusion. Factors such as cultural norms, regional policies, and specific economic conditions can significantly impact the effectiveness of financial inclusion initiatives.
4. The study focuses specifically on Haryana, and its findings may not be directly applicable to other regions or states. The unique socio-economic and cultural characteristics of Haryana may limit the generalizability of the results to a broader context.
5. This study used four indicators to construct the financial inclusion index of Haryana. Some other factors also can be used to make an index like gender, rural-urban, social group etc.
6. The study used only data from commercial banks to measure financial inclusion. However, for a more comprehensive view of financial inclusion, other institutions such as regional rural banks (RRBs), MFIs, SHGs, co-operative banks, etc. could be considered.

Conclusions

The Govt. of India taking many initiatives to increase the level of financial inclusion in India such as Pradhan Mantri Jan Dhan Yojana, demonetization, Kisan credit card, business correspondence, and Pradhan Mantri Jeevan Jyoti Bima Yojana, etc. These initiatives had a lot of effect on the banking system. All states have different impacts on these steps and various levels of financial inclusion. Financial inclusion in Haryana has been consistently improving over time. The findings reveal that certain districts that lagged behind in the 2012 index have risen in their rankings in 2022. According to the results, the Gurugram district had a higher position in the index, with an FII value of 0.14 in 2012. It has since achieved the first rank in 2022, with an FII value of 0.23 and also Panchkula shows a high level of financial inclusion. But the situation is alarming in some districts like Nuh, Palwal, Jind, and Bhiwani. The results show a substantial difference in financial inclusion across districts in the state. This study can be helpful for policymakers in identifying the areas that require more attention to increase financial inclusion levels across all districts in Haryana. Effective policies can then be created based on these findings. The study recommends implementing an inclusive policy to take all segments of society under formal financial arrangements. Additionally, establishing digital infrastructure in rural and remote areas, creating more centres of financial literacy, and adopting liberal credit policies can help to promote the real spirit of financial sector reforms.

About the authors

Mamta Rani is a PhD student at the Department of Economics, Chaudhary Devi Lal University, Sirsa, Haryana, India. **Manoj Siwach** is a Professor at the Department of Economics, Chaudhary Devi Lal University, Sirsa, Haryana, India.

References

Agarwal, T. and P.K. Panda (2018), "Pattern of Digital Divide and Convergence in access to ICT facilities among the Indian States", *Journal of Infrastructure Development*, 10(1-2): 37-51.

Ahamed, M.M. and S.K. Mallick (2019), "Is Financial Inclusion Good for Bank Stability? International Evidence", *Journal of Economic Behavior & Organization*, 157: 403-427.

Alhassan, A., Li, L., Reddy, K. and G. Duppati (2021), "The Relationship between Political Instability and Financial Inclusion: Evidence from Middle East and North Africa", *International Journal of Finance & Economics*, 26(1): 353-374.

Arora, N. and N. Kumar (2022), "Extent of Financial Inclusion in Haryana: A District-level Analysis", *Vision*, 09722629221096023.

Beck, T., Demirgüc-Kunt, A. and R. Levine (2007), "Finance, Inequality and the Poor", Journal *of Economic Growth*, 12(5): 27-49.

Bruhn, M. and I. Love (2014), "The Real Impact of Improved Access to Finance: Evidence from Mexico", *Journal of Finance*, 69(3): 1347-1376.

Carbo, S., E.P.M. Gardener and P. Molyneux (2005), *Financial Exclusion*, Palgrave Macmillan, Basingstoke.

Chakrabarty, K.C. (2011), "Financial Inclusion and Banks: Issues and Perspectives", *RBI Bulletin*, 1831-1837.

Chongloi, N. and M. Bobo (2021), "Financial Inclusion in Rural Area: A Case Study of Manipur ", *Journal of Emerging Technologies and Innovative Research*, 7(11).

Connolly, C. and K. Hajaj (2001), "Financial Exclusion and Social Exclusion", Financial Services Consumer Policy Centre UNSW, University of New South Wales.

Cull, R., T. Ehrbeck and N. Holle (2014), "Financial Inclusion and Development: Recent Impact Evidence", *Consultative Group to Assist the Poor Focus Note 9/2014*, Consultative Group to Assist the Poor (CGAP), Washington, D.C., USA.

Demirgüç-Kunt, A. and L.F. Klapper (2012), "Measuring Financial Inclusion: The Global Findex Database", *World Bank Policy Research Working Paper 6025*, World Bank.

Demirgüç-Kunt, A., L. Klapper, D. Singer and P. Van Oudheusden (2018), "The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution", *World Bank Policy Research Working Paper 8440*, World Bank.

Duflo, E. (2012), "Women's Empowerment and Economic Development", *Journal of Economic Literature*, 50(4): 1051-1079.

Eldomiaty, T., R. Hammam and R. El Bakry (2020), "Institutional Determinants of Financial Inclusion: Evidence from World Economies", *International Journal of Development Issues*, 19(2): 217-228.

Florek, K., J. Łukaszewicz, J. Perkal, H.I. Steinhaus and S. Zubrzycki (1952), Taksonomia. Wrocławska*, Przegla˛d Antropologiczny, Poznan´*, XVII.

Garg, S., Priyanka, Narwal, K.P. and S. Kumar (2023), "Goods and Service Tax and its Implications on Revenue Efficiency of Sub-national Governments in India: An Empirical Analysis", *American Journal of Business*.

Goodwin, D., L. Adelman, S. Middleton and K. Ashworth (2000), "Debt, Money Management and Access to Financial Services: Evidence from the 1999 PSE Survey of Britain", *Working Paper 8*, Centre for Research in Social Policy, Loughborough University, Loughborough.

GPFI (2011), *Global Standard-Setting Bodies and Financial Inclusion for the Poor: Toward Proportionate Standards and Guidance*, Global Partnership for Financial Inclusion (GPFI).

GPFI (2020), *G20-2020 Financial Inclusion Action Plan*, Global Partnership for Financial Inclusion.

Han, R. and M. Melecky (2013), "Financial Inclusion for Stability: Access to Bank Deposits and the Deposit Growth during the Global Financial Crisis", *World Bank Policy Research Working Paper No. 6577*, World Bank, Washington, DC.

Hayton, K., V. Percy, K. Latimer and M. Chapman (2007), *Financial Inclusion: A Topic Report from the Scottish Household Survey*, London: Scottish Government Social Research.

Johnson, S. and S. Anagol (2012), "The Emergence and Importance of Social Finance", *Annual Review of Financial Economics*, 4: 375-407.

Kempson, E. and C. Whyley (1998), *Access to Current Accounts*, British Bankers' Association, London.

Kempson, E. and C. Whyley (1999), "Kept out or Opted out? Understanding and Combating Financial Exclusion", *The Policy Press*, Bristol.

Kempson, E. and C. Whyley (1999), *Banking for All? Policies to Promote Financial Inclusion in Low-Income Communities*, York: Joseph Rowntree Foundation.

Kempson, H.E. and C.M. Whyley (1999), "Understanding and Combating Financial Exclusion", *Insurance Trends*, 21: 18-22.

Kempson, H.E., C.M. Whyley, J. Caskey and S.B. Collard (2000), "In or Out? Financial Exclusion: A Literature and Research Review", *Financial Services Authority*.

Khera, P., S. Ng, S. Ogawa and R. Sahay (2022), "Measuring Digital Financial Inclusion in Emerging Market and Developing Economies: A New Index", *Asian Economic Policy Review*.

King, R.G. and R. Levine (1993), "Finance and Growth: Schumpeter might be Right", *Quarterly Journal of Economics*, 108(3): 717-737.

Kumar, A. and N. Yadav (2016), "Financial Inclusion in India: An Overview", *International Journal of Research and Development: A Management Review*, 5(2): 50-55.

Leeladhar, V. and S. Paul (2012), "Financial Inclusion in India: Policies and Programs", *Economic & Political Weekly,* 47(19): 42-49.

Leyshon, A. and N. Thrift (1995), "Geographies of Financial Exclusion: Financial Abandonment in Britain and the United States", *Transactions of the Institute of British Geographers*, 20(3): 312-41.

Mehrotra, N., V. Puhazhendhi, G.G. Nair and B.B. Sahoo (2009), "Financial Inclusion: An Overview", *Department of Economic Analysis and Research*, NABARD.

Mohan, B. (2014), "Pradhan Mantri Jan Dhan Yojana (PMJDY): Features, Needs and Challenges", *International Journal of Marketing, Financial Services & Management Research*, 2277-3622.

Montgomery, H. and J. Weiss (2011), "Can Commercially-oriented Microfinance Help Meet the Millennium Development Goals? Evidence from Pakistan", *World Development*, 39(1): 87-109.

Mukhopadhyay, J.P. (2016), "Financial Inclusion in India: A Demand-side Approach", *Economic and Political Weekly*, 46-54.

Murinde, V. (2012), "Financial Development and Economic Growth: Global and African Evidence", *Journal of African Economies*, 21(1): i10-i56.

Nandru, P., and S. Rentala (2019), "Demand-side Analysis of Measuring Financial Inclusion: Impact on Socio-economic Status of Primitive Tribal Groups (PTGs) in India", *International Journal of Development Issues*.

Ohlan, R. (2013), "Pattern of Regional Disparities in Socio-Economic Development in India: District Level Analysis", *Social Indicators Research*, 114(3): 841-873.

Pitt, M.M., S.R. Khandker and J. Cartwright (2006), "Empowering Women with Micro Finance: Evidence from Bangladesh", *Economic Development and Cultural Change*, 54(4): 791-831.

Rai, R. (2019), "Pradhan Mantri Fasal Bima Yojana: An Assessment of India's Crop Insurance Scheme", *ORF Issue Brief*, 16: 296.

Raichoudhury, A. (2020), "Major Determinants of Financial Inclusion: State-level Evidences from India", *Vision*, 24(2): 151-159.

Rangarajan, C. (2008), "Report of the Committee on Financial Inclusion", *Government of India*, New Delhi.

Rani, M. (2022), "Financial Inclusion in Some Selected South Asian Countries: Measuring Gender Disparity in Account Ownership", *International Journal of Business Management & Research*, 12(2): 6-10.

Shee, S.P. and R. Maiti (2017), "Agricultural Level of Development: A Comparative Study between Project and Non-project Area of JSW Bengal Steel Ltd. at Sundra Basin of Salboni Block, Paschim Medinipur, West Bengal, India", *City, Territory and Architecture*, 4(1): 12.

Sinclair, S.P. (2001), *Financial Exclusion: An Introductory Survey*, CRSIS, Edinburgh College of Art, Heriot Watt University.

Toporowski, J. (1987), "Beyond Banking: Financial Institutions and the Poor". In *Excluding the Poor*, P. Golding (ed.), pp. 55-69. London: Child Poverty Action Group.

Triki, T. and I. Faye (2013), *Financial Inclusion in Africa*, Abidjan: African Development Bank.

Whyley, C., E. Kempson and S. Collard (2000), *Saving and Borrowing: Use of the Social Fund Budgeting Loan Scheme and Community Credit Unions* (No. 125), Leeds: Corporate Document Services.

World Bank (2006), *World Bank World Development Indicators*, World Bank, Washington, DC.

World Bank (2008), "Finance for All: Policies and Pitfalls in Expanding Access", *World Bank Policy Research Report*, Washington, DC.

World Bank (2015), *Global Financial Development Report 2015/2016: Long-Term Finance*, World Bank Publications.

World Bank (2017), "Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution". Retrieved from https://globalfindex.worldbank.org/sites/globalfindex / files/2018-04/2017%20Findex%20full%20report_0.pdf

Yangdol, R. and M. Sarma (2019), "Demand-side Factors for Financial Inclusion: A Cross-country Empirical Analysis", *International Studies*, 56(2-3): 163-185.

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RURAL ECONOMIC TRANSFORMATION AND NARROWING RURAL-URBAN DIVIDE: A STUDY OF RURAL-URBAN MIDDLE-CLASS HOUSEHOLDS FROM PURBA BARDHAMAN DISTRICT, WEST BENGAL

SUPARNA PAL*
University of Burdwan, Bardhaman, West Bengal, India

Abstract: This article examines the contemporary economic changes in rural areas and the resultant shrinking of the rural-urban divide. The rural economy of West Bengal is facing structural transformation. This transformation is the outcome of economic reforms that opened up various sectors of the economy, causing economic diversification. For a long time, the rural economy was dominated by agriculture. However, due to economic reforms and resultant economic transformation, rural West Bengal is becoming more dependent on non-farm activities. This shift from farm to non-farm activities is being facilitated by rural middle-class households, which are acting as catalysts for economic transformation in rural areas. The transformed rural economy has reduced the rural-urban gap, reflecting the new pattern of occupations. To comprehend this economic pattern, we carry out a micro-study across rural and urban middle-class households in Purba Bardhaman district in West Bengal. Drawing on secondary data and micro-level empirical studies, this research reveals that the structural transformation has expanded the opportunities for non-farm activities in rural areas. The educated rural middle-class is capitalizing on these opportunities, actively engaging in non-farm activities and reshaping the economic landscape. As a result, there is a clear and discernible narrowing of the gap between rural and urban occupational patterns.

Keywords: Economic diversification, Farm worker, Non-farm economy, Rural middle-class, Structural transformation.

Introduction

Farm and non-farm occupations are often regarded as the defining factors of the rural-urban divide (Hnatkovska and Lahiri, 2012; Berdegue et al., 2013). This divide is often attributed to the perceived

*Correspondence to: Suparna Pal, PhD Student, Department of Geography, University of Burdwan, Bardhaman, West Bengal 713104, India. Email: suparna10pal@gmail.com

characteristics of a rural economy, which is believed to have limited economic diversification, with a primary focus on the farm sector and a few related activities. In contrast, urban economies exhibit a broad spectrum of non-farm activities. This difference in economic structure ultimately creates significant differences between rural and urban areas according to the pattern of workforce participation. However, Scott et al. (2007) questioned this perception and condemned it as a 'stereotypical view'. Much like Scott et al. (2007), many other scholars (Reardon et al., 1998; Joshi et al., 2003; Gupta, 2005; Lanjouw and Proctor, 2005; Reardon et al., 2007; Jatav and Sen, 2013, Christiaensen and Todo, 2014; Reddy and Swaminathan 2014; Gupta, 2015; Tacoli and Vorley, 2015; Joshi and Lanjouw, 2016; Kumar, 2015; Singh 2016; Singh, 2017; Guin, 2018; Jodhka, 2018; Choithani et al., 2021; Jain and Korzhenevych, 2022) found little evidence to support the claim that agriculture continues to dominate rural economies. They also claimed that the village economy is undergoing significant alterations, steadily diminishing its reliance on the farm sector by including non-farm industries on a regular basis. This practice is actually reducing the rural-urban economic divide.

On the other hand, a large body of research found that a wide gap still exists between these two spaces; a sample of this outlook can be found in Pradhan et al. (2000), Banerjee and Piketty (2001), Deaton and Dreze (2002), Bhalla (2003), Deaton and Kozel (2005), Dubey et al. (2006), Pateman (2011), Kundu and Pandey (2020), and Sahasranaman and Kumar (2022). Countering these studies, Pal and Ghosh (2007) and Hnatkovska and Lahiri (2012) revealed that most of this work is concentrated on measuring inequality or poverty between rural and urban areas on the basis of a few rounds of National Sample Survey (NSS) data, and neglects the micro-level ground realities. In this regard, Jodhka (2018) demonstrated that, despite official statistics indicating that a majority of rural workers are employed in agriculture, the number of households solely dependent on agriculture has been decreasing over the years.

A much larger proportion of rural workers now earn their livelihood from non-farm activities and engage in multiple economic endeavours. This trend indicates that rural economies are becoming more similar to urban economies. Some of the studies have compared rural and urban economies based on participation of the labour force in farm or elementary occupations, wage, and migration of labour from rural to urban areas, and found significant gaps between these two spaces. However, Gupta (2005) criticizes these studies, asserting that they suffer from a one-sided approach. Additionally, he suggests that existing studies may lack a balanced perspective or fail to consider all relevant factors that influence rural-urban dynamics. Echoing this concern, Datt and Ghosal (2014), Mujumdar (2002), Gupta (2005; 2015), Banerjee and Duflo (2008), Basile and Mukhopadhyay (2009), Shah and Harriss-White (2011), Hnatkovska and Lahiri (2012), Jodhka (2014), Berdegue et al. (2013), and Majumdar (2020) argue that focusing on traditional factors such as labour force participation in the farm sector, wage, and migration of labour from rural to urban areas, and neglecting other modern factors, constrain such studies to bring out interesting findings, as they are unable to cover the substantive rural economic scenario. It is to be understood that the term 'rural' extends beyond just the residence of cultivators or farm workers; a village is also the home of individuals involved in diverse economic activities such as small entrepreneurship, professional services, and managerial roles. These individuals, who earn salaries from their respective professions, sometimes constitute a significant segment of the rural populace. They represent the educated professionals of rural areas today and are often categorised as the 'rural middle-class' by many social scientists (Misra, 2004; Heley, 2010; Kumar, 2015; Krishnan and Hatekar, 2017; Aslany, 2019, 2020). Their growing participation in non-farm activities is altering the rural economy. Consequently, there is a discernible narrowing of the gap between rural and urban occupational patterns. However, this does not imply

that the rural-urban occupational divide has entirely vanished. Instead, it is accurate to state that the substantial gap has begun to narrow as rural economies are diversifying.

The expansion of the rural economy is the immediate outcome of economic reform in India, which has resulted in a structural transformation in occupational patterns throughout the country (Hnatkovskay and Lahiri, 2012). The trend of movement of employees from agriculture to non-agricultural activities is obviously associated with such structural transformation (Haggblade et al., 2010), and has played a significant role in the expansion of India's non-farm activities. In 1990s, India initiated major changes in its economic policies to introduce economic reforms (Datt and Sundharam, 2008). Economic reforms opened up various sectors of the economy, which eventually diversified both urban and rural livelihoods. Livelihood diversification created greater job opportunities in rural areas, and in the long-run it has expanded non-farm economic activities by stimulating local entrepreneurship (Datta and Ghoshal, 2014). With this surge in the non-farm economy, a shift towards reliance on a more diversified economic base is becoming the trend in rural areas, further fuelling rural economic transformation (Berdegue et al., 2013).

The rural middle-class is playing a prominent role in this transformation process (Misra, 2004; Banerhee and Duflo, 2018, Jodhka, 2018; Aslany, 2020). This class represents a significant proportion of the working population of rural society these days (Banerjee and Duflo, 2008). Fernandes (2006) called them the 'neo-rich' of rural society, who are professionally and economically very similar to the urban middle-class households. They reside in rural territories, but are accustomed to urban lifestyles and professions. Even so, studies addressing the rural-urban divide often focus on economically disadvantaged individuals primarily involved in basic occupations, leaving a considerable portion of the rural middle-class population understudied. Consequently, a considerable rural-urban occupational divide has been perceived. While recent studies by scholars such as Fernandes (2000), Banerjee and Duflo (2008), Harris -White (2016), Jodhka and Prakash (2016), Jodhka (2018), Krishnan and Hatekar (2017), Aslany (2020), and other emerging researchers acknowledge the presence of a rural middle-class and their impact on rural socio-economic transformation at the macro-scale, there is still little research on how their presence is gradually closing the rural-urban divide at the grassroots level. Against this backdrop, the current research intends to illustrate the occupational patterns in rural and urban contexts via the lens of middle-class households in Purba Bardhaman district, West Bengal. To understand the given scenario, this study has posed three crucial research questions:

1. Is the rural economy really diversifying and transforming into a non-farm one?
2. Are rural middle-class households bridging the occupational gap between rural and urban areas, leading to a reduction in the rural-urban divide?
3. What are the underlying causes contributing to the observed phenomenon?

To explore the observed phenomenon at the grassroot level, this study has selected Bardhaman city and four sizable adjacent villages, namely, Galsi, Jaugram, Mandalgram, and Kusumgram from Purba Bardhaman district. Further, to observe the pattern of rural economic diversification and rural-urban occupational similarity, this study has employed both primary findings to comprehend the reality on the ground as well as secondary data to perceive the larger pattern.

Study Area

As said, to observe the pattern of economic divergence and rural-urban occupational changes, this study has chosen Bardhaman city and other four villages, namely, Galsi, Jaugram, Mandalgram and Kusumgram in Purba Bardhaman district (Figure 1). For the selection of villages**,** all the community development (C.D.) blocks of Purba Bardhaman district have primarily been taken into

consideration. For further statistical analysis, villages with populations exceeding ten thousand were considered. The analysis incorporated several variables, including population density, literacy rate, and the number of workers engaged in non-farm activities, as reported in the Census of India 2011. Additionally, the availability of village amenities was assessed, covering infrastructure aspects such as road density, connectivity with Bardhaman city, educational facilities, medical infrastructure, and household assets. These factors were utilised to calculate the Index Value Analysis. Individual scores of the villages cropping up from every parameter have been compiled to scrutinise a composite index value. Then, all the villages are distributed in four classes based on four Quartile Divisions. Finally, first village from each quartile division class has been selected. The selected villages are: Jaugram from the fourth quartile division, Mandalgram from the third, Kusumgram from the second, and Galsi from the first quartile (Table 1).

Table 1: Selection of the Villages

	Blocks	Villages	Composite Score	Rank
1st Quartile	Galsi - II	Galsi	8.58929684	1
	Burdwan - I	Rayan	7.79034586	2
	Purbasthali - I	Samudragar	7.76161421	3
	Kalna - I	Krishnadebpur	6.81338956	4
	Galsi - I	Mankar	6.51092296	5
2nd Quartile	Manteswar	Kusumgram	6.17199165	6
	Ketugram - I	Kandara	5.97509919	7
	Memari - I	Chanchal	5.83502541	8
3rd Quartile	Memari - II	Mandalgram	5.775858	9
	Bhatar	Orgram	5.7366907	10
	Katwa - I	Srikhanda	5.24749109	11
	Katwa - I	Khajurdihi	5.17656878	12
	Katwa - II	Karui	4.86516023	13
4th Quartile	Jamalpur	Jaugram	4.68085053	14
	Mangolkote	Mangalkot	4.51486249	15
	Bhatar	Eruar	4.27526079	16
	Bhatar	Bara Belun	4.12526123	17
	Kalna - I	Gramkalna	2.72069109	18

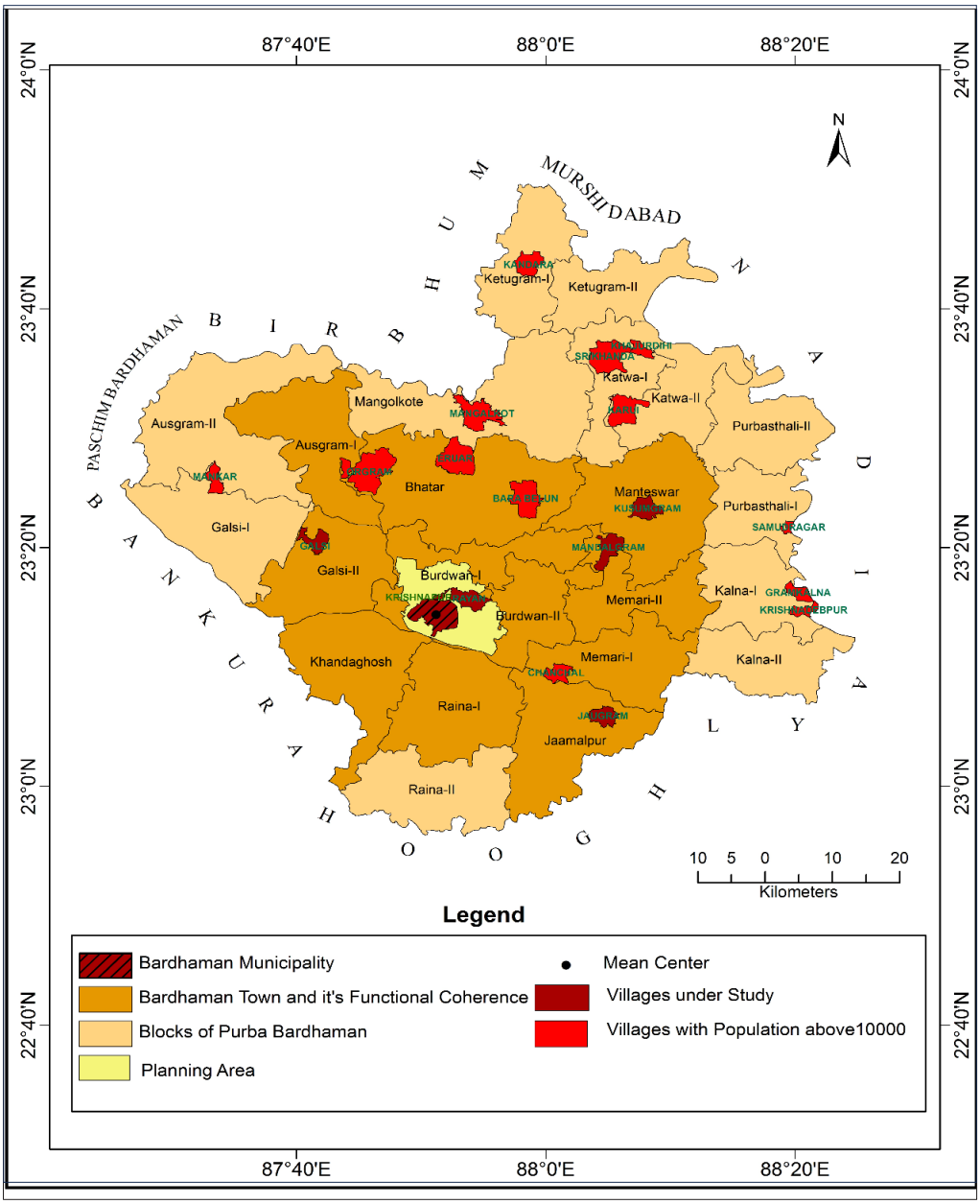
Source: Calculated by the author from the Census data.

Database and Methodology

This study relies predominantly on primary data gathered through field surveys, supplemented by the use of relevant secondary data, to grasp the overarching trends in the expansion of non-farm sectors. To begin with, the distribution of the workforce across various economic sectors has been examined at the state and district levels to discern the developmental patterns of non-farm sectors in both regions. Subsequently, utilizing a structured questionnaire, the study has surveyed 400 middle-class households in the designated areas. This study deliberately focuses on middle-class households, as the lifestyle and occupation of the middle class typically adhere to specific patterns, characterized by educated and monthly salary earning individuals (Goldthrope, 1963; Pandey, 2009).

The middle-class in rural West Bengal is no exception. Their presence in rural territory acts as a catalyst for rural socio-economic transformation. For the selection of middle-class households, this study has followed Gilbertson's classification of the middle class (Gilbertson, 2018: 24-25).

Figure 1: Map of Purba Bardhaman District



Additionally, the study validates and verifies this classification by cross-referencing it with the classification provided by Maitra (2007). Gilbertson (2018) tried to identify the middle-class on the basis of income categories provided by India's National Council for Applied Economic Research (NCAER). The NCAER defines 'middle-class' as those households whose annual incomes range between Rs. 200,000 and 1 million. The McKinsey Quarterly authored by Eric et al. (2007) also identified the middle-class with that same income bracket. Following this income bar, Shukla (2010: 99-100) has also estimated the size of the middle-class in India. To determine the sample size for this study, Cochran's (1977) sample size selection technique was employed, estimating an initial calculation of 382 households. This was subsequently rounded up to 400 households to facilitate the sampling process. The sample was then evenly split into two subsets, with 200 households selected from rural areas and 200 from urban areas. This method was designed to achieve a balanced and comprehensive representation of both rural and urban contexts.

In order to understand the growth of non-farm employment and patterns of occupational diversification in the studied areas over time, this study has gathered data on household occupational engagement across different generations. Specifically, it examines two distinct age groups: individuals under 35, and those over 55, spanning a generational gap of 20 years. Utilizing data gathered from the field survey, this study has employed the proportional Z-test method to compare non-farm employment between rural and urban settings over time. Finally, the diversity pattern for the two different generations was calculated using the Herfindahl-Hirschman Index (HHI). In the final phase of the study, a transition matrix was calculated to elucidate the trend of occupational mobility and to delve into the aspirations of rural youth. This approach was employed to achieve a comprehensive understanding of non-farm employment dynamics in rural areas. Afterwards, employing quantitative methods (correlation and beta index) and qualitative approaches (literature review and other qualitative approaches such as interviews and focused group discussions), this study endeavoured to cultivate a more profound understanding of the expansion of non-farm employment in rural areas.

Transformative Shift: Non-Farm Employment Growth and Diminishing Rural-Urban Occupational Divide

There exists a prevailing paradigm regarding the sectoral distribution of workers in rural and urban areas, which posits that the rural and urban occupational patterns are contrary to each other. According to this prototype, the evident characteristic of metropolitan areas is that a lesser proportion of the workforce is involved in agrarian activities, whereas rural areas have a negligible proportion of persons engaged in non-agrarian enterprises. However, this prototype has been undergoing considerable changes, particularly in the last few decades, with shifts observed in the workforce participation rates between the farm and non-farm sectors in rural areas. In this regard, it is pertinent to mention Jodhka's (2014: 28) observations:

> "The rural has had its own dynamics and has been experiencing many changes, emanating from within and responding to those coming from the outside. For example, the structure of the rural economy is no longer synonymous with agriculture and its allied activities. Even when official numbers show a majority of rural workers being employed in agriculture, the number of households that exclusively depend on agriculture has been declining over the years. A much larger proportion of rural workers today earn their livelihood from non-farm activities and through multiple economic engagements."

To understand the occupational dynamics, it is crucial to investigate workforce growth in both farm and non-farm sectors, both at macro and micro levels. Hence, this study utilizes secondary

data from existing sources alongside primary data gathered through field survey. Through the collaborative use of primary and secondary data, the research aims to offer a holistic insight into the changing dynamics of the rural economy and its influence on the occupational landscape.

Insights from Secondary Data

The secondary data from the Census of India underscores a notable falling off in the percentage of workers engaged in the farm sector in the state of West Bengal during the period from 1991 to 2011. Conversely, there has been a significant increase in participation rates within the non-farm sectors. Table 2 illustrates a clear shift in the dependency of workers from farm-based to non-farm occupations in West Bengal. The expansion of non-farm employment in rural areas has led to a substantial reduction in the rural-urban divide in terms of both farm and non-farm workers across West Bengal over time. This growth in the non-farm sector has not only reduced traditional differences, but has also resulted in a surge in its subsectors. The National Sample Survey Office (NSSO) reports on workforce growth based on industrial categories, offering significant evidence of this trend (see Table 3). Similarly, Table 4 depicts the same farm and non-farm employment trends in rural and urban areas in undivided Bardhaman district.

Table 2: Growth Pattern of Farm and Non-farm Employment in West Bengal, 1991-2011

Census Years	Rural		Urban		Rural-Urban difference in non-farm worker
	Farm	Non-farm	Farm	Non-farm	
1991	73.52	26.48	6.47	93.53	67.05
2011	58.95	41.04	3.82	96.17	55.13

Source: Primary Census Abstract, 1991 and 2011

Table 3: Distribution of Employed Persons in Rural and Urban Areas of West Bengal

Section	1993-94 50th Round NSS Report		2011-12 68th Round NSS Report	
	Rural	Urban	Rural	Urban
Agriculture, forestry and fishing	61.7	4.2	53.21	2.37
Mining and quarrying	0.2	2.3	0.3	0.86
Manufacturing	15	30	19.47	31.38
Electricity	0.1	1	0.06	1.05
Construction	2.8	5.7	8.43	6.16
Wholesale and retail trade	8.4	18.4	6.43	18.66
Transport, storage, etc.	3.2	8.8	3.53	7.94
Financial services	0.5	3.9	0.42	2.45
Community services	8	25.7	8.15	29.13

Source: 50th and 68th Rounds NSS Reports on Employment and Unemployment; Report Numbers: 406 and 554.

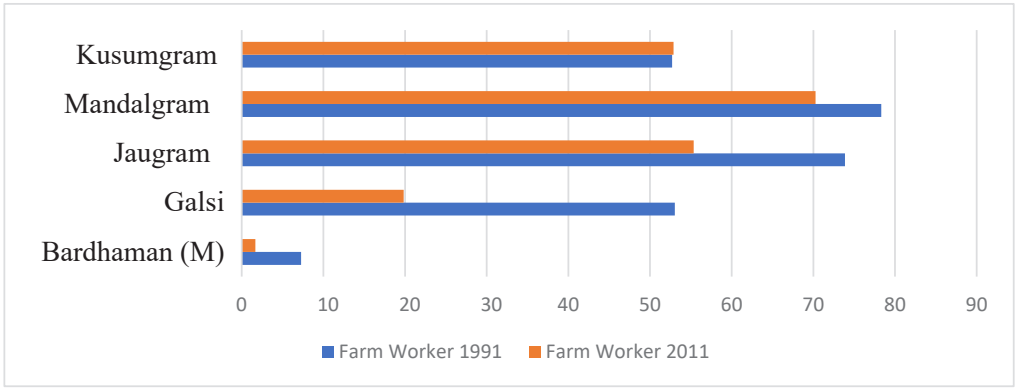
Table 4: Growth Pattern of Farm and Non-farm Employment in the District of Bardhaman, 1991-2011

Census Years	Rural		Urban		Rural-Urban difference in non-farm worker
	Farm	Non-farm	Farm	Non-farm	
1991	73.33	26.67	9.66	90.34	63.67
2011	64.65	35.35	4.49	95.51	60.16

Note: Undivided Bardhaman district
Source: Primary Census Abstract, 1991 and 2011

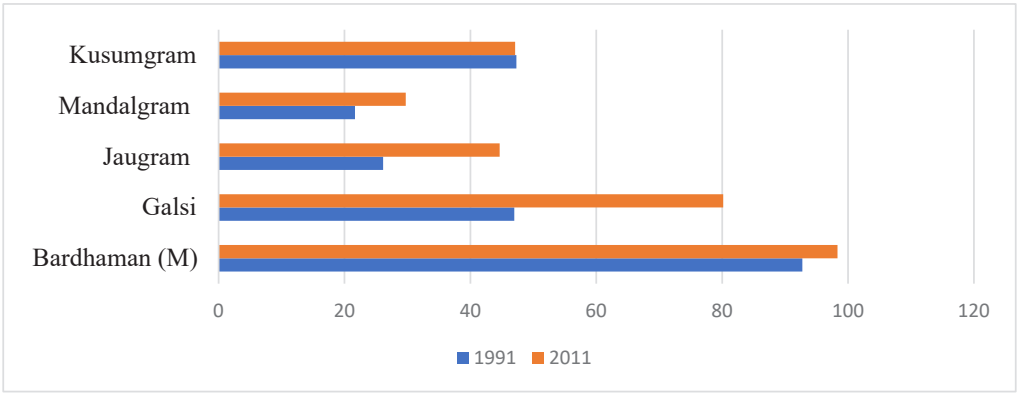
A closer examination at the micro level, particularly in the four study villages of the district, demonstrates a consistent positive growth rate in non-farm employment, mirroring the trends observed at the state and district levels as well as in their nearest urban area, i.e., Bardhaman city. These trends signify a broader shift towards a diversified economy and a reduced dependence on agriculture for livelihoods in these specific areas. Figures drawn on the basis of Census data (Figures 2 and 3) demonstrate this pattern.

Figure 2: Growth of Farm Employment in the Study Areas, 1991-2011



Note: Bardhaman (M) stands for Bardhaman municipality (i.e., city)
Source: Primary Census Abstract, 1991 and 2011

Figure 3: Growth of Non-farm Employment in the Study Areas, 1991-2011



Note: Bardhaman (M) stands for Bardhaman municipality (i.e., city)
Source: Primary Census Abstract, 1991 and 2011

Ground Truth: Insights from Micro Level Observations

This study raises a pertinent question: Is the broader trend observed in the Census data also evident in the selected villages? To address this query, the study has gathered information on farm and non-farm employment from middle-class households. The collected field survey data is revealing substantial differences between the 2011 Census data and the ground-level findings. The Census data for 2011 indicates a significant rural-urban divide in farm employment. According to the Census, the percentages of farm workers in Galsi, Jaugram, Mandalgram, and Kusumgram are 19.83, 55.35, 70.26 and 52.88, respectively. In contrast, Bardhaman municipality reports a mere 1.68 per cent

engagement in farm activities, highlighting a substantial rural-urban divide. However, the micro data paints a different picture. Farm employment scenario in Galsi, Jaugram, Mandalgram, and Kusumgram is reported as follows: they are 4.90%, 11.23 per cent, 17.78 per cent, and 9.63 per cent, respectively. In contrast, non-farm employment participations portray 95.1 per cent, 88.77 per cent, 82.22 per cent, and 90.37 per cent in Galsi, Jaugram, Mandalgram, and Kusumgram, respectively. This closely aligns with the non-farm employment pattern observed in Bardhaman city, which stands at around 99 per cent. This trend is particularly pronounced among the young individuals in the above rural areas. To comprehend this occupational trend and the growth of non-farm employment over time, the study has collected data on non-farm employment across two distinct age groups—individuals under 35 and those over 55, spanning a generational gap of 20 years. Utilizing the proportional Z-test method for analysis, the study makes a significant observation. The formula for the proportional Z-test is as follows:

$$\frac{(\bar{p}_1 - \bar{p}_2) - 0}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where p_1 and p_2 represent the sample proportions for the two groups and n_1 and n_2 represent the sample sizes of the two groups.

The rural-urban divide in terms of engagement in non-farm sector was statistically significant for the age group of '55 years and above' in all villages, except Galsi. However, for the younger generation, this divide has become statistically insignificant (Table 5), which indicates that non-farm employment has increased over time in these rural areas.

Table 5: Comparison of Non-farm Employment over Time

Urban	Rural	For the age cohort above 55 years		For the age cohort below 35 years	
		Proportional Z Test	p-value	Proportional Z Test	p-value
Bardhaman city	Galsi	1.6897	0.08876*	1.0233	0.30772*
Bardhaman city	Jaugram	3.3475	0.0008**	1.2978	0.1936*
Bardhaman city	Mandalgram	4.0302	0.00001**	1.6581	0.09692*
Bardhaman city	Kusumgram	3.9081	0.0001**	1.7005	0.08726*

Note: A single star (*) denotes that the rural-urban divide is statistically insignificant, whereas double star (**) indicates that the rural-urban divide is statistically significant at 0.05 level.

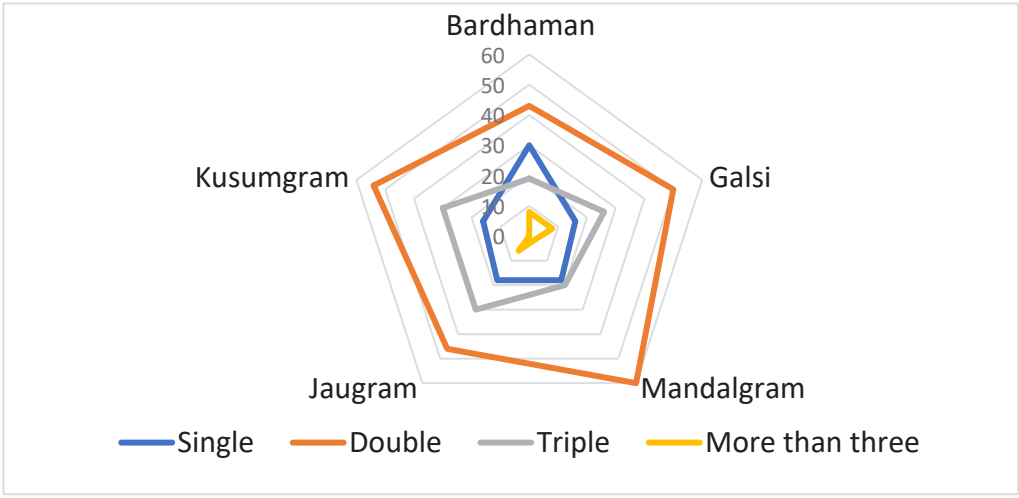
Source: Field survey

The micro data also reveals that a certain number of individuals from middle-class households in all villages are still engaged in farm activities. Interestingly, the Bardhaman municipality data also records that nearly one per cent of workers are engaged in farm activity. Such participation in farm activity by both rural and urban middle-class households is somewhat unexpected, given that these households are primarily composed of educated professionals in both locations, who usually prefer to engage in non-farm occupations. Upon closer investigation, the study identifies an interesting scenario. The individuals engaged in farm activities from these households are generally lessor farmers. Lessor farmers are not directly involved in hands-on farming activities; instead, they lease out their land for short-term tenancy arrangements. In rural areas, they frequently supervise their ancestral farming by hiring agricultural labourers, or consume a large portion of harvests through sharecropping systems.

Generally, these lessor farmers are from the age cohort of 55 years and above. In many

situations, these lessor farmers or their sons are also involved in other economic activities, such as self-employment or minor salary-earning work. A few of them are retired defence personnel who are getting pensions from the Central Government. The farm workers in urban middle-class households belong to a similar category. They currently reside away from their native lands while they manage agricultural production on their ancestral farmland by hiring labour and other means of production. Some urban households maintain strong connections to their rural roots, accessing rural farm production to ensure financial stability. However, it is crucial to note that farming is not the primary economic activity for these households (Figure 4). The pattern suggests that middle-class households in both rural and urban areas simultaneously engage in several economic activities, indicating economic diversification.

Figure 4: Household's Engagement in Multiple Economic Activities



Source: Field survey

Diversification Dynamics

Based on the empirical observations presented in the previous section, it can be inferred that the family members of the surveyed households have been found to be engaged in multiple non-farm economic activities. Such accomplishments are feasible when the economy of the rural area is sufficiently diversified to absorb this workforce. To delve deeper into the investigation, this study has undertaken the calculation of the Herfindahl-Hirschman Index (HHI) for two different generations (Table 6). The HHI is calculated by summing the squared percentage shares of all the individual occupations within a given area. The formula for calculating the HHI is as follows:

$$HHI = 10{,}000 \sum_{i=0}^{n} S_{i^2}$$

where n = number of different occupations, s = proportion of total employment of the *i*th occupation. The value is multiplied by 100 or 10,000. But in some conventions, the value is expressed in decimal. The value ranges from 0 to 10,000. A higher value indicates greater market concentration, meaning fewer occupations dominate the market. Conversely, a lower value suggests a more competitive market with a larger number of occupations (Sengupta and Samanta, 2022).

Table 6: Pattern of Occupational Diversifications

Categories of Occupational Choice	Bardhaman city	Galsi	Jaugram	Mandalgram	Kusumgram
Herfindahl-Hirschman Index (HHI) for the age cohort above 55 years	0.1996 (1996)	0.1827 (1827.68)*	0.2426 (2426.22)*	0.2048 (2048.79)*	0.2051 (1282.19)*
Herfindahl-Hirschman Index (HHI) for the age cohort below 35 years	0.1002 (1002.13)	0.1046 (1046.32)*	0.1313 (1312.18)*	0.1519 (1519.84)*	0.1474 (1474.01)*

Note: * represents HHI*10,000
Source: Field survey

The Herfindahl-Hirschman Index (HHI) presented in Table 6 for two different generations illustrates a notable upward trend in the non-farm occupational pattern across the four study villages over time. This trend is accompanied by a reduction in the rural-urban gap. The decreasing values of HHI from the older generation to the younger generation indicate an increasing rate of availability of occupational choices over time. This suggests that as generations progress, there is a notable diversification of occupational opportunities, particularly in non-farm sectors. This rate of diversification is very close to the rate of urban occupational diversification. Consequently, individuals have greater flexibility and choice in employment options, indicating favourable conditions for inter-generational occupational mobility.

Inter-generational Occupational Mobility: Tracing Pathways across Generations

In our questionnaire survey conducted in the rural areas of Galsi, Jaugram, Kusumgram, and Mandalgram, a significant finding emerged: a considerable proportion of the current generation has forsaken the traditional vocations practiced by their fathers, opting instead for different sectors. To elucidate this phenomenon of occupational mobility across generations, the study employed the mobility matrix approach, focusing on two generations within families: heads of households and their co-resident adult sons, as well as heads of households and their fathers. Through this method, which examines the occupational dynamics between fathers and sons or daughters, the research aims to illuminate the shifting patterns of occupational choices and economic activities within rural communities. To generate the inter-generational occupational matrix using the mobility matrix approach, the following formula is typically used:

$$aij = \frac{\sum O_{ij}}{\sum O_j}$$

The equation provides the outlines for how to calculate the transition probability *(aij)* from the father's occupation *(j)* to the son's occupation *(i)*, where $\sum Oij$ represents the total number of workers in the *i-th* occupation whose fathers were in occupation j, and $\sum Oj$ represents the total number of workers whose fathers were in occupation j. Specifically, *aij* quantifies the likelihood of a worker transitioning from their father's occupation or the conversion probability from the father's occupation to the son's occupation. When $i = j$, *aij*, indicating the diagonal pattern, represents the proportion of individuals who continue in the same occupation of their fathers, reflecting occupational inheritance. Conversely, *1- aij*, can be interpreted as the proportion of individuals who deviate from their fathers' occupations, thus serving as a measure of occupational mobility within the studied population.

The inter-generational occupational mobility matrix was fabricated using data obtained from the middle-class households in rural and urban areas. After data collection, all the occupations were categorized following the occupational division provided by the Census of India. On the basis of that categorized data, an occupational mobility matrix was constructed. This matrix provides a structured representation of the relationships between the occupations of fathers and their respective sons or daughters. Each row of the matrix represents a father's occupation category, while each column represents the son or daughter's occupation category. The matrix (Table 7) serves as a visual representation, highlighting several key aspects of occupational choices within these diverse settings. This matrix allows for a comprehensive examination of how occupational patterns are evolving over generations, shedding light on the dynamics of job choices within families. The study has also found that these dynamics of occupational choices across generations are primarily influenced by social and caste-based mobility, which is discussed later in this article.

Table 7: Pattern of Intergenerational Occupational Mobility

		Father								
	Son	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**O7**	**O8**	**O9**
Farmers / Skilled Agricultural and Fishery Workers	**O1**	0.02564	0.08333	0	0	0	0	0	0	0
Primitive Occupations / Elementary Occupations	**O2**	0	0	0	0	0	0	0	0	0
Production / Craft and Related Trade Workers / Transport Operators / Plant and Machine Operators and Assemblers	**O3**	0.00855	0.08333	0.16667	0.02632	0	0	0	0	0
Service Workers and Shop and Market Sales Workers / Sales personnel	**O4**	0.23077	0.66667	0.41667	0.47368	0	0.01408	0.10526	0	0.28571
Administrator / Legislator, Senior Officials and Managers	**O5**	0.00855	0	0	0	0	0.01408	0.05263	0	0
Professionals	**O6**	0.4359	0.16667	0.25	0.26316	0.5	0.59155	0.36842	0.5	0.71429
Clerk	**O7**	0.2735	0	0.16667	0.18421	0.5	0.35211	0.42105	0.25	0

Contd...

Table 7 contd...

Technicians and Associate Professionals	**O8**	0.00855	0	0	0.02632	0	0.02817	0.05263	0.25	0
Workers Not Classified by Occupations	**O9**	0.00855	0	0	0.02632	0	0	0	0	0

Source: Field survey

The evidences from secondary sources and analysis based on the micro data suggest a notable transformation in occupational patterns. In rural areas, a significant proportion of individuals with agricultural backgrounds have shifted towards non-farm employment. However, what are the push factors responsible for the convergence of rural and urban occupational patterns? The following section delves into an exploration of the underlying reasons behind this transformative shift in rural areas.

Driving Forces in the Rural Economy

The rural economy is complex and influenced by a multitude of driving forces that can vary significantly across regions and countries. Certain globally pervasive factors that interact with regional circumstances, influence the economic path of rural areas. A deeper comprehension of these interactions is necessary to understand the scenario of non-farm employment in rural areas. To thoroughly investigate these dynamics, following Chatterjee and Dwivedi (2023), a focus group discussions (FGDs) was arranged. These FGDs were structured around an open-ended survey schedule, encompassing twelve specific questions, outlined in Tables 8 and 9, across eight groups. Each study village was represented by two distinct groups: one comprising individuals aged 35 years and younger, and the other comprising individuals aged 55 years and above. From FGDs, the participants' perceptions and demands were documented, and thereafter, the most prominent themes from the eight focus group discussions (FGDs) were highlighted (Table- 10 and 11).

Table 8: Questions for Individuals 'Aged 55 and Above'

1.	What is your current occupation or profession?
2.	Is the occupation carried on by your descendants? If yes, why? If not, why?
3.	Would you like your line of work to be continued by your descendants? If yes, why? If not, why?
4.	What is your caste, and have your descendants departed from the occupation followed by you and your ancestors?
5.	During your youth, what were the predominant factors influencing your choice of occupation?
6.	In your view, what are the main factors that are currently propelling the growth of the non-farm economy in your locality?

Table 9: Questions for Individuals 'Aged 35 and Younger'

1.	What is your father's occupation, and do you aspire to follow his footsteps?
2.	What is your educational background? Based on your level of education, what type of occupation would you prefer to pursue?
3.	What is the reason for your reluctance to engage in the farm economy?
4.	Why do you have such preferences?
5.	In your opinion, what are the key driving forces behind the growth of the non-farm economy in your locality?
6.	As educated younger member of the workforce, what opportunities you are seeking for in your locality? Additionally which kind of rural landscape do you aspire to create?

Table 10: Principal Findings from Focus Group Discussions: Perceptions of the Elderly People

FGDs	Summary of Discussions
Galsi and Jaugram	"No matter how much money we earn by farming; if no one in the family is at least graduate and engaged in a relatively good job, then this village has no value."
- People's Perception	- This is a reflection of the changing dynamics in rural areas, where the perceived values and social standing of a village are increasingly getting associated with education and engagement in formal employment. The shift towards non-farm occupations is not merely an economic decision, but is deeply connected to the aspirations for social mobility and a higher social standing within the community.
Mandalgram and Kusumgram	"Belonging to a lower caste, our roles were confined to farming, working on others' land, and raising livestock. Education was not within our reach. However, in the present time, our sons and daughters have acquired education. Why should they endure the same hardships like us?"
- People's Perception	- Over time, there has been a shift away from traditional, caste-based occupations in rural areas. Members of various castes are now exploring a broader range of professions beyond the occupations traditionally associated with their castes.
Jaugram and Mandalgram	"Earlier, the government used to take various agriculture related measures for the development of rural areas, such as low-interest agricultural loans, reducing the prices of fertilizers and crops, providing training for good yields, etc. There were limited or no prominent initiatives focused on the expansion of non-farm activities during that time."
- People's Perception	- Public efforts primarily concentrated on agriculture related measures. Initiatives directed towards diversifying rural economies beyond agriculture were lacking. The lack of focus on non-farm activities constrained the growth of alternative income-generating opportunities for rural residents in the past.
Mandalgram and Jaugram	"Once upon a time, we had been a prosperous family in the village, owning vast tracts of land from which we derived our livelihood. Our children never had to consider alternative sources of income. However, due to land reform projects and 'bargadari' enforced by the earlier Left Front government, we lost a significant portion of our land. Now, what options do our descendants have for sustenance aside from pursuing non-farm activities?"
- People's Perception	- The redistribution of land has compelled the descendants of landholders to participate in various economic activities beyond traditional farming.

Table 11: Principal Findings from Focus Group Discussions: Perceptions of the Younger People

FGDs	Summary of Discussions
Galsi, Jaugram and Kusumgram	"We have studied so far. We have not learned anything about *chasbas* (farming) nor do we wish to. We don't even know what land we have? We just know that there is land. The land is a family property; money can be obtained by selling it later".
- People's Perception	- With increased education, individuals may aspire to pursue careers that are often perceived as more prestigious or financially lucrative than traditional farming. Professions in technology, business, or the sciences might be more attractive to those with higher education.
Jaugram and Kusumgram	"Both the state and the central governments have initiated several programmes for 'Karma Sangsthan' (employment generation). For instance, the state government is offering training on various handicrafts activities to educated unemployed youth at minimal or no cost. Meanwhile, the central government has introduced a scheme like the Bangla Swanirbhar Karma Sangsthan Prakalpa (BSKP) loan, providing low-interest credits to encourage new business ventures and facilitating opportunities for start-ups".

Contd...

Table 11 contd...

FGDs	Summary of Discussions
- People's Perception	- Government policies aimed at the expansion of the non-farm economy. These policies often focus on fostering diversification, creating employment opportunities, and promoting sustainable economic growth in rural areas.
Jaugram and Mandalgram	"Back when we were a joint family, our family had accumulated a lot of land together; the income from land was also quite good. But later the joint family broke up and my paternal uncles parted with their share of the estate. Even though my father somehow managed the family by cultivating the land that he got in his share; now, if that land is divided between two brothers (i.e., my brother and I), it is no longer possible to support our family from that amount of land. So, I separately ran a grocery store and my brother worked in the panchayat office."
- People's perception	- The fragmented land reduces crop production as well as total income for rural households and, therefore, creates reluctance in farming enterprise.
Galsi, Kusumgram and Jaugram	"With advancements in transportation and communication, a modern touch has permeated every aspect of life. Tasks once performed by agricultural labourers are now efficiently handled by large machines operating across the country. The improved connectivity allows for easy travel to Bardhaman city from villages, enabling us to commute for work and return in the evening. Despite these abundant opportunities, why do we continue to exclusively focus on farming?"
- People's Perception	- A robust transport and communication system is crucial for fostering an environment conducive to the expansion of non-farm activities. It enables modernization, economic diversification, employment generation, and overall rural development.

Based on the findings of the FGDs, a mixed-method approach was used in this study (a combination of quantitative and qualitative techniques) in order to get a thorough understanding of the factors that propel the non-farm economy in rural areas.

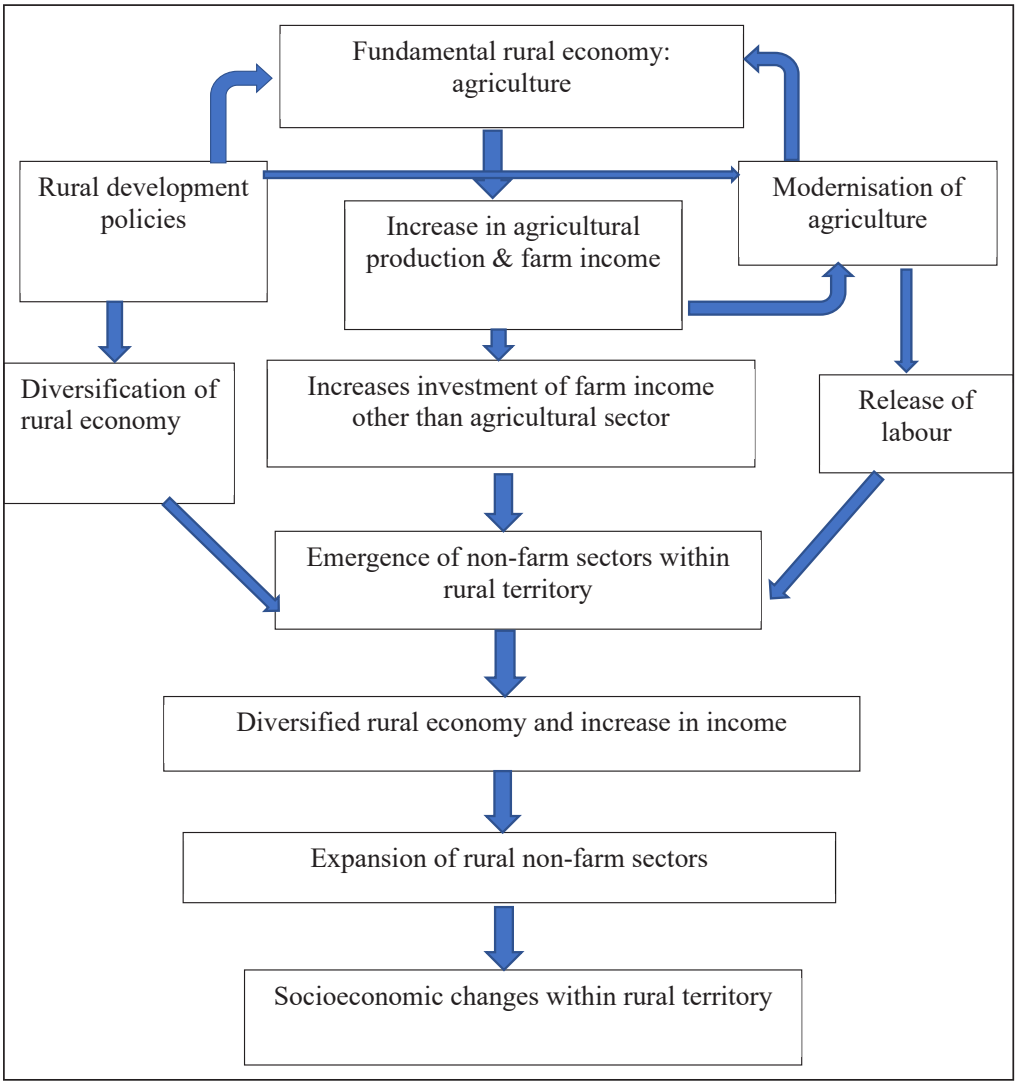
Dynamic Forces in Agriculture: Unravelling Push and Pull Factors with a Focus on Project Land Reform and Land Fragmentation

In rural areas, human settlements often cluster around locations where primary economic activities provide sustenance. Agriculture commonly serves as the primary means of subsistence, and as a result, the distribution of rural populations is influenced by factors such as the availability of fertile soil, water resources, grazing land, and infrastructure. Additionally, many rural regions are endowed with natural resources like minerals, timber, or unique natural landscapes, which support the production of exportable raw materials and processed goods. Essentially, the economic foundation of a rural area encompasses those fundamental productive activities that maintain competitiveness in external markets. In spite of that, rural economy is sometimes seen to diversify. The process of rural economic diversification varies across different agricultural regions. Dynamic agricultural regions often diversify their economies through 'pull factors', while stagnant agricultural regions are frequently transformed by 'push factors' (Reardon et al., 1998).

The process of agricultural modernization acts as a significant pull factor in rural areas. When new agricultural technologies and contemporary farm inputs are introduced, they often result in agricultural surpluses and expand trade opportunities. In these contexts, agricultural growth not only enhances productivity in the farm sector, but also catalyses the development of the rural non-farm economy through several interconnected phases. Initially, the increase in labour productivity in farms leads to a rise in the per-capita food supply, freeing up members of the farmer's family to participate in non-farm activities (Figure 5). The decline in proportion of agricultural labour from 75 per cent to 65 per cent of the rural labour force in the first 25 years of the Green Revolution

is the evidence of this fact (Hazell and Haggblade, 1991). Secondly, the adoption of technology, leading to an upsurge in agricultural production, results in increased farm incomes. This rise in farm incomes, coupled with high rural savings, makes capital available for investment outside the farm sector, specifically in the non-farm sector (Hazell et al., 2007).

Figure 5: Process of Diversification of Rural Economy



Source: Prepared by author

Alongside the broader forces at play, other local forces that have actively contributed to the transformation of the rural employment structure at the local level include Project Land Reform and rapid land fragmentations. The rural areas of West Bengal have been deeply impacted by 'Project Land Reform' or the West Bengal Land Reforms Act. The act was initially implemented in West

Bengal in 1955 but enforced in 1971 due to litigations (Bandyopadhyay, 2013). Land reform and 'bargadari' had played a pivotal role in shaping the socio-economic landscape of rural West Bengal. On the one hand, this Act transformed many agricultural labourers into cultivators, while on the other, the descendants of landholders were compelled to adopt professions other than agriculture. This shift was evident in all the villages of West Bengal, and the study villages are no exceptions.

Another significant ground level force is land-fragmentation. Agricultural land is a valuable asset for rural households; therefore, it is prone to experiencing higher levels of fragmentation. Many recent studies have opined that land fragmentation is an obstacle to profitable crop cultivation and agricultural mechanization (Markussen et al., 2016; Ali et al., 2020). Other current research also admitted that the fragmented land reduces crop production and total income for rural households (Pham et al., 2010; Tran and Vu, 2019). This factor is also emphasized in the statements of many rural residents in the study area expressed in Table 10. Based on the statements of rural residents, this study tried to clearly delineate the consequence of land fragmentation on the engagement of rural residents with non-farm economic activities. From the correlation matrix shown in Table 12, it is evident that land fragmentation has a positive impact on non-farm economic diversification.

Table 12: Correlation between Land Fragmentation and Engagement of Household Members in Non-farm Economic Activities

	Measure	Households went through land fragmentation	Engagement in non-farm economic activities
Households went through land fragmentation	Pearson Correlation	1	0.796*
	Sig. (2-tailed)		0.000
	N	400	400
Engagement in non-farm economic activities	Pearson Correlation	0.796*	1
	Sig. (2-tailed)	0.000	
	N	400	400

Source: Calculated from the field data

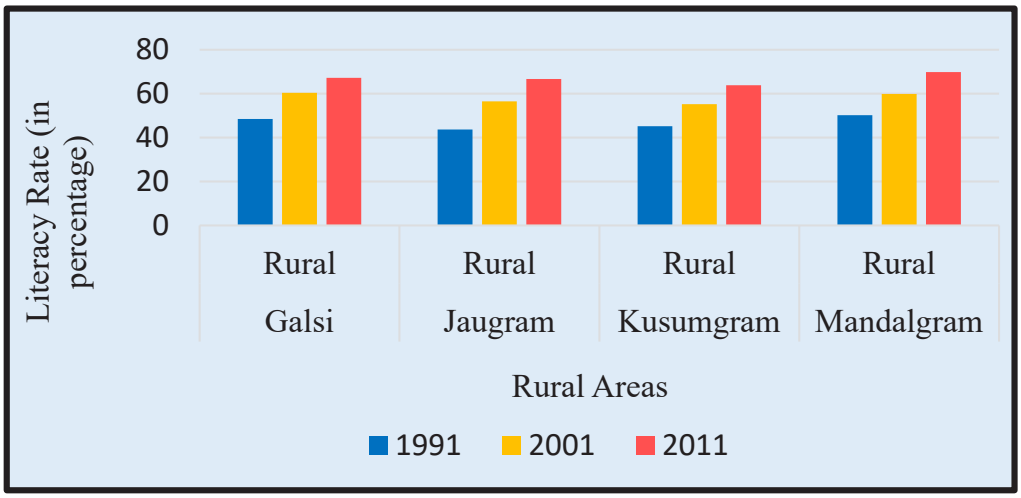
Advancements in Transport and Communication Systems alongside Rising Literacy Rates: Catalysts for Non-farm Economic Development

The pivotal role played by transport and communication systems in fostering the expansion of non-farm employment in rural areas is undeniable. The extension of these systems has allowed rural residents to commute daily to the nearest urban centres, leading to seamless integration with urban economies and cultures. This development has helped many rural individuals to engage in different non-farm activities in the nearest urban areas and prompted many rural households to distance themselves from the traditional rural economy, which is primarily centred around agriculture. As a result, not only have livelihood patterns diversified in rural areas, but entire rural social structures have undergone a profound transformation due to the proximity of urban centre (Bardhaman) and exposure to urban influences as well. This evolving socio-economic pattern has also impacted rural literacy rates (Figure 6), although the role of the Government in expansion of rural literacy is also undeniable.

To assess the proximity of these study villages to their urban counterpart (Bardhaman), the 'Beta Index' is used. The beta index, a method employed to measure the intensity of connectivity of the four villages under study with Bardhaman city, reveals significant insights. From the index, it is clear that, among the four villages, Galsi (1.04) and Jaugram (0.80) exhibit higher connectivity

with their nearest city, Bardhaman, compared to Mandalgram (0.64) and Kusumgram (0.78). Simultaneously, the literacy rate and participation in non-farm activities are higher in the former villages. From the observation, it can be opined that the transport/communication system is able to reshape rural socio-economic landscapes.

Figure 6: Growing Literacy Rates in the Study Areas (Rural)



Upon attaining education, a significant number of rural residents have distanced themselves from the traditional rural economic activities, particularly agriculture, transitioning into typical salary-earning activities, constituting the present working class in rural areas. Some have also ventured into local entrepreneurship. The rise of modern enterprises in rural areas indicates their similarities to urban economies and cultures. The data acquired from the panchayat office (village government), field surveys, and interviews with rural inhabitants revealed that the number of commercial stores has increased significantly during the last 5-10 years. Confectionary, xerox shops, mobile stores, ladies' parlours, electronic goods shops, computer businesses, and small bike showrooms are among the most recent additions (Table 13). The majority of these shops are owned by young males aged 20 to 40, with educational backgrounds ranging from higher secondary (10+2) to graduation. The distinguishing feature is that, while some of their fathers work in agriculture, none of the young store owners do it themselves. This tendency indicates an intergenerational shift in occupational preferences. These newly emerged entrepreneurs from rural society acknowledge that their aspirations, coupled with various government schemes, have played a pivotal role in their establishment as entrepreneurs within their locality. All these observations highlight a discernible reluctance among the younger generation towards engaging in agricultural activities. This shift in occupational preferences is an immediate outcome of the exposure of rural society to urban culture, and has contributed significantly to the growth of the non-farm economy in rural areas.

Aspiring for Social Mobility: A Journey towards Progress and Change

Economic transformation is typically linked to social development and mobility. In terms of social mobility, occupation stands out as a crucial indication of social status, income levels, and living standards (Kumar et al., 2002; Goldthorpe and McKnight, 2006; Vaid, 2016; Vakulabharanam and Motiram, 2016; Iversen and Sen, 2017). The data collected from middle-class households in the

study areas supports this viewpoint. The observed pattern of agricultural growth in rural areas reflects the desire of rural households to move up the socioeconomic ladder. Achieving upward mobility frequently entails shifting away from reliance on agriculture as the major occupation. As a result, after selling their agricultural properties or entering into sharecropping agreements, many rural households are transitioning to middle-class employment, notably regular salary-earning occupations. According to interviews with local residents, rural areas can be divided into three major groups depending on their livelihoods: cultivators, workers, and entrepreneurs. Notably, in recent years, a new class of service professionals, notably the educated middle-class, has emerged in rural areas. These individuals are not outsiders; they represent the younger generation in rural areas, who have chosen to pursue various salary-earning jobs in both public and private sectors. Departing from traditional village occupations, they have immersed themselves in different salaried positions, because engaging in well-reputed, formalized jobs with a fixed salary is perceived as a means of elevating social status among these rural residents. The growing pattern of literacy and the increase in non-farm activities in these villages supports this observation (Figures 2, 3 and 6).

Table 13: Rural Enterprises

Before 2010	2010-2015	After 2015
Grocery - variety - medicine - sweet shop;	Confectionary;	Fast-food centres, restaurants, café;
Garment and cosmetic shop - jewellery shop - shoe shop;	Personal networking for companies like Amwaya and Oriflame;	Boutique shops;
Garage;	Motor vehicle parts shop;	Show-room for bikes;
Doctor's chamber;	Health clinic;	Pathology centres;
Tailoring shops;	Parlour;	Parlour and bridal make-up;
Cable centres;	Cyber café;	Internet services, 'Tathya Mitra Kendra' (digital services);
Private tuition and coaching in education;	Art schools for music-dance-guitar-painting;	Kindergarten schools;
Telephone booth	Mobile recharge, hardware store, photo studio	Electronics and mobile shops Others: House plan service, gym centre, local courier service, etc.

Source: For the periods of 'before 2010' and '2010-2015', the data were collected from the panchayat office, while for the period of 'after 2015', the data were collected through field survey.

One argument that has evolved in this context is that the passion for social mobility has allowed the rural population to choose their occupation in practice. In traditional rural society, prestigious secular occupations were virtually monopolized by the privileged castes, putting the disadvantaged strata of village society at the bottom of the occupational ladder. To understand the freedom to choose an occupation, it is thus necessary to consider caste-based occupational mobility.

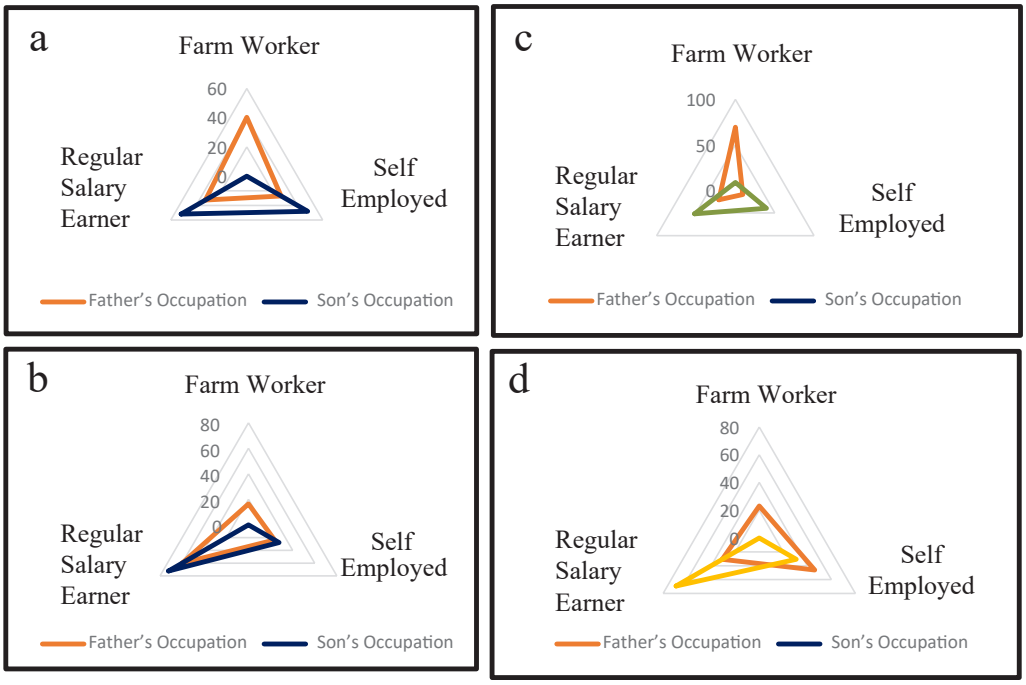
Caste-based Occupational Mobility

The occupational structure of rural society has been formed on the basis of the caste system (Dhanagare, 1990). Under that caste-based occupational structure, the underprivileged castes were forced to continue low-skill, risky jobs (mostly in agriculture), and they were specifically prohibited from pursuing the prestigious secular occupations of the privileged castes (Hnatkovskay and Lahiri, 2012). Meanwhile, urban areas were the centres of agglomeration of different types of workers belonging to different castes from the very beginning. Therefore, urban areas did not experience the

same kind of rigidity of caste-based occupation, which ultimately created a huge gap between urban and rural areas. In rural life, this caste-based occupational separation persisted until the 1970s. As a result, the diversification of the rural economy, as well as the socioeconomic upliftment of rural society's downtrodden strata, was deemed unlikely at the time (Sharma, 1983).

Since 1980s onwards, rapid economic upheaval in India and the expansion of education regardless of caste or creed helped to weaken the caste system's grip on rural society (Gupta, 2005). As a result, the diversification of the rural economy, along with socio-economic upliftment of the oppressed strata of rural society was unlikely till that time (Sharma, 1983). Since 1980s onward, the caste system's grip on rural society loosened due to the swift transformation of the Indian economy and the growth of education regardless of caste or creed (Gupta, 2005). Empirical data collected from the four selected villages shows a dramatic change in the pattern of occupational choice among traditionally unprivileged groups (Figure 7). It shows that people from OBC and SC households have systematically and significantly switched from their parents' occupations, just like people from the privileged castes. This pattern indicates that the hold of the caste system on the rural occupational system has significantly reduced. All classes and castes are free to choose their occupation, eventually diversifying rural livelihoods and reducing the rural-urban divide.

Figure 7: Caste-based Occupational Mobility



Notes: a: occupational mobility among general caste (rural); b: occupational mobility among general caste (urban); c: occupational mobility among other backward class and scheduled caste (rural); and d: occupational mobility among other backward class and scheduled caste (urban).

Source: Field survey

In summary, it can be said that various pull and push factors in agricultural regions (along with the implementation of land reform projects and land fragmentation), proximity to Bardhaman city,

increasing literacy rates, and the aspiration for social mobility across generations and castes have collectively contributed to the expansion of non-farm activities in the rural areas under study. All these factors serve as underlying causes of rural economic diversification. And the diversification has created opportunities and viability for non-farm activities in rural areas, and significantly contributed to a reduction of the rural-urban economic gap.

Conclusions

This article explores the expansion of the non-farm economy and the underlying factors contributing to it. There are two notable aspects of this exploration. Firstly, it emphasizes the rise of non-farm activities in villages. While official statistics indicate that a majority of rural workers are still engaged in the agriculture sector, the reality on the ground reveals that very few households rely solely on agriculture for their livelihoods. The increased number of rural workers who are sustaining their livelihoods through non-farm activities and participating in diverse economic pursuits signifies a notable diversification in the rural economy. The second aspect involves exploring the underlying factors driving this diversification, for which the study pinpoints some specific causes. These include the interplay of push and pull factors within agricultural regions, initiatives such as land reform projects, the fragmentation of land, and the pursuit of social mobility spanning generations and castes. Collectively, these factors are driving a transition in the labour force from agriculture to non-agriculture sectors, shaping a rural economy that shares similarities with urban areas. As a result, this transformation is contributing to narrowing the gap between rural and urban areas. Furthermore, this study asserts that the diversification is predominantly propelled by the educated middle-class residing in rural areas. Consequently, it is arguable that the expanding rural non-farm economy does not ensure equal access for all segments of rural society.

This assertion is supported by the significant percentage of the workforce still engaged in agricultural activities, as revealed by the Census reports. Wealthy households, equipped with substantial financial, human, and political capital, are capitalizing on the non-farm economy. Hence, social scientists and policymakers should not assume that the non-farm economy will automatically elevate the socio-economic status of all segments of the rural society. This underscores the need for meticulous planning and strategic interventions to ensure that the benefits of the non-farm economy reach every stratum of rural society. To enable non-farm earnings to serve as a catalyst for rural development, policymakers may need to prioritize investments in rural education and health to enhance the existing human capital. Simultaneously, they must dismantle economic and social barriers that hinder the entry of all rural residents into lucrative non-farm professions. Establishing access to local non-farm markets and connecting rural households to regional and urban labour markets through efficient transportation and communication systems will indeed be an effective step. Through the adoption of a comprehensive policy framework tailored to the unique needs of each region, policymakers can promote a more dynamic and prosperous rural landscape, steering it towards sustainable growth, improved livelihoods, and a reduction of the rural-urban occupational divide.

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About the author

Suparna Pal is a PhD student at the Department of Geography, University of Burdwan, Bardhaman, West Bengal, India.

References

Ahmad, I. and H. Reifeld (2018), *Middle Class Values in India and Western Europe*, London: Social Science Press.

Ali, A., C. Xia, C. Jia and M. Faisal (2020), "Investment Profitability and Economic Efficiency of the Drip Irrigation System: Evidence from Egypt", *Irrigation and Drainage*, 69(5): 1033-1050.

Aslany, M. (2019), "The Indian Middle-Class, Its Size, and Urban-Rural Variations", *Contemporary South Asia*, 27(2): 196-213.

Aslany, M. (2020), *Contested Capital: Rural Middle Classes in India: Rural Middle-Classes in India*, Cambridge University Press.

Bandyopadhyay, P. (2013), *Land and All That: Land and Land Reforms in West Bengal: Perspective India*, Kolkata: Deys Publishers.

Banerjee, A. and T. Piketty (2001), "Are the Rich Growing Richer: Evidence from Indian Tax Data", *Working paper*, MIT and CEPREMAP.

Banerjee, A.V. and E. Duflo (2008), "What is Middle-Class about the Middle-Classes around the World?" *Journal of Economic Perspectives*, 22(2): 3-28.

Basile, E. and I. Mukhopadhyay (eds.) (2009), *The Changing Identity of Rural India: A Socio-historic Analysis*, London: Anthem Press.

Beinhocker, E.D., D. Farrell and A.S. Zainulbhai (2007), "Tracking the Growth of India's Middle Class", *McKinsey Quarterly*, 3: 50.

Berdegue, A.J., T. Rosda and J. Bebbington (2013), "The Rural Transformation". In *International Development: Ideas, Experience and Prospects*, B. Currie-Alder, R. Kanbur, D. Malone and R. Medhora (eds.), pp. 463-478. Oxford: Oxford University Press.

Bhagat, R.B. (2005), "Rural-Urban Classification and Municipal Governance in India", *Singapore Journal of Tropical Geography*, 26(1): 61-73.

Bhalla, S.S. (2003), "Recounting the Poor: Poverty in India, 1983-99", *Economic and Political Weekly*, 338-349.

Chatterjee, B. and A. Dwivedi (2023), "Social Inequality in the Context of Gender: A Study of Rural West Bengal, India", *Global Social Welfare*, 1-13.

Choithani, C., R.J. van Duijne and J. Nijman (2021), "Changing Livelihoods at India's Rural- Urban Transition", *World Development*, 146: 105617.

Christiaensen, L. and L. Todo (2014), "Poverty Reduction During the Rural-Urban Transformation: The Role of the Missing Middle", *World Development*, 63: 43-58.

Cochran, W.G. (1977), *Sampling Techniques*, New York: John Wiley and Sons.

Datt, R. and K.P.M. Sundharam (2008), *Indian Economy*, New Delhi: S. Chand.

Datt, R. and R.K. Ghosal (2014), "Diversification in the Rural Employment Structure in West Bengal during the Post-Reform Period", *Business Studies*, 35/36: 136-146.

Deaton, A. and J. Dreze (2002), "Poverty and Inequality in India: A Re-examination", *Economic and Political Weekly*, 3729-3748.

Deaton, A. and V. Kozel (2005), "Data and Dogma: The Great Indian Poverty Debate', *World Bank Research Observer*, 20(2): 177-199.

Dhanagare, D.N. (1990), "Review: Rural Transition in Thanjavur", *Economic and Political Weekly*, 25(36): 1948-1950.

Dubey, A., R. Palmer-Jones and K. Sen (2006), "Surplus Labour, Social Structure and Rural to Urban Migration: Evidence from Indian Data", *European Journal of Development Research*, 18: 86-104.

Fernandes, L. (2000), "Restructuring the New Middle-Class in Liberalizing India", *Comparative Studies of South Asia, Africa and the Middle East*, 20(1): 88-104.

Fernandes, L. (2006), *India's New Middle-Class: Democratic Politics in an Era of Economic Reform*, Minnesota: University of Minnesota Press.

Gilbertson, A. (2018), *Within the limits: Moral Boundaries of Class and Gender in Urban India*, Oxford University Press, USA.

Goldthorpe, J.H. and D. Lockwood (1963), "Affluence and the British Class Structure", *Sociological Review*, 11(2): 133-163.

Goldthorpe, J.H. and A. McKnight (2006), "The Economic Basis of Social Class". In *Mobility and Inequality: Frontiers of Research in Sociology and Economics*, S.L. Morgan, D.B. Grusky and G.S. Fields (eds.), pp. 109-136, Stanford: Stanford University Press.

Guin, D. (2018), "From Large Villages to Small Towns: A Study of Rural Transformation in New Census Towns, India", *International Journal of Rural Management*, 14(2): 87-109.

Gupta, D. (2005), "Whither the Indian Village: Culture and Agriculture in Rural India", *Economic and Political Weekly*, 40(8): 751-758.

Gupta, D. (2015), "The Importance of Being 'Rurban': Tracking Changes in a Traditional Setting", *Economic and Political Weekly*, 37-43.

Haggblade, S., P. Hazell and T. Reardon (2010), "The Rural Non-Farm Economy: Prospects for Growth and Poverty Reduction", *World Development*, 38(10): 1429-1441.

Harriss-White, B. (2016), *Middle India and Urban-Rural Development: Four Decades of Change*, Springer.

Hazell, P., Haggblade, S., and Reardon, T. (2007). Structural Transformation of the Rural Non-farm Economy, *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*, 83.

Hazell, P.B.R., C. Ramasamy and B. Rajagopalan (1991), "An Analysis of the Indirect Effects of Agricultural Growth on the Regional Economy". In *The Green Revolution Reconsidered: The Impact of High-Yielding Rice Varieties in South India*, Peter B.R. Hazell, C. Ramasamy and P.K. Aiyasamy (eds.), Baltimore: Published for the International Food Policy Research Institute (IFPRI) by Johns Hopkins University Press.

Heley, J. (2010), "The New Squirearchy and Emergent Cultures of the New Middle-Classes in Rural Areas", *Journal of Rural Studies*, 26(4): 321-331.

Hnatkovska, V. and A. Lahiri (2012), "The Rural-Urban Divide in India", *Working Paper*, Presented in IGC-India 2012 Conference in Delhi.

Iversen, V., A. Krishna and K. Sen (2017), "Rags to Riches? Intergenerational Occupational Mobility in India", *Economic and Political Weekly*, 107-114.

Jain, M. and A. Korzhenevych (2022), "The Concept of Planetary Urbanization Applied to India's Rural to Urban Transformation", *Habitat International*, 129: 102671.

Jatav, M. and S. Sen (2013), "Drivers of Non-farm Employment in Rural India: Evidence from the 2009-10 NSSO Round", *Economic and Political Weekly*, 14-21.

Jodhka, S. (2018), "Rural Change in Times of 'Distress'", *Economic and Political Weekly*, 53(26): 5-7.

Jodhka, S.S. (2014), "Changing Face of Rural India", *Economic and Political Weekly*, 49(14): 28-31.

Jodhka, S.S. and A. Prakash (2016), *The Indian Middle-Class*, Oxford University Press.

Joshi P.K., A. Gulati, P.S. Birthal and L. Tewari (2003), "Agriculture Diversification in South Asia: Patterns, Determinants, and Policy Implications", *Economic and Political Weekly*, 39: 2457-2467.

Joshi, H.B. and P. Lanjouw (2016), "Non-farm Diversification, Inequality and Mobility in Palanpur", *Economic and Political Weekly*, 43-51.

Krishnan, S. and N. Hatekar (2017), "Rise of the New Middle-Class in India and Its Changing Structure", *Economic and Political Weekly*, 40-48.

Kumar, S. (2015), "Rural Middle-Class: Nature of Social change in Charotar (Anand), Gujarat". In *The Trajectory of India's Middle-Class: Economy, Ethics and Etiquette*, Lancy Lobo and Jayesh Shah (eds.), pp. 185-197, Cambridge Scholars Publishing

Kumar, S., A. Heath and O. Heath (2002), "Determinants of Social Mobility in India", *Economic and Political Weekly*, 2983-2987.

Kundu, D. and A. Pandey (2020), "Exploring Rural-Urban Inequality in India in the Post-economic Reform Period", *Environment and Urbanization ASIA*, 11(1): 102-122.

Lanjouw, P. and F. Proctor (2005), "Rural Non-farm Economy: Latin American Experience". In *Rural Transformation in India: The Role of Non-farm Sector*, R. Nayyar and A.N. Sharma (eds.), pp. 49-53. New Delhi: Institute for Human Development.

Maitra, S. (2007), "Who are the Indian Middle Class? A Mixture Model of Class Membership based on Durables Ownership", PhD Thesis, Department of Economics, York University, Toronto.

Majumdar, K. (2020), "Rural Transformation in India: Deagrarianization and the Transition from a Farming to Non-farming Economy", *Journal of Developing Societies*, 36(2): 182-205.

Markussen, T., F. Tarp, D.H. Thiep and N.D.A. Tuan (2016), "Inter- and Intra-farm Land Fragmentation in Vietnam", *WIDER Working Paper (No. 2016/11)*.

Misra, R. (2004), "Towards an Analytical Construct of the New Middle-Class". In *Understanding the Social Sphere: The Village and Beyond*, Yogesh Atal and Rajesh Misra (eds.), pp. 244-262. Jaipur: Rawat Publications.

Mujumdar, N.A. (2002), "Rural Development: New Perceptions", *Economic and Political Weekly*, 3983-3987.

Pal, P. and J. Ghosh (2007), "Inequality in India: A Survey of Recent Trends", *DESA Working Paper No. 45 ST/ESA/2007/DWP/45*, United Nations Department of Economic and Social Affairs (DESA), New York, USA.

Pandey, V. (2009), *Crisis of Urban Middle-Class*, Jaipur: Rawat Publication.

Pateman, T. (2011), "Rural and Urban Areas: Comparing Lives Using Rural/Urban Classifications", *Regional Trends*, 43: 11-86.

Pham, T.H., B.A. Tuan and D. Le Thanh (2010), "Is Non-farm Diversification a Way Out of Poverty for Rural Households? Evidence from Vietnam in 1993-2006", *PMMA Working Paper 2010-17*.

Pradhan, B.K., P.K. Roy, M.R. Saluja and S. Venkatram (2000), "Rural-Urban Disparities: Income Distribution, Expenditure Pattern and Social Sector", *Economic and Political Weekly*, 35(28/29): 2527-2539.

Reardon, T., K. Stamolous, A. Balisacan, M.E. Cruz, J. Berdegué and B. Banks (1998), "Rural Non-farm Income in Developing Countries". The State of Food and Agriculture 1998, pp. 283-356. Rome: Food and Agricultural Organization of the United Nations.

Reardon, T., K. Stamoulis and P. Pingali (2007), "Rural Non-farm Employment in Developing Countries in an Era of Globalization", A*gricultural Economics*, 37: 173-183.

Reddy, A.B. and M. Swaminathan (2014), "Intergenerational Occupational Mobility in Rural India: Evidence from Ten Villages", *Review of Agrarian Studies*, 4(1): 95-134.

Sahasranaman, A. and N. Kumar (2022), Income and Inequality across Rural-Urban, Occupational, and Caste Divides, *Economic and Political Weekly*, 57(26-27).

Scott, A., A. Gilbert and A. Gelan (2007), The Urban-Rural Divide: Myth or Reality? Aberdeen: Macaulay Institute.

Sengupta, A. and G. Samanta (2022), "Understanding Immobility of a Highly Vulnerable Coastal Village in the Indian Sundarban", *Regional Environmental Change*.

Shah, A. and B. Harriss-White (2011), "Resurrecting Scholarship on Agrarian Transformations", *Economic and Political Weekly*, 13-18.

Sharma, K.L. (1983), "Caste and Class: Factors Affecting Social Mobility among the Scheduled Caste", *Journal of Sociological Studies*, 2: 55.

Shukla, R. (2010), *How India Earns, Spends and Saves: Unmasking the Real India*, New Delhi: SAGE Publications India Pvt Ltd.

Sing, S. (2017), "Land Transactions and Changing Dimensions of Rural India: A Study of Two Villages in the Neighbourhood of an Indian Metropolis Lucknow", Ph.D. Thesis, University of Lucknow.

Singh, H. (2016), "Increasing Rural to Urban Migration in India: A Challenge or an Opportunity", *International Journal of Applied Research*, *2*(4): 447-450.

Tacoli, C. and B. Vorley (2015), "Reframing the Debate on Urbanisation, Rural Transformation and Food Security", *IIED Briefing Paper*, International Institute for Environment and Development (IIED).

Tran, T.Q. and H. van Vu (2019), "Land Fragmentation and Household Income: First Evidence from Rural Vietnam", *Land Use Policy*, 89: 104247.

Vaid, D. (2016). "Patterns of Social Mobility and the Role of Education in India", *Contemporary South Asia*, 24(3): 285-312.

Vakulabharanam, V. and S. Motiram (2016), "Mobility and Inequality in Neoliberal India", *Contemporary South Asia*, 24(3): 257-270.

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