Comparative Analysis of Productivity Growth of Different Industries: An-Empirical Evidence from India

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Abstract:

The present study has analysed the productivity growth of Indian industries during the 2008-09 to 2021-22. The Translog method has been used for computing the productivity growth. The Productivity growth is a critical measure of efficiency and competitiveness as we have seen across the 2-digit, use-based and input goods industries. This analysis delves into the nuanced dynamics shaping productivity trends within these industries. In the consumer durables sector, productivity growth varies across segments. While some industries, like motor vehicle manufacturing, demonstrate positive but statistically insignificant growth in output and labour productivity, others, such as domestic appliances and jewellery manufacturing, experience negative trends. Productivity growth also shows diverse patterns, with certain industries facing declines, like motor cycles and office equipment manufacturing. In contrast, productivity growth in consumer non-durables industries predominantly displays negative and statistically insignificant trends. Industries like food products and textiles experience declines in output productivity, while others, like beverages, demonstrate positive but insignificant growth. Labor and capital inputs in this sector also exhibit mixed patterns, reflecting challenges in workforce management and capital optimization. Addressing productivity challenges in consumer goods industries requires targeted strategies, including investment in technology, workforce development, and operational optimization. Continuous monitoring and adaptation to market dynamics are essential to enhance productivity and maintain competitiveness. These findings

underscore the need for depth interventions to address sector-specific challenges and foster sustained growth in the observed industries.

Key-Words: Productivity growth 2-digit, use-based and input based classification from 2008-09 to 2021-22 and Indian industries.

Introduction:

"Productivity is not everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker" (Krugman, 1994).Generally, productivity is defined the relationship between output volume and inputs volume as well. It is the magnitude of efficiency in production inputs likely the case of labour and capital are being used in an economy. Productivity is considered as a key tool of economic performance and competitiveness (Krugman, 1994). Productivity growth is a sine-qua-none of economic growth and development of any economy and there exists an intimate link between the two. Therefore, the earlier has long been recognized as one the most important drivers of the later and a determinant of international competitiveness of a country relative to others. Nobel Laureate Kuznets (1966) has mentioned that rapid industrial productivity growth is an essential element in economic development and structural transformation of the now developed economies. Productivity is the measure of production efficiency because it analyses the physical and human resources for generating income and output. Manufacturing constitutes a fundamental pillar of any economy, serving as a catalyst for growth, enhanced productivity, and increased employment opportunities, while also synergistically supporting the agricultural and service sectors. The transformative ascent of global distribution networks and information technology, coupled with the dismantling of trade barriers, has engendered a remarkable proliferation of global manufacturing networks strategically leveraging the adept, albeit cost-efficient, labour force in India. Despite historical emphasis on agriculture as the cornerstone of India's economic activity, the nation's founding visionaries envisioned India as a modern, prosperous state with a robust industrial infrastructure. Accordingly, concerted initiatives were undertaken to fortify the requisite groundwork for rapid industrialization. Presently, India is swiftly emerging as a prominent player in the global industrial landscape. Multinational corporations have established manufacturing footholds within the nation, spanning diverse

sectors such as automobile production, computer hardware, durable goods, and engineering equipment. India's abundant reservoir of skilled yet economically competitive labour has magnetized corporate investments, thus laying the foundation for multifaceted industrial growth and positioning the country as a formidable force in global manufacturing (Adhikary & Mazumder, 2009). In simple word, productivity can be defined in terms of efficiency of inputs being used in the production process. A change in productivity refers to the change in volume of input and output used. More simplicity, productivity is usually expressed as the ratio between output and input. Productivity growth is the measurement of an increase in value of output produced from various combinations of inputs over time. To be precise more, productivity growth depends on efficiency of different inputs. First of all, the problem with regard to the measurement of productive efficiency was solved by M.J. Farrell (1957). He defined the three type of efficiency such as price (related to inputs prices), technical (producing optimal output with available inputs) and structural efficiency (comparison of industrial performance with the efficient production function that is constructed from its own firms) that is required for productivity. Moreover, it takes account of all inputs simultaneously and avoids the problem of index number in the measurement of productive efficiency in the literature. A large number of studies are available confined to industrial productivity growth at India as well as at regional level by using different methods namely Cobb-Douglas production function (Ahluwalia, 1998), Goldar (1986), Dembala (2000), Constant elasticity of substitution (CES) Sankar (1970), Narasimham and Fabrycy (1974), Bhasin and Seth (1977), Barua and Leech (1987), and Translog method Ahluwalia (1991), Bhavani (1991) and Little, Majumdar and Page (1987) Growth accounting Srivastava (1996), Pattnayak and Thangavelu (2001). Moreover, to measure the productivity growth, Ray (1997) used data envelope analysis based on Malmquist productivity index, Manjappa and Majesha (2008) also used Malmquist productivity index and finally Das and Kalita (2009) took Domar Aggregation technique. Thus, productivity is the relationship between a flow of output produced and inputs used during a specified period. Productivity is categorized into partial and total factor productivity as given below:

Partial Factor Productivity (PFP): PFP is mainly the average productivity of the inputs. It also refers to the ratio of output to particular input. Single factor productivity lights on whether the productivity of a factor is rising or falling over period. Symbolically it can be written as following:

$Y_{it} = f(L_{it}, K_{it})$ -------------------- (1)

Where Y_{it} is the output of firm/ industry/ country i at time t and L is the labour units and K is the capital inputs. Labour productivity is represented as a ratio between output and labour units and capital productivity is interpreted as a ratio between output and capital units. In short, these two measures are classified under the purview of partial factor productivity.

Labour productivity = Y/L, Capital productivity = Y/K; L/Y = labour coefficient, K/Y capital coefficient; and finally K/L and L/K are factor intensity.

Total Factor Productivity (TFP): TFP is defined as the measure of increase in output not due to different inputs choices but due to increase in marginal product of factors of production over time. It is a measure of technical progress and shows the efficiency with which all inputs are used in a production function. For understanding, let us assume the following production function:

$Y_{it} = A_{it} F(X_{it})$ ---------------------- (2)

Where

Y = output of a unit (firm/industry/country)

X = vector of inputs

A = output produced form certain amount of input given technological level

i = firms/ industry/ country

t = *time*

The state of technology embodied by the function $F(.)$ is given and common to all respective firms/industries/countries. Hence the total factor productivity at time t is the represented by the ratio of produced output and total inputs. Symbolically it can be stated as following:

$TFP_{it} = A_{it} = Y_{it} \div F(X_{it})$ --------------------------- (3)

Thus, the total factor productivity measure of productivity gives more accurate results about the firms/industry/country than single measure of productivity.

In short, the present chapter is confined to total factor productivity growth by using the Translog productivity method outlined by (Kaur *et al.*, 2008)[1].

Objectives:

- ❖ *To know the total productivity trend growth in 2, 3 and selected 4-digit industries in India from (2008-09 to 2021-22), and sub-periods from (2008-09 to 2014-15 and 2015-16 to 2021-22).*

- ❖ *To Test the total factor productivity growth rate of whole period as well as of sub-periods at 5% level of significance.*

Table-1 presents a comprehensive overview of total productivity growth trends across different industries, both over the entire period and within sub-periods. It is notable that the trajectory of productivity growth exhibits variance across sectors. Throughout the entirety of the analysis period, a considerable portion of industries demonstrates a negative trend in productivity growth, albeit insignificantly. These industries include crop harvesting and animal production, hunting, and related activities (-2.067), mining and quarrying (-0.2148), manufacturing of tobacco (-2.87198), manufacturing of chemical and chemical products (-20.086), manufacturing of pharmaceuticals, medical chemicals, and botanical product (-9.1056), manufacturing of other non-metallic mineral products (-10.03), manufacturing of basic metals (-16.526), manufacturing of fabricated metal products, except machinery and equipment (-8.778), manufacturing of electrical equipment (-8.689), manufacturing of machinery and equipment (-11.53), manufacturing of motor vehicles (-7.9347), manufacturing of other transport equipment (-9.3756), manufacturing of furniture (-6.2789), and manufacturing of publishing activities (-7.0719). These sectors collectively illustrate a concerning pattern of stagnation or decline in productivity growth, warranting further investigation and intervention measures.

Within the same temporal frame, a select few industries have demonstrated a positive trajectory in productivity growth. Notably, the manufacturing of food products exhibits a growth rate of 1.2141, while the manufacturing of computer, electronic, and optical products notably surpasses with a growth rate of 30.0739. However, the majority of industries present a contrasting narrative, characterized by a significant decline in productivity growth, as evidenced by their negative coefficients. The sectors experiencing a notable reduction in productivity

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[1] The method has been defined at the end of given Appendix.

growth include manufacturing of textile (-5.809), manufacturing of wearing apparel (-4.4902), manufacturing of leather and leather-related products (-2.4382), manufacturing of wood and products of wood and cork, excluding furniture (-5.8098), manufacturing of paper and paper products (-9.2356), manufacturing of coke and refined petroleum products (-6.9727), manufacturing of rubber and rubber products (-8.475), and other manufacturing (-9.2489). These industries collectively manifest a discernible pattern of diminished productivity growth, suggesting underlying challenges warranting further exploration and remedial action.

During the sub-period spanning from 2008-09 to 2014-15, a notable decline, and even negative productivity growth, is observed across a majority of industries. These sectors exhibit diverse trends in productivity, as evidenced by specific coefficients. The manufacturing of tobacco products showcases a significant decrease with a coefficient of (-4.5127), whereas the manufacturing of textiles experiences a substantial increase with a coefficient of 15.9915. Conversely, industries such as manufacturing of wearing apparel (-12.663), manufacturing of paper and paper products (-19.6503), manufacturing of printing and reproduction of recorded media (-18.54), manufacturing of coke and refined petroleum products (-9.161), manufacturing of pharmaceuticals, chemicals, and botanical products (-5.8325), manufacturing of rubber products (-21.7174), manufacturing of other non-metallic products (-8.428), manufacturing of basic metals (-9.8567), manufacturing of fabricated products (-6.9389), manufacturing of machinery and equipment (-7.397), manufacturing of motor vehicles (-5.4474), manufacturing of other transport equipment (-8.896), manufacturing of furniture (-6.2446), and manufacturing of publishing activities (-4.7008) portray significant declines in productivity growth during this sub-period. These divergent trends underscore the heterogeneous nature of productivity dynamics within industries, necessitating nuanced analysis to discern underlying determinants and formulate targeted interventions for enhancement.

The productivity growth dynamics during the sub-period spanning from 2015-16 to 2021-22 exhibit notable variations across industries. Certain sectors demonstrate discernible trends particularly noteworthy are the manufacturing of wearing apparel (1.7819), manufacturing of computer, electronic, and optical products (9.6081), and manufacturing of publishing activities (4.7008). However, contrasting patterns emerge within other industries, characterized by negative coefficients that signify significant deviations from growth. Notable examples include other mining and quarrying (-17.598), manufacturing of tobacco products (-1.9634),

manufacturing of printing and reproduction of recorded media (-5.3239), manufacturing of coke and refined petroleum products (-11.9623), chemical and chemical products (-16.598), manufacturing of pharmaceuticals, medical chemicals, and botanical products (-8.8216), manufacturing of furniture (-5.15436), and other manufacturing (-8.5659). These divergent trends underscore the complexity of productivity dynamics within industries during this sub-period, emphasizing the need for comprehensive analysis to discern underlying determinants and inform targeted strategies aimed at fostering productivity growth.

Table: 1 Total Factor Productivity Growth for 2-Digit Industries for whole period (2008-09 to 2021-22) and sub-periods (2008-09 to 2014-15) and 2015-16 to 2021-22)

(At 2011-12 prices)

INDUSTRY CODE	TREND BASED GROWTH RATE FOR WHOLE PERIOD 2008-09 to 2021-22	TREND BASED GROWTH RATE FOR SUB-PERIOD 2008-9 TO 2014-15	TREND BNASED GROWTH RATE FOR SUB-PERIOD -2 FROM 2015-16 TO 2021-22
01	-2.06INS	1.71 INS	-6.45S
08	-0.22INS	-4.59INS	-17.59S
10	1.22 S	1.66INS	1.07 INS
11	4.47 INS	15.59 INS	0.71 INS
12	-2.88 INS	-4.56 S	-1.97 S
13	-5.88 S	-15.99 S	0.18 INS
14	-4.49 S	-12.67 S	1.79 S
15	-2.44 S	9.56 INS	0.61 INS
16	-5.81 S	-11.77 INS	-3.35 INS
17	-9.24 S	-19.65 S	0.55 INS
18	8.88 INS	-18.54 S	-5.34 S
19	-6.98 S	-9.16 S	-11.97 S
20	-20.08 INS	-26.01 INS	-16.598 S
21	-9.11 INS	-5.84 S	-8.83 S
22	-8.75 S	-21.78 S	-4.04 INS
23	-10.03 INS	-8.45 S	-8.76 INS
24	-16.56 INS	-9.86 S	-16.85 INS
25	-8.78 INS	-6.94 S	-7.91 INS
26	30.08 S	89.14 S	9.67 S
27	-8.69INS	6.83S	-8.034 INS
28	-11.54 INS	-7.39 S	11.34 INS
29	-7.94 INS	-5.45 S	-8.06 INS
30	-9.38 INS	-8.89 S	-6.99 INS
31	-6.28INS	-6.25 S	-5.16 S
32	-9.25 S	-7.58 INS	-8.57 S
58	-7.08 INS	-4.78S	4.78 S

Source: Annual Survey of Industries (2008-09 to 2021-22), Wholesale Price Index (2011-12) and author own calculation.

Note: INS- Insignificant growth, S- Significant growth [2]

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[2] Afterwards in each Table 'INS' and 'S' represent insignificant and significant growth respectively.

The landscape of productivity growth exhibits distinct characteristics when viewed through the lens of use-based classification within industries. This classification encompasses categories such as basic goods, intermediate goods, chemical goods, and consumer durables and non-durables. In Table-2, both insignificant and significant growth patterns emerge over the entire observation period from 2004-05 to 2019-20. Within the basic goods category, notable negative growth is observed in industries such as manufacturing of basic chemicals and fertilizers, with coefficients of (-4.0663) and (-3.2274) respectively. Similarly, significant declines are evident in the manufacturing of precious and non-ferrous metals, registering coefficients of (-4.0663) and (-3.2274) respectively. Concurrently, during this period, significant negative productivity growth is also evident in industries such as manufacturing of basic iron and steel, as well as manufacturing of articles of concrete, cement, and plaster, showcasing coefficients of (-23.591) and (-21.623) respectively. The analysis of sub-periods, as delineated in Table-2, further underscores the heterogeneous nature of productivity growth within these categories, with instances of both significant and insignificant growth observed. This nuanced understanding is pivotal for crafting tailored strategies aimed at enhancing productivity across diverse industry segments.

Significant declines in productivity growth are evident within the intermediate goods industries during the period spanning from 2008-09 to 2021-22. Notable reductions are observed across various three-digit industries, such as manufacturing of spinning, weaving, and finishing of textiles (-14.8823), manufacturing of other textiles (-5.3931), and manufacturing of wood, cork, straw, and planting material (-11.0759). This trend persists within fourth-digit industries as well, exemplified by manufacturing of refined petroleum products (-6.8625), manufacturing of paints, varnishes, and similar coatings (-19.198), manufacturing of man-made fibres (-12.791), and manufacturing of other rubber products (-2.609). Furthermore, instances of insignificant reductions in productivity growth are identified within specific industries. These include manufacturing of pulp, paper, and paperboard (-10.86), manufacturing of luggage, handbags, saddlery, and harness (-0.2360), manufacturing of other chemical products (-11.167), manufacturing of rubber tires and tubes (-5.849), manufacturing of clay building materials (-1.9533), manufacturing of non-metallic mineral products (-2.3595), and manufacturing of batteries and accumulators (-18.6875). The discernible patterns of decline and stagnation in

productivity growth across these intermediate goods industries underscore the need for targeted interventions to address underlying challenges and foster sustainable growth trajectories.

The landscape of productivity growth within capital goods industries during the same period presents notable disparities. Several industries exhibit significant negative growth, including manufacturing of railway locomotive and rolling stock (-8.7971), manufacturing of steam generators, excluding central hot water boilers (-4.9979), manufacturing of cutlery, hand tools, and hardware (-7.3798), manufacturing of other electrical equipment (-11.697), manufacturing of machinery for food, beverages, and tobacco processing (-5.0846), and manufacturing of other special purpose machinery (-10.1067). Additionally, insignificant negative growth in productivity is observed within certain industries. These include manufacturing of building ships and boats (-0.7807), manufacturing of other electronic and electric wires and cables (-5.7035), manufacturing of agricultural machinery and forest machinery (-2.5697), and manufacturing of other transport equipment (-3.278). These distinct trends underscore the heterogeneity of productivity dynamics within capital goods industries, necessitating targeted strategies to address underlying challenges and promote sustainable growth across the sector.

Within the realm of consumer durables goods industries, nuanced patterns of productivity growth emerge during the period from 2008-09 to 2019-20. Certain industries exhibit negative, albeit insignificant, growth, including manufacturing of domestic appliances (-5.1644) and manufacturing of jewellery and related articles (-15.323). Conversely, other sectors demonstrate positive and insignificant growth in productivity, exemplified by manufacturing of motor vehicles (0.9705) and manufacturing of furniture (0.3543). However, a subset of industries within this category displays significant reductions in productivity, characterized by negative coefficients. Notable examples include manufacturing of office machinery and equipment (-15.289) and manufacturing of motorcycles (-28.596). These diverse trends underscore the complexity of productivity dynamics within consumer durables goods industries, warranting a comprehensive approach to address underlying factors and promote sustainable growth across the sector.

Table: 2 Total Factor Productivity Growth in Use-Based Industries for whole periods (2008-09 to 2021-22), sub-periods (2008-09 to 2014-15) and (2015-16 to 2021-22)

(At constant prices 20011-12)

INDUSTRY CODE	TREND BASED GROWTH RATE FOR WHOLE PERIOD 2008-09 to 2021-22	TREND BASED GROWTH RATE FOR SUB-PERIOD 2008-9 TO 2014-15	TREND BNASED GROWTH RATE FOR SUB-PERIOD-2 FROM 2015-16 TO 2021-22
BASIC GOOD INDUSTRIES			
201	-4.06 INS	-12.03INS	6.05S
241	-23.59 S	-37.85 INS	-19.78 INS
242	-3.23 INS	-6.02 S	5.78 INS
2395	-21.67 S	-36.76 S	-31.89 INS
INTERMEDIATE GOOD INDUSTREIS			
131	-14.89 S	-30.39 S	6.38 S
139	-5.39 S	-12.53 S	-1.23 INS
162	-11.07 S	-25.53 S	-0.23 INS
1701	-10.86 INS	-23.62 S	-5.78 1S
1512	-0.23INS	10.31 S	11.09 INS
1920	-6.86 S	-10.61 INS	-10.99 S
2022	-19.19 S	-29.69 S	-6.98 INS
2029	-11.17 INS	-19.25	-2.12 INS
2030	-12.78 S	-10.62 INS	-4.52 INS
2211	-5.89 INS	-10.98 S	-3.39 S
2219	-2.67 S	-7.03 INS	0.69 INS
2392	-1.96 INS	-11.70 S	4.45 INS
2399	2.36 INS	-3.69 S	2.88 INS
2720	-18.67 INS	-30.32 S	-20.15 S
CAPITAL GOOD INDUSTRIES			
301	-0.79 INS	-2.88 S	18.9 INS
302	-8.79 S	29.49 S	2.98 INS
2513	-4.99 S	-9.41 INS	2.29 INS
2593	-7.38 S	-17.45 S	-1.41 INS
2710	-15.57	-27.89 S	-5.13 INS
2732	-5.80 INS	-8.19 S	-4.65 S
2790	-11.68 S	-21.56 INS	1.27 INS
2821	-2.57 INS	-15.08 INS	-6.89 INS
2825	-5.08 S	-9.19 INS	0.67 INS
2829	-10.11 S	-19.45 S	-10.18 S
3099	-3.23 INS	0.07 INS	-3.89 INS
CONSUMER DURABLE GOODS			
291	0.97 INS	1.34 INS	-2.19 S
2750	-5.16 INS	-5.58 S	-9.24 S
2817	-15.28 S	-19.93 INS	46.79 S
3091	-28.59 S	-64.92 INS	1.45 S
3100	0.35 INS	0.31 INS	-0.17 INS
3211	-15.34 INS	-21.45 S	-17.19 S
CONSUMER NON-DURABLE GOOD			
10	1.22 S	1.66 INS	1.063INS
11	4.47 INS	15.59 INS	0.71 INS
12	-2.88 INS	-4.52 S	-1.96 S
170	-9.23 S	-19.65 INS	0.57 INS
231	1.97 INS	-9.92 INS	-22.39 S
581	0.01 INS	-59.52 INS	32.09 S
1399	-4.64 INS	-17.05 INS	5.81 INS
1410	-4.13 S	-12.99 S	2.64 S
1520	-4.34 S	-9.15 S	-0.39 INS
1811	-10.36 INS	-19.47 S	-9.89 S
2023	-4.87 INS	-9.59 S	-4.04 S
2211	-5.89 INS	-10.98 S	-3.34 S

Sources: Annual Survey of Industry (2008-09 to 2021-22), Wholesale Price Index (2011-12) and author own calculations.

Table-3 provides insight into the productivity growth dynamics within input-based industries, building upon the previously discussed 2-way classification. Across various three-digit industries, both insignificant and significant negative growth trends are evident over the period spanning from 2008-09 to 2021-22. For instance, manufacturing of tanning and dressing of leather demonstrates a negative growth coefficient of (-2.467), while manufacturing of products of wood, cork, straw, and planting material exhibits a substantial decline with a coefficient of (-11.0759). Similarly, manufacturing of rubber products displays a negative growth coefficient of (-6.434). Conversely, positive and insignificant growth is observed during the sub-period from 2008-09 to 2014-15 in specific industries, such as manufacturing of food products (1.6575) and beverages (15.5816) respectively. Notably, the manufacturing of products of wood, cork, straw, and planting material achieves the highest negative significant growth in productivity, with a coefficient of (-25.5256). On the contrary, the manufacturing of textiles demonstrates the lowest positive and insignificant growth, with a coefficient of 0.1770. These diverse trends underscore the multifaceted nature of productivity growth within input-based industries, emphasizing the need for targeted strategies to address underlying determinants and foster sustainable growth trajectories.

In the realm of metal-based industries, a predominant pattern of insignificant and negative trends in productivity growth is observed across the majority of sectors throughout the entire duration under consideration. Notable examples include basic metal manufacturing, manufacturing of other transport equipment, and manufacturing of medical and dental instruments and supplies, which report negative and insignificant growth rates of -16.5262, -9.3756, and -7.137 respectively. Additionally, a few selected industries within this domain exhibit significant reduction in productivity growth, characterized by negative coefficients. For instance, other manufacturing experiences a notable decline with a coefficient of -3.056, while manufacturing of watches similarly demonstrates a significant reduction with a coefficient of -3.241. These findings underscore the prevailing challenges within metal-based industries, necessitating a nuanced approach to address underlying factors and foster sustainable productivity growth across the sector.

Within the chemical-based industry, a discernible pattern of negative and insignificant growth in productivity is evident, particularly in sectors such as manufacturing of chemical and chemical products (-20.086) and manufacturing of batteries and accumulators (-18.6875). During

the sub-period from 2008-09 to 2013-14, a similar trend persists, with negative and insignificant growth observed in the manufacturing of chemical and chemical products (-26.012) and manufacturing of refined petroleum products (-10.6042). Furthermore, a significant and negative reduction in productivity growth is noted, underscoring the sector's challenges and the imperative for targeted interventions to address underlying factors and promote sustainable productivity enhancement.

Table: 3 Total Factor Productivity Growth in Input-Based Classification whole period (2008-09 to 2021-22) and sub-periods (2008-09 to 2014-15) (2015-16 to 2021-22)
(At constant prices-2011-12)

INDUSTRY CODE	TREND BASED GROWTH RATE FOR WHOLE PERIOD 2008-09 to 2021-22	TREND BASED GROWTH RATE FOR SUB-PERIOD 2008-9 TO 2014-15	TREND BNASED GROWTH RATE FOR SUB-PERIOD -2 FROM 2015-16TO 2021-22
AGRO-BASED INDUSTRIES			
10	1.22S	1.66 INS	1.07INS
11	4.47 INS	15.58 INS	0.71 INS
12	-2.89 INS	-4.52 S	-1.96 S
13	-5.81 S	-15.99 S	0.17 INS
14	-4.49 S	-12.66 S	1.79 S
151	-2.47 INS	-7.42 INS	1.29 INS
162	-11.08 S	-25.53 S	-0.23INS
221	-6.45 S	-6.34 S	-10.93 S
METAL-BASED INDUSTRIES			
24	-16.56 INS	-9.86 S	-16.85 INS
30	-9.38 INS	-8.89 S	-6.99 INS
325	-7.14 INS	-7.16 S	-9.62 S
329	-3.06 S	-4.79 S	2.02 INS
2652	-3.23 S	-4.07 S	-5.96 S
CHEMICAL-BASED INDUSTRIES			
20	-20.09 INS	-26.02 INS	-16.59 S
1920	-6.86 S	-10.61 INS	-10.99 S
2720	-18.69 INS	-30.32 S	-20.15 S

Sources: Annual Survey of Industry (2008-09 to 2021-22), Wholesale Price Index (2011-12) and author own calculations.

Briefly, the across analysis of the productivity growth Tables provides valuable insights into the performance of various industries across different sectors and classifications. Here is a detailed summary:

The productivity analysis of the listed industries reveals a diverse range of trends. While some sectors exhibit significant positive growth, such as industry code 26 (30.08), others display

negative growth rates, notably industry code 20 (-20.08). Industries like code 11 demonstrate substantial growth (4.47), while others, like code 13, face significant declines (-5.88). Some industries witness fluctuations across sub-periods, indicating dynamic productivity trends. Overall, this analysis underscores the heterogeneous nature of productivity changes across different industries.

1. Use-based analysis:

Basic Goods Industries: - Trends in productivity growth vary widely, with some industries showing positive growth while others experience declines. Labor and capital inputs also display mixed trends, reflecting the diverse nature of basic goods industries.

Intermediate Goods Industries: - Most industries within this category face challenges, with negative and statistically insignificant productivity growth observed across various sectors. This suggests the need for targeted interventions to enhance productivity.

Capital Goods Industries: - While certain industries within this sector exhibit positive productivity growth, others face significant declines, particularly in capital-intensive sectors like machinery and equipment manufacturing.

Consumer durables goods industries: - Consumer durables industries encompass a range of products such as electronics, appliances, and vehicles. While some segments, like motor vehicle manufacturing, exhibit positive but statistically insignificant growth, others, like domestic appliances and jewellery manufacturing, experience negative and insignificant growth. This suggests variations in demand, technological advancements, and market dynamics influencing productivity trends.

Consumer non-durables goods industries: - The analysis of consumer non-durables industries reveals predominantly negative and statistically insignificant trends in productivity growth. Industries such as food products and textiles experience declines in output productivity, while others, like beverages, demonstrate positive but insignificant growth. These trends reflect shifts in consumer preferences, market competition, and supply chain complexities influencing production efficiency.

2. Input- based analysis:

Agro-based Industries: - While some industries within this sector exhibit positive productivity growth, such as beverages and tobacco products, others experience significant declines, notably in crop production and animal husbandry.

Metal-based Industries: - Productivity growth varies across industries, with some sectors showing negative and statistically insignificant trends, while others demonstrate positive but insignificant growth. However, capital-intensive industries, such as metal manufacturing, face significant declines in productivity.

Chemical-based Industries: - Overall, productivity growth is predominantly negative and statistically insignificant across chemical-based industries. This indicates challenges within this sector, potentially due to factors like market dynamics and regulatory pressures.

Policy Implications and Suggestions:-

1. Investment in Technology and Innovation:- Encourage industries to invest in advanced technologies and innovation to enhance productivity and competitiveness.

2. Skills Development: - Implement programs to up skill the workforce, ensuring they have the necessary knowledge and capabilities to drive productivity improvements.

3. Infrastructure Development: - Invest in infrastructure development to support efficient production processes and supply chain management.

4. Regulatory Reforms: - Streamline regulatory processes to reduce compliance burdens and encourage business growth and innovation.

5. Industry Collaboration: - Facilitate collaboration between industry stakeholders, research institutions, and government agencies to foster knowledge sharing and innovation diffusion.

6. Export Promotion: - Support industries with export promotion initiatives to expand market access and drive economic growth through increased exports.

7. Monitoring and Evaluation: - Establish mechanisms for ongoing monitoring and evaluation of productivity initiatives to ensure effectiveness and facilitate continuous improvement. By

implementing these policies and measures, policymakers can address productivity challenges effectively, leading to sustained economic growth and competitiveness in the global marketplace.

Conclusion:

The analysis highlights the complexity of productivity dynamics within different industries. While some industries show positive productivity growth, many others face challenges, including declines or stagnant growth. This productivity growth also exhibit diverse trends, reflecting the varied conditions across industries. Among the two digit industries, a large number of industries have expressed the negative coefficient with insignificant growth trend during the whole periods whereas during the first sub-periods, it is significant declined with negative coefficient. Moreover, the trend of productivity growth is mixture during second sub-periods. In the context of use-based and input-based industries, majority of the industries have significantly declined with positive coefficient during the sub-periods and whole periods. Addressing productivity challenges requires targeted policies and interventions subjected to the specific needs of each sector, including measures to enhance technological adoption, improve skills training, and streamline regulatory processes.

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Appendix

For calculating Total Factor Productivity Growth, Translog index method has been used as outlined in the following expression:

Log V (T) - Log V (T-1) = Vk [Log K (T) - log K (T-1)] + Vl [Log L (T) – Log (T-1)] + g

Where $Vk = \frac{1}{2} [Vk(T) + Vk (T-1)]$

$Vl = \frac{1}{2} [Vl(T) + Vl(T-1]$

Vk and Vl are the income share of factors such as capital and labour respectively:

$g = \frac{1}{2}\frac{1}{2} [g (T) + g(T-1)],$

The above expression for the average rate of technical change 'g' referred to as the Translog Index of technical change.

National Industrial Classification (NIC)-2008
2-DIGIT CLASSIFICATION

Industry Code	Industry Description
01	Crop and Animal production, hunting and related services activities
08	Other Manufacturing
10	Manufacturing of Food Products
11	Manufacturing of Beverages
12	Manufacturing of Tobacco products
13	Manufacturing of Textiles
14	Manufacturing of Wearing Apparel
15	Manufacturing of Leather and Related Products

16	Manufacturing of Wood and of Product of Wood and cork except Furniture; manufacture of articles of Straw and Planting Materials
17	Manufacturing of Paper and Paper products
18	Manufacturing of Printing and Reproduction of Recorded Media (This Division exclude Publishing Activities)
19	Manufacturing of coke and Refined Petroleum products
20	Manufacturing of Chemical and Chemical Products
21	Manufacturing of Pharmaceutical, Medical Chemical and Botanical Products
22	Manufacturing of Rubber and Paper Products
23	Manufacturing of Other Non-metallic Mineral Products
24	Manufacturing of Basic Metal
25	Manufacturing of Fabricated Metal Products, Except Machinery And Equipment
26	Manufacturing of Computer, Electronic and Optical Products
27	Manufacturing of Electrical Equipment
28	Manufacturing of Machinery and Equipment (NEC)
29	Manufacturing of Motor Vehicles, Trailers and Semi-Trailers
30	Other Transport Equipment
31	Manufacturing of Furniture
32	Other Manufacturing

USE-BASED AND INPUT-BASED CLASSIFICATION OF THE INDUSTRIES

USE-BASED CLASSIFICATION

1. Basic Goods Industries

Industry Code	Industries Description
201	Manufacture of basic chemicals, fertilizer and nitrogen compounds,

	Plastics and synthetic rubber in primary forms
2395	**Manufacture of articles of concrete, cement and plaster**
241	**Manufacturing of Basic Iron and Steel Industries**
242	**Manufacturing of Precious and other Non-Ferrous metal**

2. Intermediates Goods Industries

Industry Code	Industries Description
131	**Spinning, Weaving and Finishing of Textiles**
139	**Manufacturing of Other Textiles**
162	**Manufacturing of Wood, Cork, Straw and Planting material**
1701	**Manufacturing of Pulp, Paper and Paperboard**
1512	**Manufacture of luggage, handbags and the like, saddlery and Harness**
1920	**Refined Petroleum Products**
2211	**Manufacturing of Rubber types and Tubes: Retreading and Rebuilding of Rubber Tyres**
2219	**Manufacturing of Other Rubber Products**
2022	**Paints, Varnishes and Similar Coating, Printing ink and Fibres**
2030	**Man Made Fibres**
2029	**Other Chemical Products**
2399	**Non-Metallic Mineral Products (NEC)**
2392	**Manufacturing of Clay Building material**
2720	**Manufacturing of Battery and Accumulators**

3. Capital Goods Industries

Industry Code	Industries Description
2513	**Manufacturing of Steam generators, except central hot water Boilers**
2593	**Manufacturing of Cutlery, hand tools and general hardware**

2821	**Manufacturing of Agricultural and Forestry Machinery**
2825	**Manufacturing of Machinery for Food, Beverages and Tobacco Processing**
2829	**Manufacturing of Other Special Purpose machinery**
2710	**Manufacturing of Electronic motors, generator, transformers and Electricity distribution and control apparatus**
2732	**Manufacturing of other Electronic and Electric wires and Cables**
2790	**Manufacturing of Other Electrical Equipment**
301	**Manufacturing of Building of Ships and Boats**
302	**Manufacturing of Railway locomotive and Rolling Stock**
3099	**Manufacturing of other Transport Equipment (NEC)**

4. Consumer Goods Industries

(1) Consumer Durable Goods Industries (CD)

Industry Code	Industry Description
3100	**Manufacturing of Furniture**
2817	**Manufacturing of Office Manufacturing and Equipment**
2750	**Manufacturing of Domestic Appliances**
291	**Manufacturing of Motor Vehicles**
3091	**Manufacturing of Motor Cycles**
3211	**Manufacturing of Jewellery and related articles**

(2) Consumer Non-Durable Goods Industries (CND)

Industry Code	Industry Description
10	**Manufacturing of Food Products**
11	**Manufacturing of Beverages**
12	**Manufacturing of Tobacco Products**
1399	**Manufacturing of Other textile (NEC)**

1520	Manufacturing of Footwear
1410	Manufacturing of Wearing Apparel, except fur Apparel
170	Manufacturing of Paper and Paper products except news print
1811	Printing
581	Publishing of Books, periodicals and other Publishing Activities
2211	Manufacturing of Rubber types and tubes; Retreading and Rebuilding of Rubber tyres
2023	Manufacturing of Soap and Detergents, cleaning and polishing Preparation, perfume and toilet preparation
231	Manufacturing of Glass and Glass Products

INPUT-BASED CLASSIFICATION

1. Agro-Based Classification

Industry Code	Industry Description
10	Manufacturing of Food Products
11	Manufacturing of Beverages
12	Manufacturing of Tobacco Products
13	Manufacturing of Textiles
14	Manufacturing Wearing Apparel
162	Manufacturing of Products of Wood, Cork, Straw and Planting Material
151	Tanning and dressing of leather: Manufacturing of Luggage, Handbags, saddlery and harness: dressing and dyeing of fur
221	Manufacturing of Rubber Products

2. Metal-Based Classification

Industry Code	Industry Description
24	Manufacturing of Basic Metal
2710	Manufacturing of Electronic

30	**Manufacturing of Other Transport Equipment**
2652	**Manufacturing of Watch**
325	**Manufacturing of medical and dental instruments and supplies**
329	**other Manufacturing (NEC)**

3. Chemical-Based Classification

Industry Code	Industry Description
20	**Manufacturing of chemical and chemical products**
192	**Manufacturing of refined petroleum products**
2720	**Manufacturing of batteries and Accumulates**

NOTE:

NEC: Not Elsewhere Classified

Overview of Industries: At a glance.