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| RESEARCH ARTICLE

Structural Changes in Indian Economy since the 1950s: A Markov Chain Analysis

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| ABSTRACT
Understanding the evolution of the production structure of an economy has been one of the core macroeconomic issues for academicians, professional economists, policymakers and governments for decades. Within this context, this study investigated the structural changes in the Indian economy since the 1950s using a time-varying Markov chain (TVMC) model—a data-oriented non-parametric methodology—within a panel data framework. It aimed to understand whether India's production structure followed the Classical–Chenery path of transformation or deviated towards a service-led trajectory. The production sector of the Indian economy was classified into three sectors–agriculture, industry and service. The data on the sectoral shares in the real gross value added (GVA) in the economy was taken from the National Statistical Accounts and deflated using the Wholesale Price Index (2011–12 as base year). The period under investigation was divided into three distinct phases: the dirigiste pre-liberalisation period (1951–1991), the neoliberal post-liberalisation period (1991–2011), and the digital integration period associated with the digital era (2011–2021). The findings showed that the Indian economy took a different growth path, experiencing direct service-led structural transformation of its production system. Its growth path showed (i) persistent decline in the GVA share of the agricultural sector throughout the study period, which was consistent with the agricultural transformation observed in developed economies; (ii) a stagnant GVA share of the manufacturing sector, indicating limited industrial deepening; and (iii) a sharp, sustained and premature expansion in the GVA share of the service sector. While projections about the production structure suggest that the service sector will sustain and improve its GVA share in the long-run, it would pave the path of jobless growth in the Indian economy. The novelty of this study lies in integrating historical data with a probabilistic model to analyse sectoral transformation, providing insights for future industrial and employment policies. However, its contribution to the literature is methodological, offering insight on how long-run historical data can enhance our understanding of structural change in an economy, which remains crucial for long-run policy framing.

| KEYWORDS
Economic development, Indian economy, Projection, Markov chain, Structural change.

| JEL CODES: C33, C73, O11, O14, O47

| ARTICLE INFORMATION

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1. Introduction

Kuznets (1973) lists structural transformation or structural change in an economy as one of the six key characteristics of modern economic growth. Herrendrof et al. (2013) referred to structural change as the reallocation of economic activity across the broad sectors of the economy – agriculture, manufacturing and services. Thus, structural changes show the changing significance of these production sectors in the economy of a country; that is a compositional change in its production structure. However, the study of economic structures has been a core macroeconomic issue for academics, professional economists, policymakers and governments worldwide. Structural change analysis originates from Sir William Petty's (1662) implicit views on the movement of labour from low- to high-productive sectors of the economy. His views are reflected in Francois Quesnay's theory on 'economic

activity as a natural system', 'circular flow of income' and 'sectoral interdependence between agriculture, manufacturing and consumption' as well as Adam Smith's concept of the Division of Labour. Recent views on structural change in an economy include Clark (1940), Lewis (1954), Solow (1956), Swan (1956), Hirschman (1958), Kaldor (1960), Fei and Ranis (1964), Kuznets (1966, 1971), Chenery and Syrquin (1975), Matsuyama (1992), Rodrik (2016), and more.

The foundational work on structural change analysis in an economy was first laid down in Lewis's Dual Sector Economy Model (1954), which explained why and how surplus labour transfers from the agricultural sector to the industrial sector of an economy. The basic answer to these two complementary questions is that productivity gap between the agricultural and manufacturing sectors causes transfer of labour from the agriculture to industrail sector of the economy. Kuznets (1973) stated that structural change is a natural outcome of the modern growth process, where the agricultural share declines as productivity rises. Chenery and Syrquin (1975) argued that the manufacturing sector remains the hallmark for modern economic growth, and it plays its role as the *'engine of growth'* in the economy, where the reallocation of economic activity across agriculture, manufacturing and service sectors occurs in a certain pattern. Specifically, economic activities experience transition from the agricultural to the manufacturing sector and subsequently to the service sector of the economy with increasing productivity, income level and urbanisation. The East Asian development model (Japan, South Korea, Taiwan, and later China) exemplifies this manufacturing-led trajectory of economic growth. Amsden (1989) and Chang (2002) argued that state-led industrial policy frameworks promoting export and technology acquisition have induced such patterns of economic growth and development in these economies. Moreover, Syrquin and Chenery (1989) focussed on the process of resource allocation, specifically in the context of the structures of final demand, trade, production and employment in 108 countries during 1950–1983.

Like the growth and development experiences of the developed and the East Asian economies, the Indian economy is also anticipated to experience some kind of structural change pattern over its evolution history. Since the 1950s, the Indian economy has evolved under multiple policy regimes–*dirigisme*, characterised by state-led economic management (1951–1991), (ii) *neoliberalism*, characterised by a market-led strategy (1991–2011), and *digital integration* (2011–present). Since the Indian economy has been governed under diverse policy regimes so far, its production structure is expected to experience different patterns of structural change since the 1950s. The literature on structural change in the Indian economy reveals a different story where the Indian economy experienced leapfrogged industrialisation, i.e., manufacturing peaked at lower income levels as compared to developed economies and East Asian economies viz. Japan, South Korea, Taiwan and China. According to Gordan and Gupta (2004), India's competitive ability in IT-enabled services and its integration into the global value chains created this pattern of economic shift in the Indian economy. Similarly, Dasgupta and Singh (2005) stated that the expansion of ICT and knowledge-intensive services led to this. Kochhar et al. (2006) and Panagariya (2008) stated that global competitiveness in IT and business services without robust industrial growth were responsible for such a pattern. They called this a '*service-led puzzle*'. Moreover, Bosworth et al. (2007) found that productivity growth in the Indian economy was concentrated in the service sector, specifically in communication and finance, while manufacturing lagged in terms of growth. Furthermore, Haraguchi et al. (2017), substantiating the above literature, argued that the dynamism of globalisation and automation in the Indian economy has altered the scope of manufacturing as an engine of growth. Ghani and O'Connell (2014) and Eichengreen and Gupta (2013) suggested that services can contribute to growth at earlier stages, especially 'modern services', such as finance, IT and business outsourcing. However, this development model does not align with the employment needs of low-skilled workers, a sizable section of labourforce that is abundantly available in India. Mazumdar and Sarkar (2013) and Kohli (2006) noted that this trajectory creates the risk of jobless growth, as service production needs less labour per unit of output. Within this context, Rodrik (2016) noted that like many African and Latin American countries, India experienced this leapfrogged industrialisation—*'premature deindustrialisation'*—where manufacturing stagnated at around 15–17% of the GDP, which was quite lower than East Asia's historical peaks.

Literature reviewed on the subject includes the classical perspective of scholars as well as Indian studies on structural change analysis in the economies. From this, we could come to know research gaps in the study area, methodological alternatives, data selection, etc. Researchers have only performed structural change analysis using static growth accounting and simple data analytics. Although there are several studies on structural change in the Indian economy, none have provided a probabilistic modelling of changes in the production structure of the Indian economy. Moreover, most studies focus only on 1991 as the benchmark year to divide the study period in pre- and post-economic reform periods for the structural analysis, without differentiating much between neoliberal period (1991-2011) and digital reform period (2011-2021).

To investigate the patterns of structural change in the Indian economy from a different lens, this study applies a time-varying Markov chain (TVMC) model to the gross value added (GVA) data to analyse these changes probabilistically. The model traces structural change dynamics highlighting persistence as well as transition in the components of a system. The study is specific in terms of examining the sectoral composition as a stochastic process with transition probabilities involving across different

decades and policy regimes. However, the central questions to be addressed here are as follows: (i) What are the structural dynamics of the sectoral distribution of GVA in the Indian economy across different policy regimes? (ii) Do India's structural change patterns follow or deviate from the classical pattern of structural change experienced in the developed economies? (iii) What would be the future structure of the Indian economy, specifically in the benchmark year set for achieving the status of Viksit Bharat in the year 2047.

This study is structured into a total of five sections. Section 1 above provided the context of the present study followed by three research questions to be addressed. Section 2 lists the objectives of the study. Section 3 proposes the data and methodology to be used in the study. Section 4 presents empirical results and discussion. The last section concludes the study followed by the list of references.

2. Objectives of the Study

1. To examine structural changes in the Indian economy, i.e., to identify the persistence, mobility and probability of inter-sectoral shifts in the Indian economy since the 1950s.
2. To explore if there is any alignment of structural change patterns with different policy regimes adopted in the Indian economy since the 1950s.
3. To know if India's structural change patterns follow or deviate from the structural change experienced in the developed economies.
4. To make projections for the future structure of the Indian economy, in years 2030 and 2047.

3. Data and Methodology

3.1 Methodology

This study used a TVMC model, which offers a probability-based non-parametric framework for tracing structural changes in an economy where different sectors are stratified based on their categorical attributes. This model is applicable in situations where the progress of a system through time can be measured in terms of a single outcome variable. Unlike static growth accounting and simple data analytics, this methodology is capable of identifying persistence and mobility across sectors and long-run structural outcomes in the economy. Since this study classifies economic activity in India into three attribute-based productive sectors—agriculture, industry and service—the Markov chain framework is the most suitable methodology for capturing the structural change in the Indian economy, if any. Here, the basic model of the TVMC can be presented as follows:

A Markov chain is defined as:

- A set of states (here, sub-sectors): $S = \{1, 2, \dots \dots \dots, N\}$. In the present case, $N = 3$: Agriculture (A), industry (I) and service (S) sectors.
- Transition probability matrix:

$$P_t = \begin{bmatrix} P_{11} & P_{12} \cdots\cdots & P_{1n} \\ P_{21} & P_{22} \cdots\cdots & P_{2n} \\ \vdots & \vdots & \vdots \\ . & . \cdots\cdots & . \\ . & . \cdots\cdots & . \\ P_{n1} & P_{n2} \cdots\cdots & P_{nn} \end{bmatrix}$$

- Where, P_t = Transition probability matrix in which P_t^{ij} is the probability of moving from sector i to j. Every element in this matrix is positive, but less than 1. The sum of each row of this matrix equals to 1.
- This model states that the value of the variable—here, the sectoral share in real gross value added ($SGVA$)—between two time points evolves as

$$SGVA_{t+1} = SGVA_t \,.\, P_t$$

- Where, $SGVA^t$ = gross value added share in time t
- $SGVA_{t+1}$ = gross value added share in time $t + 1$
- Thus, it shows that the gross value added (GVA) share in time $t + 1$ ($SGVA_{t+1}$) depends on its value in immediately previous time point t ($SGVA_t$) and transition probability (P_t) from sector i to j.

To write this model in matrix language: let, we take three economic sectors (agriculture–A , industry–I and service–S) at time t, which is represented by a starting state vector: $SGVA_t = [A_t,\ I_t,\ S_t]$ where $A_t,\ I_t$ and S_t express the distributional shares of its

sub-sectors A, I and S, respectively, in the GVA measure taken for analysis. However, the TVMC model[1] in matrix form can be written as

$$SGVA_{t+1} = SGVA_t . P_t$$

Where, P_t represents the matrix mapping $SGVA_t \rightarrow SGVA_{t+1} \rightarrow \cdots \ldots \ldots \ldots \rightarrow SGVA_{t+n-1} \rightarrow SGVA_{t+n}$.

To develop the basic model, assume:

First time-step: Since $SGVA_t = [A_t,\ I_t,\ S_t]$ and $P_{ij}^t = \begin{bmatrix} P_t^{11} & P_t^{12} & P_t^{13} \\ P_t^{21} & P_t^{22} & P_t^{23} \end{bmatrix}$ where,

$$P_{ij}^{11} + P_{ij}^{12} + P_{ij}^{13} = 1 \text{ and } P_{ij}^{21} + P_{ij}^{22} + P_{ij}^{23} = 1$$

Therefore, $SGVA_{t+1} = [A_t,\ I_t,\ S_t] . \begin{bmatrix} P_t^{11} & P_t^{12} & P_t^{13} \\ P_t^{21} & P_t^{22} & P_t^{23} \end{bmatrix} = [A_{t+1},\ I_{t+1}, S_{t+1}]$

Next time-step: Since $SGVA_{t+1} = [A_{t+1},\ I_{t+1}, S_{t+1}]$ and $P_{ij}^{t+1} = \begin{bmatrix} P_t^{21} & P_t^{22} & P_t^{23} \\ P_t^{31} & P_t^{32} & P_t^{33} \end{bmatrix}$ where,

$$P_{ij}^{21} + P_{ij}^{22} + P_{ij}^{23} = 1 \text{ and } P_{ij}^{31} + P_{ij}^{32} + P_{ij}^{33} = 1$$

Therefore, $SGVA_{t+2} = [A_{t+1},\ I_{t+1},\ S_{t+1}] . \begin{bmatrix} P_t^{21} & P_t^{22} & P_t^{23} \\ P_t^{31} & P_t^{32} & P_t^{33} \end{bmatrix} = [A_{t+2},\ I_{t+2},\ S_{t+2}]$

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N^{th} step: $SGVA_{t+n} = [A_{t+(n-1)},\ I_{t+(n-1)}, S_{t+(n-1)}] . \begin{bmatrix} P_t^{n1} & P_t^{n2} & P_t^{n3} \\ P_t^{n1} & P_t^{n2} & P_t^{n3} \end{bmatrix} = [A_{t+n},\ I_{t+n},\ S_{t+n}]$

This framework shows that transition probabilities change over time, which makes it a suitable model for knowing whether structural changes in the Indian economy have been gradual, accelerating or path-dependent. Most importantly, this framework has the ability to trace the effects of economic and non-economic shocks experienced by the economy in terms of policy interventions, investment boosts, technology, etc. during a specified time period, say t to $t+1$. However, the present study estimates the probabilities of moving the economic activity between three productive sub-sectors of the Indian economy over the study period.

3.2 Data

This study used panel data on the percentage share of agriculture, industry and service sectors in the GVA measure of GDP (output) in the Indian economy since the 1950s: 1951–52 (1951), 1961–62 (1961), 1971-72 (1971), 1981–82 (1981), 1991–92 (1991), 2001–02 (2001), 2011–12 (2011) and 2021–22 (2021). The data was sourced from the National Statistical Accounts. This data was first deflated using the Wholesale Price Index for the year $2011 - 12 = 100$; thereafter, the sectoral percentage share in GVA was calculated by dividing the GVA of the sector by the total GVA of the economy. Furthermore, to project the GVA shares of three sectors, we constructed a late-era decadal transition matrix by averaging the estimated matrices for 1991–2001, 2001–2011 and 2011–21. Thereafter, by taking the transition matrix for 2021 as the baseline, TVMC model-based projections of GVA shares were performed. To get the projected GVA shares of the three sectors in 2031–32 (2031), 2041–42 (2041) and 2051–52 (2051), their transition probabilities for 2031, 2041 and 2051 were estimated. Finally, to get the projected GVA shares of all three productive sectors in the year 1947 (Viksit Bharat@2047), we interpolated linearly between 2041 and 2051.

4. Results and Discussion

Based on the proposed data and methodology, the results of the study showed that the Indian economy has observed a clear process of structural change since the 1950s. India's structural change experiences were deviated from the path of structural change experienced by developed economies, as analysed under the classical theories of development (Clark, 1940; Lewis, 1954; Kuznets, 1966; Chenery and Syrquin 1975; Syrquin and Chenery 1989; Fei and Ranis, 1964; Solow, 1956, etc.). Historically,

[1] *Time-varying (non-homogeneous) Markov chain does not necessarily converge to a single stationary distribution—at least not in the same way that a time-homogeneous chain does. However, it may converge to a limit distribution. If the matrices P_t stabilize or change slowly, then y_t might converge to a limit vector. But this limit vector is notstationary in the traditional sense—it changes because the system changes.*

structural changes have played a significant role in the Indian economy due strong productivity linkages, tradability, and capacity to absorb surplus labour in agriculture.

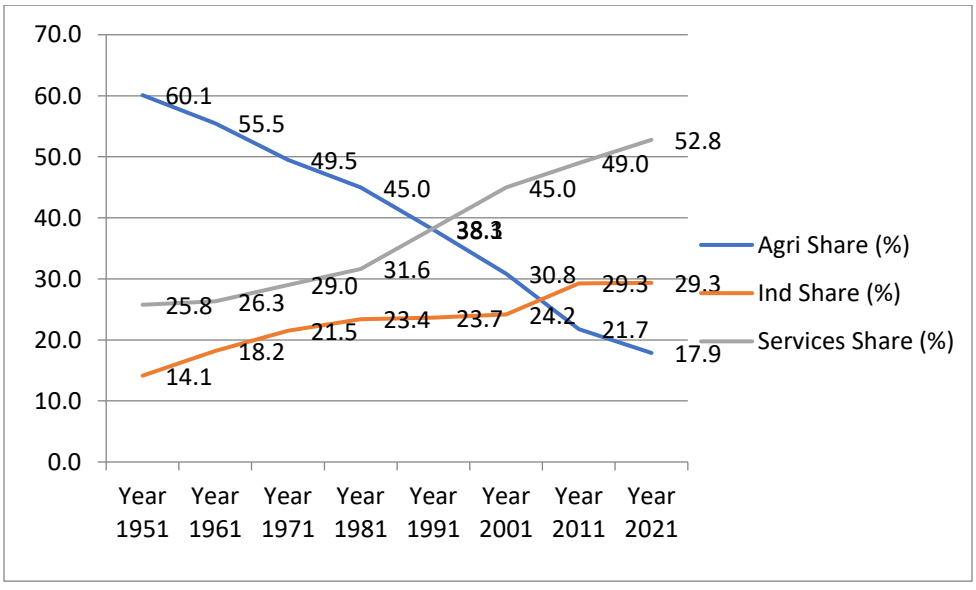
Table 1: Sectoral Share in GVA

Year	Agri. Share (%)	Industry Share (%)	Service Share (%)
1951	60.1	14.1	25.8
1991	38.1	23.7	38.3
2011	21.7	29.3	49.0
2021	17.9	29.3	52.8

Source: *National Statistical Accounts/ Economic Survey 2024-25*

As shown in Table 1, the GVA share of all three sectors of the Indian economy has changed drastically since the 1950s. Agriculture remained the dominant sector of the Indian economy only up to the year 1991 over both industrial and service sectors, and only the industrial sector until 2011. Since in this study, the total economic activity in the economy has been subdivided only into three productive sectors, a change in the share of any of the three sectors causes some change in the GVA share of other sectors of the economy by default. For example, the GVA share of agriculture declined sharply from 60.1% in 1951 to only 17.9% in 2021, a plateau in agriculture. Consequently, during this period, the GVA share of the industry and service sectors increased from 14.1% to 29.3% and from 25.8% to 52.8% in industrial and service sectors, respectively. This decline in the GVA share of agriculture mirrors the global trend in which increasing incomes reduce the relative significance of the primary sector (Herrendrof et al., 2013). This change has been caused by both supply and demand factors. However, the reduced GVA share of agriculture expanded the scope of growth in the GVA share of the industry sector and/or the service sectors of the economy by default. Broadly speaking, this is what tells us that the Indian economy has experienced extensive structural changes over the study period.

Figure 1: Sectoral Share in GVA of the Indian Economy (1951–2021)

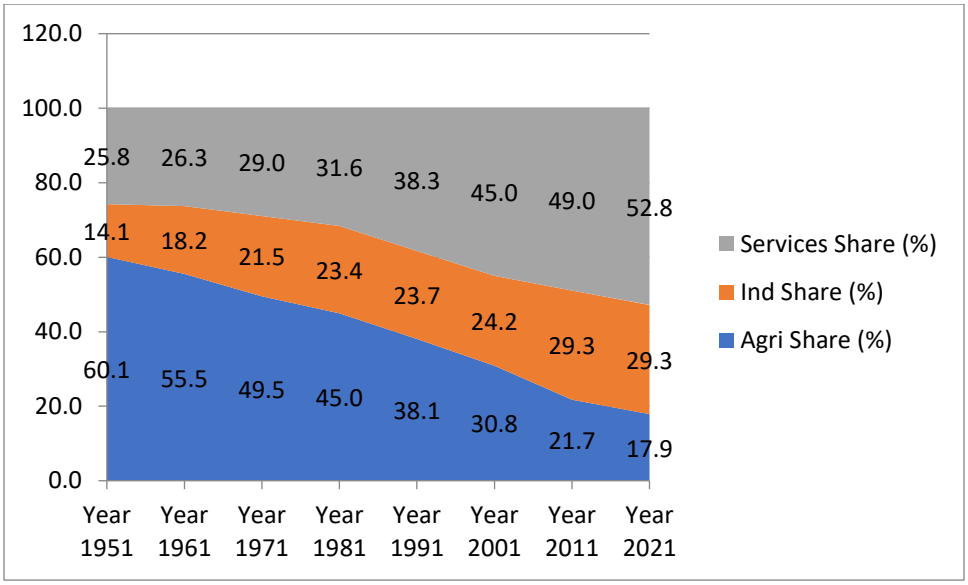


Source: Author's estimates

However, what we need to understand is how the reduced GVA share of agriculture in the total economic activity has been re-allocated between the industrial and service sectors over time. Figures 1 and 2 visually depict that the GVA share of the service sector has always been much higher compared to that of the industrial sector. It can easily be noticed that the gap between the GVA shares of the industrial and service sectors narrowed down in the initial decades from 1951 to 1981. However, in the subsequent decades, their gap has risen. It needs to be noted that it was during this point in time that the policy regime shifted from dirigisme to neoliberalism in the Indian economy. In fact, the early economic reform process was initiated from the 1980s itself; thereafter, since 1991, the scope, intensity and speed of economic reforms were enhanced by pathbreaking state policies.

Here, one can notice that the gap between the GVA shares of the industry and service sectors started widening since 1991, which implies that most of the reduced GVA share of the agricultural sector was captured by the service sector. In other words, although the service sector was dominant ever since the 1950s, its GVA share has been increasing rapidly since 1991. In addition, between 2011 and 2021, the GVA share of the industry remained stagnant, and the GVA share lost by agriculture was gained only by the service sector of the economy. This strongly reinforced the hypothesis of premature deindustrialisation in the Indian economy (Rodrik, 1016), Gordan and Gupta (2004), Dasgupta and Singh (2005), Kochhar et al. (2006), Kohli (2006), Bosworth et al. (2007), Panagariya's (2008) *'service-led puzzle'*, Haraguchi et al. (2017), Eichengreen and Gupta (2013), Mazumdar and Sarkar (2013) and Ghani and O'Connell (2014)**.** This trajectory created growth with joblessness in the economy as service production needs less labour per unit of output. Within this context, Rodrik (2016) noted that like many African and Latin American countries, India experienced this leapfrogged industrialisation*'premature deindustrialisation'* where manufacturing stagnated at around 15-17% of GDP far below the East Asian historical peaks*. In summary, the service sector has increasingly captured the GVA share reduction of agriculture, while its absorption plateaued after 2011.*

Figure 2: Changing Patterns of Sectoral Share in GVA in the Indian Economy (1951–2021)



Source: Author's estimates

Now, to conduct the TVMC model-based analysis of structural change experienced by the Indian economy since the 1950s, the whole period was subdivided into three different regimes: pre-reform period (1951–1991), economic reform period (1991–2011) and digital integration period (2011–2021). The estimated transition matrices for this period revealed sharp contrasts in the structural change dynamics from that experienced in the developed economies of the world. The analysis for all three periods can be briefed as follows:

Pre-reform period (1951–1991)

The pre-reform phase of the Indian economy, the period 1951–1991, witnessed a steady but broad reallocation of GVA shares between three productive sectors of the Indian economy. From the transition probabilities for 1951–1991, it may be concluded that though there has been high persistence in agriculture, but there was a significant reallocation from agriculture to both industrial and service sectors. During this period, the GVA share of agriculture reduced by 22%. This reduced GVA share of agriculture was reallocated to the industry and service sectors by approximately 44% and 57%, respectively. This pattern of reallocation of economic activity reveals a relatively balanced transformation path in the Indian economy during this period.

Table 2: TVMC-Based Transition Probabilities (1951-1991)

1951–1991 From ↓ To →	Agriculture	Industry	Services
Agriculture	0.848	0.152	0.000
Manufacturing	0.000	1.000	0.000
Services	0.000	0.000	1.000

Source: *Author's estimates*

This pattern of structural change seems to be consistent with the stylized model of structural change by Kuznets (1973) and Chenery and Syrquin (1975) that was experienced by the developed economies of the World. However, this decline in the GVA share of agriculture mirrors the global trend in which increasing incomes reduce the relative significance of the primary sector (Herrendrof et al., 2013). This change has been caused by various institutional and policy related factors.

Economic-reform period (1991–2011)

As far as the classical pattern of structural change is concerned, the period of economic reforms (1991–2011) marked a clear inflection in the structural change process in the Indian economy. The results of TVMC model showed that similar to the earlier period (1951–91), the GVA share of agriculture in the total economic activity declined further—from 38.1% in 1991–92 to 21.7% in 2011—but the outflow was no longer evenly distributed between the industrial and service sectors. During this period, the industry's GVA share increased modestly from 23.7% to 29.3% , while that of the service sector experienced a surge from 38.3% to 49%. The implied transition matrix in this regime (1991–2011) showed strengthening of outflow from agriculture to service, while that of agriculture to industry weakened. Roughly two-thirds of the decline in agriculture's GVA share was absorbed by services, while only one-third accrued to industry.

Table 3: TVMC-Based Transition Probabilities (1991–2011)

1991–2011 From ↓ To →	Agriculture	Industry	Services
Agriculture	0.838	0.000	0.162
Manufacturing	0.229	0.286	0.485
Services	0.000	0.444	0.556

Source: *Author's estimates*

In Markov chain terms, the persistence probability of services rose relative to industry, indicating that the service sector became the dominant absorbing sector of the Indian economy. This finding does not support the views of Kalecki (1960) and Kuznets (1968) that emphasized that agricultural development remained indispensable for industrialisation. This corresponds to the literature on services-led growth in India (Kochhar et al., 2006; Bosworth et al., 2007; Eichengreen & Gupta, 2013), which emphasizes the unique bypassing of large-scale industrialisation in favour of a direct leap from agriculture or services.

Digital integration period (2011–2021)

The outflow–inflow patterns of GVA shared among three sectors during the period of digital integration (2011–2021) showed even more striking results as compared to that during 1991–2011. During this period, agriculture's GVA share reduced marginally from 21.7% to 17.9%, but this entire decline was absorbed exclusively by the service sector, which expanded from 49% to 52.8%, while industry stagnated at 29.3%, as seen in 2011–12.

Table 4: TVMC-Based Transition Probabilities (1911–1921)

2011–2022 From ↓ To →	Agriculture	Industry	Services
Agriculture	0.179	0.293	0.528
Manufacturing	0.179	0.293	0.528
Services	0.179	0.293	0.528

Source: *Author's estimates*

Methodologically, the largest transition probability was from agriculture to the service sector (0.528), i.e., more than half of economic activity moved directly towards the service sector rather than the industrial sector. The transition probability of shift from agriculture to agriculture (0.179) showed a steady decline in the significance of agriculture, whereas the transition probability from agriculture to industry (0.293) showed a very weak indication of this shift. Thus, the corresponding transition probabilities showed near-perfect persistence in the industry and service sectors, with agriculture's outflow entirely absorbed by services. In Markov chain terms, the service sector's diagonal probability approached unity, suggesting structural lock-in. If the post-2011 transition matrix is to be iterated, the economy's long-run stationary distribution seems to converge towards a service-dominated structure exceeding 60%, with stagnant industry and a marginal agricultural base. This outcome aligns with the *'leapfrogged effect'*, *'service-led puzzle'* and *'premature deindustrialisation'* in the Indian economy (Kochhar et al., 2006; Gordan and Gupta, 2004; Bosworth et al., 2007; Panagaria, 2008; Rodrik, 2016; Haraguchi et al., 2017). It is opposed to cross-country evidence on the increasing dominance of services in late-industrialising East Asian economies viz. Japan, South Korea, Taiwan, and China.

According to Gordan and Gupta (2004), India's competitive ability in IT-enabled services and its integration in the global value chains created this pattern of economic shift in the Indian economy. Similarly, Dasgupta and Singh (2005) stated that the expansion of ICT and knowledge-intensive services made this happen. Kochhar et al. (2006) and Panagariya (2008) stated that global competitiveness in IT and business services without robust industrial growth are responsible for such a pattern. Bosworth et al. (2007) found that productivity growth was concentrated in the service sector, specifically in communication and finance, while manufacturing lagged in terms of growth. Furthermore, Haraguchi et al. (2017), substantiating the above literature, argued that the expedited processes of globalisation and automation in the Indian economy have altered the scope of manufacturing as an engine of growth. Ghani and O'Connell (2014) and Eichengreen and Gupta (2013) suggested that services contribute to growth at earlier stages, especially 'modern services', such as finance, IT, and business outsourcing. However, this development model does not align with the employment needs of low-skilled workforce abundantly available in India. Mazumdar and Sarkar (2013) noted that this trajectory creates risks of jobless growth as service production needs less labour per unit of output.

Long-Run Projections

Table 5 shows the projected sectoral GVA shares in the year 2031, 2041 and 2047 based on the sectoral GVA shares, taking 2021 as baseline, wherein agriculture, industry and service shared 17.9%, 29.3% and 52.8%, respectively. This indicates that the Indian economy is expected to experience the process of structural transformation in the years to come. During 2021 to 2047, the GVA share of agriculture, industry and service sectors is expected to change from 17.9% to only 9.43%, 29.3% to 31.63% and 52.8% to 58.95% of total GVA in the Indian economy.

Table 5: Projected Sectoral Shares (Baseline 2021)

Year	Agriculture	Industry	Service
2021 (Baseline)	17.9	29.3	52.8
2031 (TVMC, Time Step1)	13.95	30.39	55.67
2041 (TVMC, Time Step2)	10.87	31.23	57.91
2047 (Interpolated)	**9.43**	**31.63**	**58.95**

Source: *Author's estimates*

From these projected GVA shares, what we can conclude is that the industry and service sectors are expected to experience strong persistence. Therefore, most reallocation is expected to occur from agriculture to the service sector. However, as far as the significance of these estimates is concerned, these estimates of sectoral GVA shares are illustrative and should be read as structural tendencies, not precise forecasts. Furthermore, the changing dynamics of production technology, factor markets, exports, etc., may alter these projected shares of different sectoral economic activities. Among these, artificial intelligence has a high potential to impact the sectoral GVA shares in future.

The policy implications of this study deserve mention. It suggests that India should frame economic growth strategies that balance its service-led growth with stronger industrial and agricultural linkages to ensure employment generating growth and achieving the vision of Viksit Bharat 2047.

5. Conclusions

When we look at the entire period together, the TVMC-based analysis across the three policy regimes shows a clear sequence: a classical pattern of structural change during the pre-reform period (1951 to 1991), a service-biased structural change during the economic reform period (1991 to 2011), and a service lock-in structural change during the digital integration period (2011 to 2021). The mobility index implied by the Markov framework falls across regimes, reflecting declining structural mobility as services consolidate dominance. The persistence of services, combined with the stagnation of industry, raises questions about India's long-run growth trajectory, given that services-led development tends to have weaker employment multipliers relative to industry. Therefore, these results support the view that while reforms have accelerated growth, they have also pushed India onto a non-classical development path where services, rather than industry, have become the principal engine of structural change before industrial deepening. However, this pathway has delivered high growth but also poses challenges of employment creation and productivity deepening in the industrial sector. Therefore, India's future policy orientation must focus on leveraging the strengths of its service sector while creating conditions for a more resilient and competitive industrial base. However, this study, being macroeconomic in scope, is subject to aggregation bias and therefore does not capture within-sector structural changes. The transition probabilities are also sensitive to non-economic factors as well. Moreover, an analysis incorporating the trade–technology dimensions of structural change could have strengthened both the analytical depth and the policy relevance of the findings.

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