

2019

IARIW-HSE

Special IARIW-HSE Conference “Experiences and Future Challenges in Measuring Income and Wealth in CIS Countries and Eastern Europe” Moscow, Russia, September 17-18, 2019

Growth and Productivity in Post Socialist Regimes: An India-Russia Comparison

Abdul Azeez Erumban
Deb Kusum Das
Pilu Chandra Das

Paper Prepared for the IARIW-HSE Conference
Moscow, Russia, September 17-18, 2019
Session 4A: Economic Growth and Productivity Growth
Time: 16:00 – 18:00, September 17

Growth and Productivity in Post Socialist Regimes: An India-Russia comparison

Abdul Azeez Erumban
The Conference Board
&
University of Groningen
Groningen

Deb Kusum Das
Ramjas College
University of Delhi
Delhi

Pilu Chandra Das
Kidderpore College
Kolkata University
Kolkata

Abstract

The onset of globalization in the 1990s coincided with the shift in India and Russia from central planning based growth to trade-driven market economies, therefore a comparison between India and Russia after their respective integration with the world economy offers important insights in the context of comparative growth dynamics as the two economies started with closed economy regime where growth was based on socialist model of development. The paper examines the sources of economic growth and the role of productivity in accounting for the observed growth. Using the KLEMS dataset compiled for both India and Russia, the paper examines the period of 1995-2015 – 20 years since the advent of reforms and global integration of these economies. The KLEMS productivity dataset offers a new way of analyzing the dynamics of growth including the sources of growth in both Russia and India. The ‘Jorgenson et al (1987) growth accounting methodology is used to analyze the sources of growth both at the aggregate economy as well as disaggregated Industry sectors for both Russia and India. Our focus in the paper is on industry level perspective and we hope to trace the sources of growth- both real GDP and LP as well as the industry contribution to the overall growth and LP growth. An industry level perspective allows a better understanding of the growth dynamics specially to understand the drivers of growth in both India and Russia so as to offer possibilities of economic cooperation and trade between the two economies.

JEL classification-D24; P2; P52

Key words- Labor productivity, Sources of Labor Productivity and TFP growth.

AUGUST 2019

Paper prepared for the Special IARIW- HSE conference on “Experiences and Challenges in Measuring Income and Wealth in Eastern Europe and CIS countries,” Moscow, September 17-19, 2019. The authors thank Ilya B. Voskoboynikov for sharing the RUSSIA KLEMS dataset. The INDIA KLEMS dataset used in this paper is part research project “Disaggregated Industry Level Productivity Analysis for India: The KLEMS Approach” at Centre for Development Economics, Delhi, funded by the Reserve Bank of India. Deb Kusum Das would like to thank IARIW for travel and other support for attending the conference. The usual disclaimers apply. For correspondence, dkd_ramjas@yahoo.com

1. Introduction

The period since the end of 1970s saw the difference in policy orientations among developing countries, leading to a substantial debate on appropriate development strategies. The advent of 1990s saw the world order changing from closed economies to more open economies with large scale domestic and trade reforms. Two countries in particular, Russia and India stand out, as both underwent massive changes in economic policies by transforming from central planning-based growth to trade-driven market economies. Russia, India along with the rise of China can be labeled as the major economic events of the 1980s and 1990s and are posed as the engine of growth for the global economy, through the growth trajectory of these economies remain different in terms of “*rapidness as well as sustainability of growth process*. Achieving high levels of multifactor productivity (hereafter MFP) have often been a crucial determinant of the observed growth process in these economies. Therefore, for any effective comparison of economic growth, an examination of whether the changes in economic structure have led to substantial improvements in productivity assume importance as this allows us to better understand the convergence toward the income and productivity levels of the industrial countries.

India underwent changes in economic policies in 1991 after more than four decades of inward-looking socialist model of development based on state as the engine of growth and resources to be allocated via a central planning system. The departure from the Nehruvian development agenda of heavy industries-based industrialization keeping in mind the import substitution-based development aspirations began towards the end of 1970s due to a series of domestic economic events together with external circumstances¹. The period of 1980s saw sporadic reforms in place especially for external sector and industrial de regulations. The major overhauling began in 1991 with a paradigm shift from an import substitution based closed economy to an open economy with sharp decline in levels of tariff and other protectionist measures. Several economists have analyzed the period of 1950s to 1991 [Srinivasan (2011), Tendulkar and Srinivasan (2003), Joshi and Little (1998) amongst others] and have reviewed the policies and performances of the Indian economy since 1950s. It is well known that India is now more than two decades into economic reforms (1991-2015). Further reforms have encompassed all segments of Indian economy including manufacturing and services and India's GDP growth has increased consistently since the mid-1990s averaging from 6 to 7 percent, and even reaching 9 to 10 percent in some years in the mid-2000s. Furthermore, it is now widely accepted that India witnessed a slowdown in GDP growth since 2008 after almost a decade of consistent high growth (2003-2008).

The Russian economy witnessed a period of evolution by moving away from being a centrally planned economy towards a more market based and globally integrated economy.² The immediate

¹ The end of the 1970s is significant as the government instituted several committees to examine crucial aspects of development planning (foreign trade sector, industrial regulation and prices etc). The setting up of these committees reflects the attitude of the government that economic policies in place need examination in the context of the observed economic growth which remained low and stagnant for much of the period post 1964.

² In December 1991 the Soviet Union disintegrated and its largest constituent republic, Russia, emerged as an independent state. The political leadership of newly independent Russia embarked on an effort to replace its state socialist system, based on state ownership of enterprises and central planning, by a capitalist market system, based on private property and a market system of coordination (KOTZ 1999)

post USSR period saw sharp decline in the economic performance of the Russian economy both in terms of GDP and other indicators (Cooper, W 2009). The economy recovered since 1999 and growth was mainly driven by improvements in efficiency of input usage as observed by multifactor productivity growth estimates. The Russian MFP growth of around 5 percent for the period 1995-2008 is considered to be highest in the world (Jorgenson and Vu 2011). As a source of economic growth in Russia, it is also important to keep in mind an associated claim of the role of tradable natural resources particularly natural gas and oil in the observed Russian growth. Recent studies report the productivity slowdown after 2008 (Timmer & Voskoboynikov, 2016; World Bank, 2017).

Against the backdrop of the global economic slowdown and internal growth dynamics in both India and Russia, a comparison of the sources of growth in the post socialist regimes offers important insights in the context of comparative growth dynamics as the two economies started with closed economy regime where growth was based on socialist model of development and transitioned to market driven growth. Given the context, the paper examines the sources of economic growth and the role of productivity in accounting for the observed growth. Using the KLEMS dataset compiled for both India and Russia, the paper examines the period of 1995-2015 – 20 years since the advent of reforms and global integration of these economies. The paper offers many important firsts namely – (1) this is the first study of productivity comparison at detailed industry level comparing both India and Russia for the period which covers both post global integration of the 1990s and also the world economic slowdown of the 2008. (2) The study uses The KLEMS productivity dataset which offers a new way of analyzing the dynamics of growth including the sources of growth in both Russia and India. Both the INDIA KLEMS as well as RUSSIA KLEMS datasets have been curated to arrive at a set of comparable sectors/industries. (3) The 'Jorgenson et al (1987) growth accounting methodology is used to analyze the sources of growth both at the aggregate economy as well as disaggregated industry sectors for both Russia and India. Our focus in the paper is on industry level perspective and we hope to trace the sources of growth- both real GDP and LP as well as the industry contribution to the overall growth and LP growth. (4) An industry level perspective allows a better understanding of the growth dynamics specially to understand the drivers of growth in both India and Russia so as to offer possibilities of economic cooperation and trade between the two economies

The paper is structured as follows. Section 2 undertakes a review of literature covering the growth aspects of both India and Russia. The KLEMS dataset for both Russia and India is discussed along with an outline of the methodology in section 3. A comparison of sources of growth is undertaken for Russia and India with respect to GDP and labor productivity in section 4. The final section concludes the paper.

2. Review of Literature

International comparison of growth across the globe provides an examination into the observed diverse nature of growth. There could be several reasons as to why patterns of growth differ across developing countries as well as industrialized regions. Further, when we add the similarities of development paths followed this becomes even more significant from the perspectives of growth. Therefore, a comparison of economic performance especially what causes long run growth to differ amongst a set of set of countries related via economic policies, development agenda and even size attains importance. The examples of (1) why Europe lagged behind American productivity resurgence in 1990s (Timmer et al 2010), (2) Lessons from Economic Transition in China and Russia (Kotz 2000) and (3) China and India: The Pattern of Recent in a Comparative Political Economy

Perspective (Bardhan 2014) offer important insights into the comparative growth performance of major economies of the world. In the following paragraphs, we review some of the major studies that have attempted to understand the comparative growth perspectives. There are several challenges that need to be overcome in order to understand the diverse growth scenario and one of them is of having comparable datasets. The advent of the KLEMS initiative across the world offers to bridge this gap by building detailed productivity datasets which allow comparative studies relating to productivity as a determinant of observed long run growth. These datasets provide a new framework for analyzing sources of economic growth at both industry as well as economy levels for countries around the world including emerging economies like Russia, India, China and Brazil amongst others. Using these datasets several country studies have been compiled covering large time periods (Jorgenson et al 2016, Das 2018).

There are also several studies which compare growth and productivity across countries, the notable ones being (1) US-Japan economic growth comparison- 1952-74 (Jorgenson and Nishimizu 1978), (2) Japan-US productivity comparison-1960-1979 (Jorgenson et al 1987), (3) Productivity and International Competitiveness in Japan and US- 1960-1985, (Jorgenson and Kuroda 1991), (4) Economic Growth: An International Comparison 1947-1973, (Christenson, Cummings and Jorgenson 1980), (5) Relative Productivity level comparison -1947-1973 (Christenson, Cummings and Jorgenson 1980), (6) Sectoral productivity Gaps between US, Japan and Germany, 1960-1979 (Conrad and Jorgenson, 1984), (7) Assessing Japan's industrial competitiveness by international productivity level comparison with China, Korea, Taiwan and US (Motohashi 2007). While the emphasis in majority of the studies have been a US-JAPAN comparison, and have been steered through rich productivity datasets available for both US and Japan much before the advent of the KLEMS initiative. One of the important findings of such studies which mainly centered on US-Japan growth comparison shows that both US and Japan had substantial as well as rapid economic growth. Capital was by far the most important source of economic growth in both countries accounting for 40 percent of US growth and around 60 percent of Japanese growth. The growth of capital remained significant source of economic growth but productivity growth at the sectoral level was rather low. As regards the other many country centric comparisons, one finds that variations in aggregate economic growth are associated with variations in real factor inputs. It was also found that very rapid growth in real product was associated with rapid growth of both real capital as well as labor input.

The research on comparative studies using KLEMS datasets is still in its early stage. A recent study using KLEMS datasets of both China and India observed that the two economies also experienced very different growth and productivity performances over sub-periods distinguished by special policy regimes and governing systems. While both countries appeared to enjoy their best performances in the 2002-2007 period following China's WTO entry, China faltered much more in terms of total factor productivity growth in the wake of the global financial crisis. (See Harry Wu et al 2017). In addition, there are studies for both India and Russia using KLEMS dataset. Goldar et al (2017) documented and analyzed the productivity patterns in the Indian economy for the period 1980 to 2015 employing the KLEMS dataset. The following are the observations. (1) the trend growth rate of aggregate value added during the 35-year period was 6.1 % per annum- The growth accelerated from 5.1% for the period 1980-93 to around 5.8 % (1993-2002) and more recently to 7.5 % in 2003-04. (2) There were structural changes also as the share of agriculture in value added declined from 37% to 13% in 2004 and the share of market services increased to 44% from 20% during the same period (1980-2014). (3) multi factor productivity remained of the order of 1.2 % as against the 6.2% GVA growth. (4) Capital deepening was the major factor in the observed growth of the economy.

For Russia, two important papers – Timmer and Voskoboynikov (2016) and Voskoboynikov (2018) analyze the Russia MFP growth since mid 1990s. In the first paper, the authors, using KLEMS dataset analyze the drivers of Russian growth at detailed industry level. They observe that using improved measures especially on input side, since 1995 Russian growth is as much driven by input as MFP. Second the slow productivity growth to a limited set of industries limited to mining and retail sectors. Intensive growth was seen in manufacturing sector but the share in GDP declined. The Russian low technology sectors suffered from competition from ASIA where as the high technology intensive manufacturing suffered from high quality imported products. In the second paper, the author examines three aspects of Russia since 1995- The natural gas sector, informality and catching up. 3 aspects are discussed in details- (A) the productivity gains from shift to a more balanced industrial structure are more the higher, is the inter-sectoral productivity gaps? (B) structural changes shift these economies towards services and (C) the influence of labor reallocation to productivity performance can be sensitive to the expansion of the informal sector. An important finding relates to the question of labor reallocation, Strong labor reallocation to informality makes Russian case similar to India and influences aggregate labor productivity growth negatively³. In a related study Voskoboynikov (2017), observed that MFP slowdown started in Russia a few years before the crisis, as in other major global economies, such as OECD countries, China and Brazil. The following points are in order- (1) the Russia demonstrated relatively stable capital deepening makes the Russian pattern similar to resource abundant Australia and Canada. (2) The contribution of information and communication capital to labour productivity growth in Russia after 2008 declined, which could have hampered technology diffusion and (3) The structure of the flow of capital services in Russia changed after 2008. Before the crisis the contribution of machinery and equipment dominated, while after the crisis construction provided the most capital inputs.

Over all studies covering Russia and India throw some important insights, which call for detailed comparative perspective on growth and its sources in these two economies. Russia faced economic downturn following the dissolution of USSR and therefore the economic recovery backed by MFP growth has been remarkable. This was concentrated in the service industries which were underdeveloped under central planning. In case of India, out of the five broad sectors – Agriculture, industry, manufacturing, market and non market sectors, the non market services achieved the highest rate of TFP growth of 1.1. percent per annum during the period 1980-2015. Market services and manufacturing performed the best only in the period post 2002.

3. Methodology and Datasets – India and Russia KLEMS

This section describes the methodologies and dataset used in estimating labour productivity and total factor productivity at disaggregate industries level, broad sectors level as well as aggregate economy level. First, we construct a concordance table between India KLEMS Dataset and Russia KLEMS Dataset to arrive at a comparable 27 disaggregate industries. Then we appropriately aggregated these 27 industries to obtain estimates at broad sector level (Agriculture, Industry including utilities, services) as well as aggregate economy level. Our measurement of TFP growth for different industries of the Indian economy is based on a value-added production function for each industry *i*:

$$Y_i = f_i(K_i, L_i, A_i) \quad (1)$$

Y is industry gross value added, L is no of employment, K is capital service and A is an indicator of technology. Under the assumptions of constant returns to scale and competitive markets, the growth of output can be decomposed into contributions from capital, labour and total factor productivity growth (v^A) as

$$\Delta \ln Y_i = \bar{v}_i^K \Delta \ln K_i + \bar{v}_i^L \Delta \ln L_i + v^A_i \quad (2)$$

where \bar{v}_i^K , \bar{v}_i^L are the two period average shares of capital, labour in the nominal gross value added.

Labour productivity has been computed by the difference of growth rate of gross value added and growth rate of persons employed by UPSS. We defined labour productivity as gross value added per person employed (N). So $LP_i = \frac{Y_i}{N_i}$ and let be $k_i = \frac{K_i}{N_i}$ capital intensity or capital input per person.

Similar to value added growth we can also decompose labour productivity growth.

$$\Delta \ln LP_i = (\bar{v}_i^K \Delta \ln k_i + v^A_i) \quad (3)$$

The contribution to labour productivity growth comes from two sources: namely capital deepening where more or better capital makes labour more productive and from TFP growth which contributes to labour productivity point-for point.

Aggregate economy growth is computed as the sum of sectoral growth rates weighted using their nominal share. Using a Tornqvist index and defining aggregate economy value added growth as $\Delta \ln Y = \sum_i \bar{v}_i^y \Delta \ln Y_i$, where $\Delta \ln Y$ is the aggregate economy value added growth rate, \bar{v}_i^y is the nominal share of industry i in aggregate economy value added (averaged over current and previous years).

The data used in the empirical analysis of this study for India is **the India KLEMS dataset version 2018**.

⁴India KLEMS dataset version 2018 provided time series data onwards 1980-81 up to 2016-17 for 27 industries across all sectors of the economy. However, this study covers the period between 1995-96 and 2014-15. India KLEMS dataset version 2018 provided time series data for Gross Value Added (GVA), Gross Value of Output (GVO), no of Employments (L), Labour Quality (LQ), Capital Stock & Services (KS), Energy (E), Material (M), Services (S), income shares in value added & gross output and Total Factor Productivity Growth (TFPG) rate. The database has been constructed on the basis of data compiled from CSO, NSSO, ASI, Input-Output tables (I-O tables) and processed according to appropriate procedures. This paper obtained industry wise data on Gross Value Added at current prices and at 2011-12 prices, Capital Service Input, number of Employees and Labour Income Share. GVA of a sector is defined as the value of output less the value of its intermediary inputs. The National Accounts Statistics (NAS) brought out by the CSO (Central Statistics Office, Government of India) is the basic source of data for the construction of series on gross value added for INDIA KLEMS-industries. NAS provides estimates of GVA at a disaggregate industry level at both current and constant prices. NAS estimates of value added for a few industry groups are at a more aggregate level, requiring the splitting of the aggregates using additional information from ASI and NSSO unorganized manufacturing data. For this paper labour input is measured by number of persons engaged. The large-scale Employment and Unemployment Surveys (EUS) by National Sample Survey Organization (NSSO) and the estimated population series based on the decennial population census

⁴ India KLEMS Data Manual 2018 provides detailed description on the construction of each variable used in India KLESM dataset.

are the main data sources for estimating the workforce by industry groups, as per the National Industrial Classification (NIC). The other data sources on employment are Economic Survey (for public enterprises), Annual Survey of Industries (ASI for organized manufacturing Industries) and Labour Beureu Surveys (available since 2009-10). For the measurement of capital services, we need capital stock estimates for detailed asset types and the shares of each of these assets in total capital remuneration. Using the Törnqvist approximation to the continuous Divisia index under the assumption of instantaneous adjustability of capital, aggregate capital services growth rate is derived as a weighted growth rate of individual capital assets, the weights being the compensation shares of each asset.

The data used to estimate the labor and total factor productivity for Russia obtained from **the Russia KLEMS dataset**, released in March 2017. It provided time series data onward 1995-96 up to 2014-15 for 34 disaggregated industries. For this paper we combined some industries (sub-industries of Textiles, Textile Products, Leather and Footwear - 17t18 and 19; Transport and Communications - 60, 61, 62 and 63; Trade - 50, 51, and 52; Other Services - 70 and O) to get 27 industries comparable to India KLEMS industries. **Russia KLEMS 2017** provided time series data for value added, number of employed persons, capital services, labour and capital shares. Onward 2003, National Accounts (Russia) provided gross value-added data at detailed industrial level according to new industrial classification. Prior to 2003, GVA at current and constant prices for disaggregated 34 industries obtained by making appropriate adjustment according to concordance between new and old industrial classification.⁵ Employment is measured as number of jobs in the full-time equivalent (FTE jobs). Series of FTE jobs in one-digit industries of the Russian economy are available from 2003 in the Balance of Labour Inputs (BLI) and extended back to 1995 with growth rates of labour from Balance of Labour Force (BLF) and broken down to the level of 34 industries. Measurement of capital input is based on the assumption that the flow of capital services from each asset type is proportional to the average of the stock available at the end of the current and the prior period.

4. Comparing sources of Growth in Russia and India

4.1 Contributions of employment and labor productivity to value added growth in broad sectors of the economy

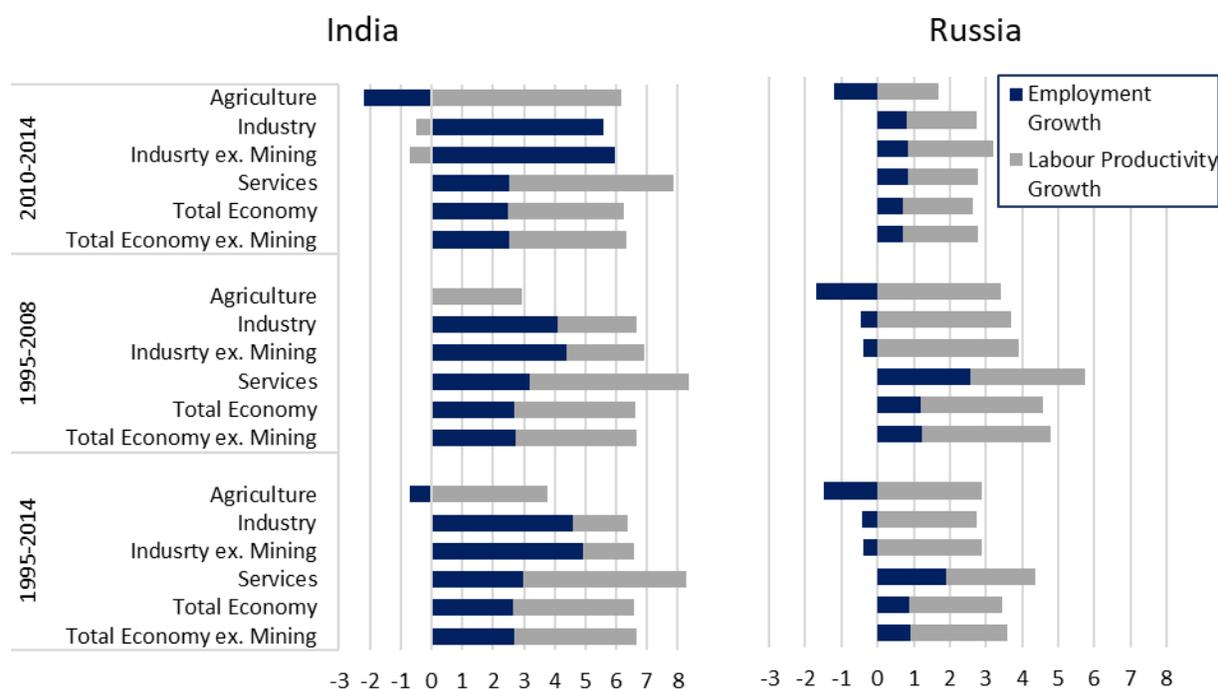
GDP growth can be decomposed into growth in labor productivity (value added per worker) and growth in employment. Such a decomposition is insightful in understanding whether the economy is growing by adding more jobs, or by improving worker productivity. The latter can be improved either by enhancing the amount of capital (machines, buildings, etc.) with which workers work or by enhancing the worker skills or through higher total factor productivity (See Erumban and van Ark, 2018). In this section, we first look at the role of labor productivity versus employment in driving economic growth in India and Russia, and subsequently, the role of capital deepening, worker skills, and TFP in driving labor productivity growth.

In Figure 1, we depict the growth rate of value added, decomposed into employment and labor productivity growth, in three broad sectors of the economy, agriculture, industry, and services in India and Russia. Given the high importance of the mining sector in the Russian economy, to make a meaningful comparison with the Indian economy, we also examine the industry and total economy,

⁵ For details see Voskoboynikov (2012)

excluding the mining sector.⁶ This, however, does not wholly take away the impact of the mining sector on the economy. There could be several other sectors that might be relying on the mining sector, such as the petrochemical sectors and even a large part of trade activities. The data covers the period 1995-2014, divided into two sub-periods, 1995-2008 (pre-global financial crisis years) and 2010-2014 (post-crisis years).

Figure 1: Contribution of employment and labor productivity to value added growth, India and Russia 1995-2014



Notes: Growth rates are calculated as log differences, and therefore, the sum of employment and labor productivity growth adds to the log differences in value added.

Source: India KLEMS, Russia KLEMS

Given its lower income base, and larger catch-up potential,⁷ India's output growth has been higher than Russia, by almost three percentage points, varying from 2 percent difference in the first period and 3.6 percent in the second. Indian economy grew at an annual average rate of 6.7 percent (6.6 percent excluding mining) during the 1995-2014 period, whereas the Russian economy has seen a growth rate of 3.6 percent. Output growth in both countries has slowed in the post-crisis period,

⁶ In 2014, the mining sector constituted 10 percent of the total GDP in Russia, while it was as tiny as just above 2 percent in India.

⁷ Per capita income in Russia is currently close to half of the average income in the United States, whereas, in India, it is just above 10 percent. In other words, the average income of Indians is just below a quarter of the average income of Russian citizens, as of 2015. Indeed, India still has a larger catch-up potential, and India has been climbing up the income ladder much faster than Russia during the last two decades. India's per capita income levels relative to the US has increased from 5.5 percent in 1995 to 10.8 percent in 2015, whereas it went up from 34.4 percent in 1995 to 47 percent in 2015 in Russia (The Conference Board Total Economy Database, November 2018). This has helped India jump from 16 percent of Russian income levels to 23 percent.

compared to the pre-crisis years – from 6.7 percent to 6.3 percent in India, and from 4.8 percent to 2.8 percent in Russia.

In both periods, much of the growth in India emanated from the services sector, which grew at 8.3 percent in the first period, and 7.8 percent in the second. The services sector was the fastest growing sector in Russia also in the first period (5.7 percent) but has slowed substantially to 2.8 percent in the second period. The industrial sector in both countries has seen a decline in growth – from 6.7 percent to 5.1 percent in India and from 3.2 percent to 2.8 percent in Russia. Thus, while the highest difference in growth rates between India and Russia the first period was in the industrial sector, India excelled much larger output growth (more than five percentage difference) in services in the second period. India's agricultural sector has shown better output growth performance in the second period, compared to Russia. Agriculture in India improved from 3 percent to 4 percent, whereas in Russia it deteriorated from 1.7 percent to just half a percent.

Employment growth has been higher in all sectors in India than in Russia, with the highest positive difference being in the industrial sector. One exception to this was the agricultural sector in the second period, where employment contraction in India was much larger than in Russia. This may have to do with the lower level of development in India, and it's still continuing phase of structural transition from a subsistence, agricultural economy.

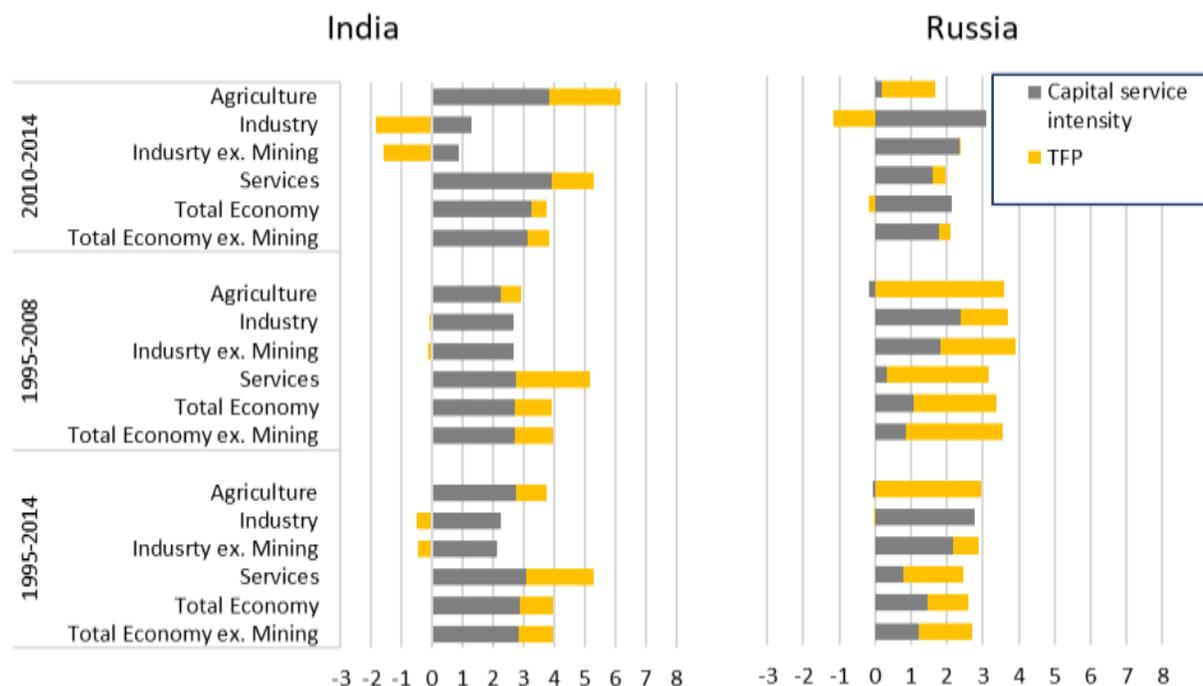
Looking at the relative roles of labor productivity and employment in driving growth, we see that, during the 1995-2008 period, 60 percent of GDP growth in the Indian economy was driven by improved productivity growth, be it the entire economy or the economy excluding the mining sector. In Russia, the role of productivity was quite higher than in India during this period, with 3/4th of Russian output growth being driven by labor productivity growth.

In India, the labor productivity shows a relatively higher role compared to job creation in the services sector, which has been a significant driver of recent economic growth in India (Verma 2012; Das et al 2016). In contrast, India's industrial sector has seen relatively lower productivity contribution, less than 40 percent of overall value-added growth. This is a notable contrast with Russia. Labor productivity contribution in the services sector was just above half of value-added growth, while in the industrial sector, where job growth has been negative, productivity was the main driver of growth. In both countries, the agricultural sector has seen contracting or stagnant job creation, thus leaving productivity the sole driver of output growth.

The story has not changed much in the post-crisis years, for the overall economy in both countries. However, there have been some changes across sectors. The services sector productivity contribution to its output growth has moved up in both countries, respectively from 62 percent of output growth to 68 percent in India, and from 55 percent to 70 percent in Russia. Thus, the services sector in India maintained an edge in labor productivity growth over Russia in both periods. The industrial sector in both countries had seen a setback, with the productivity loss being massive in India. In general, India's industrial sector has seen a lower productivity growth in both periods, but the negative difference was more pronounced in the post-crisis period. With negative labor productivity growth in the sector, almost entire output growth relied on job creation. In Russia, even though the relative contribution of productivity has declined compared to the previous period, more than 60 percent of output growth still emanated from improved worker productivity. In both countries, the agriculture sector continued to see job contraction and enhanced productivity growth.

4.2 Sources of labor productivity growth in broad sectors of the economy

Figure 2: Contribution of capital deepening and total factor productivity to labor productivity growth, India and Russia 1995-2014



Notes: Growth rates are calculated as log differences, and therefore, the sum of contributions from TFP and capital deepening adds to labor productivity growth

Source: India KLEMS, Russia KLEMS

In Figure 2, we further decompose the labor productivity growth (the gray bars in Figure 1) into contributions from capital services intensity (i.e., the growth rate of capital services per worker) and total factor productivity (TFP) growth in the broad sectors of the economy. TFP growth has slowed in the post-crisis period, in both India and Russia, but the magnitude of decline has been much more pronounced in Russia. While the aggregate economy TFP growth has slowed from 1.2 percent to 0.7 percent in India, it declined substantially from 2.7 percent to just 0.3 percent in Russia. The story remains unchanged even if we exclude mining economy from the total.

The size of the decline was somewhat comparable across the three broad sectors in Russia, whereas it ranged from 1.1 percent points in services to 1.7 points in the industry in India. India's agricultural sector is the only broad sector that has witnessed an improvement in TFP over the pre-crisis period. In general, for the entire period, the TFP growth rate in India has been lower than in Russia, except in the services sector. The difference has been pronounced in the agricultural sector. However, this is not true across both periods. While all the three sectors in India had lower TFP growth compared to Russia in the first period, with the highest difference being in agriculture followed by industry, both services and agriculture have shown higher productivity growth in India in the post-crisis years

The capital per worker has grown somewhat faster in the post-crisis period compared to the pre-crisis years across the three broad sectors of the economy in Russia. In contrast, its contribution has

declined in the industrial sector in India, while increased in the services and agricultural sectors. Except for industry in the second period, the contribution of capital deepening to labor productivity growth in India has also been relatively higher than in Russia. Highest differences in agriculture, where the potential for mechanization still exists in India, and it appears to be seeing more investment per worker, followed by the services sector.

In the first period, more than 2/3rds of labor productivity growth in India was due to increased use of capital per worker. This was less pronounced in services, where nearly half the labor productivity growth emanated from TFP. However, in industry, where TFP was negative in the first period, labor productivity growth was entirely driven by capital deepening. In Russia, on the contrary, only a quarter of growth came from increased capital deepening, whereas 3/4th was due to improved productivity. The role of productivity was even more visible in the Russian services sector, where it contributed nearly 90 percent of overall labor productivity growth. While the industry excluding mining had more than half the labor productivity growth coming from TFP, the role has been lower when mining has included. Capital deepening in agriculture contributed negatively in Russia, thus contributing TFP for the labor productivity growth.

In the second period, the role of capital has further elevated in India, to nearly 80 percent, with the relative importance of TFP declining the services sector significantly. Both the capital deepening and TFP has deteriorated in industry, while both improved in agriculture. In Russia, capital had higher relative importance in the second period.

4.3 Contributions of industry level employment and labor productivity to value added growth

In Table 1, we provide the detailed sectoral growth rates of value added in India and Russia for the period 1995-2014, and the two sub-periods, 1995-2008, and 2010-2014. Output growth has been higher in India in all sectors, except in wood & wood products, financial services, and other services sectors for the entire period. The largest differences have been in the growth rates of telecommunication services, where India had seen a massive growth rate of nearly 20 percent. Other sectors where India has had impressive growth compared to Russia include business services, education, transport equipment, public administration, and utilities, while differences were smaller in agriculture, mining, paper, food products, basic metals, and rubber & plastics sectors.

But the picture changed across the two periods. While India had higher growth in all sectors, except in wood, paper, finance, and other services in the first period, there have been many more sectors where India did worse than Russia in the post-crisis years. India fared worse in most manufacturing sectors, with the exceptions being food, textiles, paper, and petroleum. While in transport equipment, the growth rates were quite comparable, it was worse in all other manufacturing activities, with the most negative differences being in electrical equipment, non-metallic minerals, basic metals, and rubber & plastic sectors.

In terms of job creation, however, India had an edge in both periods in most sectors, except in utilities, trade and government services in the first period, and in agriculture, mining, textiles, wood, petroleum, and trade in the second period (Table 2). As mentioned earlier, the industrial sector in India has seen a substantial edge over Russia in terms of job creation. Looking at the detailed sectoral data, it appears that the construction sector has been a major driver of job growth within the industrial sector. While some of the traditional job-intensive sectors like textile, wood, and paper sectors have seen job contraction in the post-crisis period, it is also interesting to observe that investment goods producing sectors such as machinery, electrical equipment, and transport equipment have seen faster job growth in India. In Russia, post-crisis job growth has generally been

weak in the industrial sector, except in petroleum, basic metals, transport equipment, and construction. In the services sector, job creation in India was fairly high in business services in both periods.

Table 1: Value added growth rates in India and Russia, 1995-2014

	India			Russia		
	1995-2014	1995-2008	2010-2014	1995-2014	1995-2008	2010-2014
TOTAL ECONOMY	6.7	6.7	6.3	3.6	4.8	2.8
Agriculture	3.1	2.9	4.0	1.4	1.7	0.5
Industry	6.4	6.7	5.1	2.3	3.2	2.8
Mining	4.0	4.1	3.3	2.3	2.9	1.6
Food	5.1	6.0	4.6	3.3	4.3	1.6
Textiles	6.5	5.8	7.5	-0.3	-0.1	3.0
Wood	0.5	-0.8	3.0	1.9	2.9	4.7
Pulp & Paper	4.8	5.1	4.8	3.9	5.9	2.2
Petroleum	6.9	6.0	11.5	3.0	3.0	4.0
Chemicals	7.3	8.0	4.2	3.5	3.4	4.5
Rubber & Plastic	9.7	10.4	7.1	6.9	7.9	9.4
Non-Metallic Mineral	6.7	8.4	2.3	2.0	3.3	5.2
Basic Metals	5.3	4.9	3.4	2.9	3.7	5.5
Machinery	6.2	7.2	2.8	0.5	3.3	4.6
Electrical Equipment	8.6	11.1	1.4	3.6	5.7	5.7
Transport Equipment	8.0	5.5	9.1	0.9	0.7	9.0
Manufacturing, nec	7.5	7.8	6.9	2.2	2.2	7.2
Utilities	5.6	5.7	5.4	0.6	1.0	0.6
Construction	7.2	8.3	4.6	3.2	5.3	1.5
Services	8.3	8.3	7.8	4.4	5.7	2.8
Trade	7.9	8.0	7.8	4.9	6.7	2.7
Hotels & Restaurants	7.6	9.2	4.7	3.6	5.2	3.6
Transport & Storage	7.4	7.5	7.2	2.5	3.1	4.1
Telecommunication	18.3	19.7	12.8	6.0	7.6	2.7
Financial Services	10.4	10.4	10.5	10.7	12.3	8.2
Business Service	15.7	17.2	13.2	6.7	9.8	2.3
Public Administration	6.1	6.6	2.8	0.9	1.6	-0.7
Education	7.3	7.7	6.6	-0.3	0.0	-0.9
Health & Social Work	7.0	7.8	5.3	0.6	0.6	1.0
Other services	4.9	4.0	6.6	6.6	8.3	4.1

Source: India KLEMS, Russia KLEMS

These dynamics in output and employment growth boils down to a weaker labor productivity performance in most manufacturing sectors in India, compared to Russia. As is visible from Table 3, in particular, the investment goods sectors, machinery, electrical equipment, and transport

equipment sectors, along with rubber and plastic, non-metallic minerals and chemicals have all seen relatively lower productivity growth in the post-crisis period.

Table 2: Employment growth rates in India and Russia, 1995-2014

	India			Russia		
	1995-2014	1995-2008	2010-2014	1995-2014	1995-2008	2010-2014
TOTAL ECONOMY	2.7	2.7	2.5	0.9	1.2	0.7
Agriculture	-0.7	0.0	-2.2	-1.5	-1.7	-1.2
Industry	4.6	4.1	5.6	-0.4	-0.5	0.8
Mining	-0.1	0.0	-0.4	-0.3	-0.7	0.6
Food	1.1	1.0	1.2	0.2	0.7	-0.5
Textiles	0.8	1.9	-1.7	-4.6	-5.1	-1.6
Wood	-0.4	1.6	-4.6	-0.8	0.5	-1.7
Pulp & Paper	1.9	3.2	-1.0	0.4	1.8	-1.7
Petroleum	1.5	2.6	-2.5	-0.1	-1.1	3.2
Chemicals	0.9	1.1	0.6	-1.9	-1.9	-1.0
Rubber & Plastic	3.7	3.0	5.2	1.0	2.2	0.3
Non-Metallic Mineral	2.4	2.8	1.6	-2.0	-2.0	0.0
Basic Metals	2.7	2.7	2.8	-0.5	-0.4	1.1
Machinery	4.8	4.9	4.6	-3.6	-3.4	-1.6
Electrical Equipment	6.8	4.7	11.4	-2.0	-2.3	0.1
Transport Equipment	2.7	1.1	4.6	-1.1	-1.5	1.1
Manufacturing, nec	3.9	4.0	3.6	0.4	1.5	-0.3
Utilities	0.0	-1.1	1.7	1.2	1.7	-0.2
Construction	7.7	6.9	9.3	0.2	0.0	2.3
Services	3.0	3.2	2.5	1.9	2.6	0.8
Trade	2.4	3.1	1.0	3.7	5.0	1.7
Hotels & Restaurants	4.7	5.1	3.8	3.4	4.9	2.7
Transport & Storage	3.4	4.0	2.1	0.3	0.2	1.3
Telecommunication	3.3	5.6	-1.7	-0.2	0.9	-2.1
Financial Services	4.5	4.2	5.0	3.0	3.4	3.3
Business Service	9.7	10.2	8.6	0.4	-0.2	1.3
Public Administration	-0.1	-0.1	-0.2	3.3	4.8	-0.4
Education	4.1	4.7	2.8	-0.6	-0.4	-1.2
Health & Social Work	4.3	4.7	3.2	0.3	0.5	-0.1
Other services	2.6	2.3	3.3	0.7	0.9	0.8

Source: India KLEMS, Russia KLEMS

The construction sector, which has been exerting a large chunk of jobs released from the farm sector in India (see Erumban et al., 2019), have seen weak productivity growth. It is important to note that while no manufacturing industry had a negative labor productivity growth in Russia in both periods, India had severe contractions in machinery, electrical equipment sectors in the second period. And

the construction sector had negative productivity growth in both countries, but with a more pronounced decline in India. In the services sector, India maintained a higher productivity growth in all sectors in the second period, while it had a lower productivity growth in financial services, business services, and other services in the first period. No sector in India had negative productivity growth, while the government sector in Russia has seen negative productivity growth in both periods.

Table 3: Labor productivity growth rates in India and Russia, 1995-2014

	India			Russia		
	1995-2014	1995-2008	2010-2014	1995-2014	1995-2008	2010-2014
TOTAL ECONOMY	4.0	4.0	3.8	2.7	3.6	2.1
Agriculture	3.8	2.9	6.2	2.9	3.4	1.7
Industry	1.8	2.6	-0.5	2.7	3.7	1.9
Mining	4.1	4.1	3.7	2.5	3.6	1.0
Food	4.0	5.0	3.4	3.0	3.6	2.0
Textiles	5.8	3.9	9.2	4.3	5.0	4.5
Wood	0.9	-2.3	7.6	2.7	2.4	6.4
Pulp & Paper	2.9	1.8	5.8	3.5	4.2	3.8
Petroleum	5.4	3.4	14.1	3.1	4.1	0.7
Chemicals	6.4	6.9	3.6	5.4	5.3	5.5
Rubber & Plastic	6.0	7.4	1.9	5.8	5.8	9.1
Non-Metallic Mineral	4.3	5.6	0.7	4.0	5.3	5.2
Basic Metals	2.5	2.3	0.6	3.4	4.1	4.4
Machinery	1.4	2.3	-1.8	4.1	6.6	6.2
Electrical Equipment	1.8	6.4	-10.0	5.5	8.0	5.6
Transport Equipment	5.2	4.4	4.4	2.0	2.2	7.9
Manufacturing, nec	3.6	3.8	3.2	1.8	0.6	7.5
Utilities	5.6	6.8	3.7	-0.6	-0.7	0.7
Construction	-0.4	1.4	-4.7	3.0	5.4	-0.8
Services	5.3	5.2	5.3	2.5	3.2	1.9
Trade	5.5	4.9	6.8	1.1	1.7	1.0
Hotels & Restaurants	2.9	4.1	0.9	0.2	0.3	0.9
Transport & Storage	4.0	3.5	5.1	2.2	2.8	2.8
Telecommunication	15.0	14.1	14.4	6.2	6.7	4.8
Financial Services	6.0	6.2	5.5	7.7	8.9	4.9
Business Service	6.0	7.1	4.6	6.4	10.0	0.9
Public Administration	6.2	6.7	3.0	-2.4	-3.2	-0.3
Education	3.3	3.1	3.8	0.3	0.4	0.4
Health & Social Work	2.8	3.0	2.1	0.4	0.1	1.1
Other services	2.3	1.7	3.3	5.9	7.3	3.3

Notes: See Figure 1

Source: India KLEMS, Russia KLEMS

As we saw earlier, while the labor productivity growth in the overall economy and the services sector mostly held up in India over the two sub-periods, it did decline and turned negative in the industry. Looking at the detailed sectoral data, it appears that three key sectors that resulted in a negative labor productivity growth in the Indian industrial sector are electrical equipment, machinery, and construction. Besides, rubber and plastic, non-metallic minerals and chemicals sectors also have seen significant slowdowns in productivity growth in the post-crisis period.

Labor productivity growth declined in most sectors in Russia in the post-crisis period. Notable exceptions were transport equipment, wood products, rubber & plastics, other manufacturing, utilities, public administration, and health - in all these sectors productivity improved by a range of 1 to 7 percent. Three sectors - hotels & restaurants, chemicals, and transport services - did somewhat maintained their previous growth rates. Within the industrial sector, the biggest declines were in construction, electrical equipment, petroleum refining, and mining sectors. The decline in services was more prominent in business services, which lost nearly all its 10 percent productivity growth, followed by other services, and financial services.

With the improvement in several non-industrial segments in India, there were more industries with higher productivity growth compared to Russia in the second period. While some industries such as agriculture, textiles, wood, paper, petroleum, financial services, business services, and other services performed better than Russia in the second period, others including chemicals, rubber, non-metallic minerals, transport equipment, and other manufacturing have lost. More importantly, basic metals, machinery, and electrical equipment have worsened their relative productivity growth performance compared to Russia in the post-crisis period.

From our comparison of productivity growth across sectors, it is obvious that the productivity loss in the post-crisis period was more widespread in Russia than in India, and was also more pronounced. The cross-industry variation in productivity was quite comparable for the two countries in the first period - the standard deviation was about 3 in both cases. However, it was much more prominent in India in the second period, during which the standard deviation went up to 5 in India, and lowered to 2.8 in Russia.

4.4 Sources of industry labor productivity growth

In Table 4, we have the detailed industry results on the sources labor productivity growth in India and Russia for the two periods 1995-2008 and 2010-2014. Further, Figures 3a and 3b provide scatter plots of TFP growth, respectively in India and Russia. On the X-axis we have the TFP growth in industries for 1995-2008, against TFP growth in 2010-2014 on the Y-axis. Therefore, industries above the 90-degree line are those with higher productivity growth in the post-crisis years compared to the pre-crisis years.

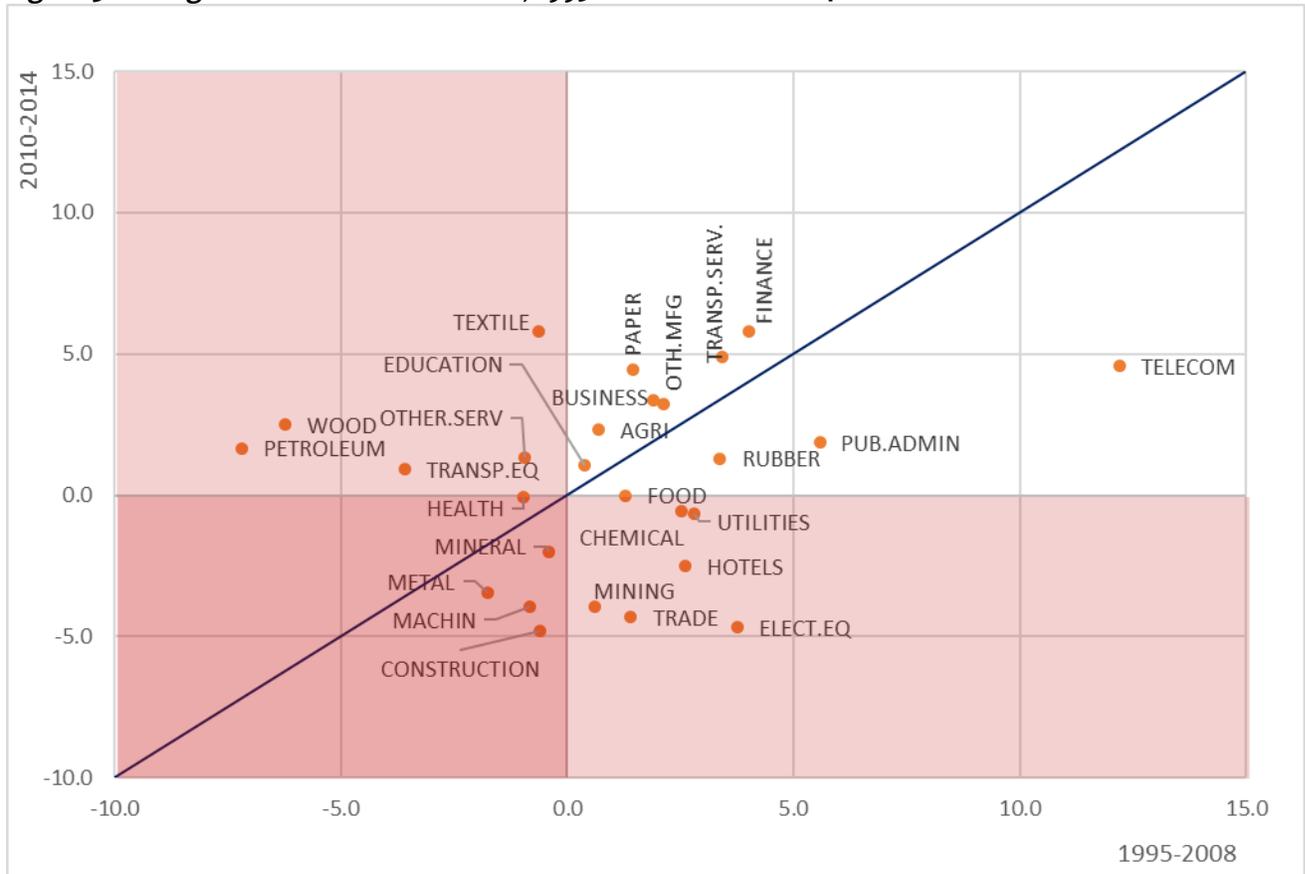
Table 4: Sources of industry level labor productivity growth rates in India and Russia, 1995-2014

	India						Russia					
	1995-2014		1995-2008		2010-2014		1995-2014		1995-2008		2010-2014	
	Capital	TFP	Capital	TFP	Capital	TFP	Capital	TFP	Capital	TFP	Capital	TFP
TOTAL ECONOMY	2.8	1.1	2.7	1.2	3.1	0.7	1.2	1.5	0.9	2.7	1.8	0.3
Agriculture	2.8	1.0	2.2	0.7	3.9	2.3	-0.1	3.0	-0.2	3.6	0.2	1.5
Industry	2.3	-0.5	2.7	-0.1	1.3	-1.8	2.8	0.0	2.4	1.3	3.1	-1.2
Mining	4.8	-0.7	3.5	0.6	7.7	-3.9	4.7	-2.2	4.7	-1.1	5.1	-4.1
Food	3.6	0.4	3.7	1.3	3.4	0.0	1.6	1.4	1.7	1.9	1.4	0.6
Textiles	4.3	1.5	4.5	-0.6	3.4	5.8	0.6	3.7	0.4	4.6	0.6	4.0
Wood	4.4	-3.5	3.9	-6.2	5.1	2.5	1.4	1.4	0.7	1.7	1.9	4.4
Pulp & Paper	0.7	2.1	0.4	1.5	1.3	4.5	0.8	2.7	0.4	3.7	1.2	2.6
Petroleum	11.0	-5.6	10.6	-7.2	12.4	1.7	7.8	-4.7	6.7	-2.7	9.0	-8.3
Chemicals	4.2	2.1	4.4	2.5	4.1	-0.6	1.8	3.6	1.1	4.2	2.9	2.5
Rubber & Plastic	3.1	2.9	4.0	3.4	0.6	1.3	0.1	5.7	-0.6	6.3	0.8	8.2
Non-Metallic Mineral	5.1	-0.8	6.0	-0.4	2.7	-2.0	2.0	2.0	1.9	3.4	1.2	4.0
Basic Metals	4.3	-1.7	4.0	-1.8	4.0	-3.4	1.6	1.9	1.7	2.4	0.1	4.3
Machinery	2.8	-1.4	3.1	-0.8	2.1	-3.9	1.2	2.9	1.1	5.5	1.1	5.1
Electrical Equipment	0.2	1.6	2.7	3.8	-5.3	-4.7	0.3	5.2	0.2	7.8	0.3	5.3
Transport Equipment	6.1	-0.9	8.0	-3.6	3.5	0.9	0.1	1.9	0.0	2.2	0.5	7.4
Manufacturing, nec	1.2	2.4	1.6	2.1	0.0	3.2	0.3	1.5	-0.2	0.8	0.9	6.6
Utilities	4.0	1.6	4.0	2.8	4.3	-0.6	1.7	-2.3	0.7	-1.4	3.9	-3.2
Construction	1.4	-1.8	2.0	-0.6	0.1	-4.8	1.1	2.0	1.4	4.0	-0.1	-0.7
Services	3.1	2.2	2.7	2.4	3.9	1.4	0.8	1.7	0.3	2.8	1.6	0.3
Trade	5.7	-0.2	3.5	1.4	11.1	-4.3	-0.2	1.3	-1.1	2.8	1.7	-0.8
Hotels & Restaurants	2.1	0.8	1.5	2.6	3.4	-2.5	-0.4	0.7	-1.1	1.4	0.4	0.5
Transport & Storage	0.2	3.7	0.0	3.4	0.2	4.9	2.0	0.2	1.4	1.4	2.8	0.0
Telecommunication	4.5	10.5	2.0	12.2	9.9	4.6	4.1	2.0	4.6	2.0	2.9	1.9
Financial Services	1.3	4.6	2.2	4.0	-0.3	5.8	1.1	6.6	0.2	8.8	2.5	2.4
Business Service	4.0	2.0	5.2	1.9	1.3	3.4	0.5	5.8	0.7	9.3	0.2	0.8
Public Administration	1.1	5.1	1.1	5.6	1.1	1.9	-0.3	-2.2	-0.5	-2.7	0.1	-0.4
Education	2.7	0.6	2.7	0.4	2.7	1.1	0.1	0.2	0.1	0.3	0.1	0.2
Health & Social Work	3.4	-0.7	4.0	-1.0	2.2	-0.1	0.4	0.0	0.5	-0.5	0.1	1.0
Other services	2.4	-0.2	2.6	-0.9	2.0	1.3	1.9	3.9	1.9	5.5	1.7	1.5

Notes: See Figure 2

Source: India KLEMS, Russia KLEMS

Figure 3a: TFP growth in Indian industries, 1995-2008 and 2010-2014



Notes: See Figure 1

Source: India KLEMS, Russia KLEMS

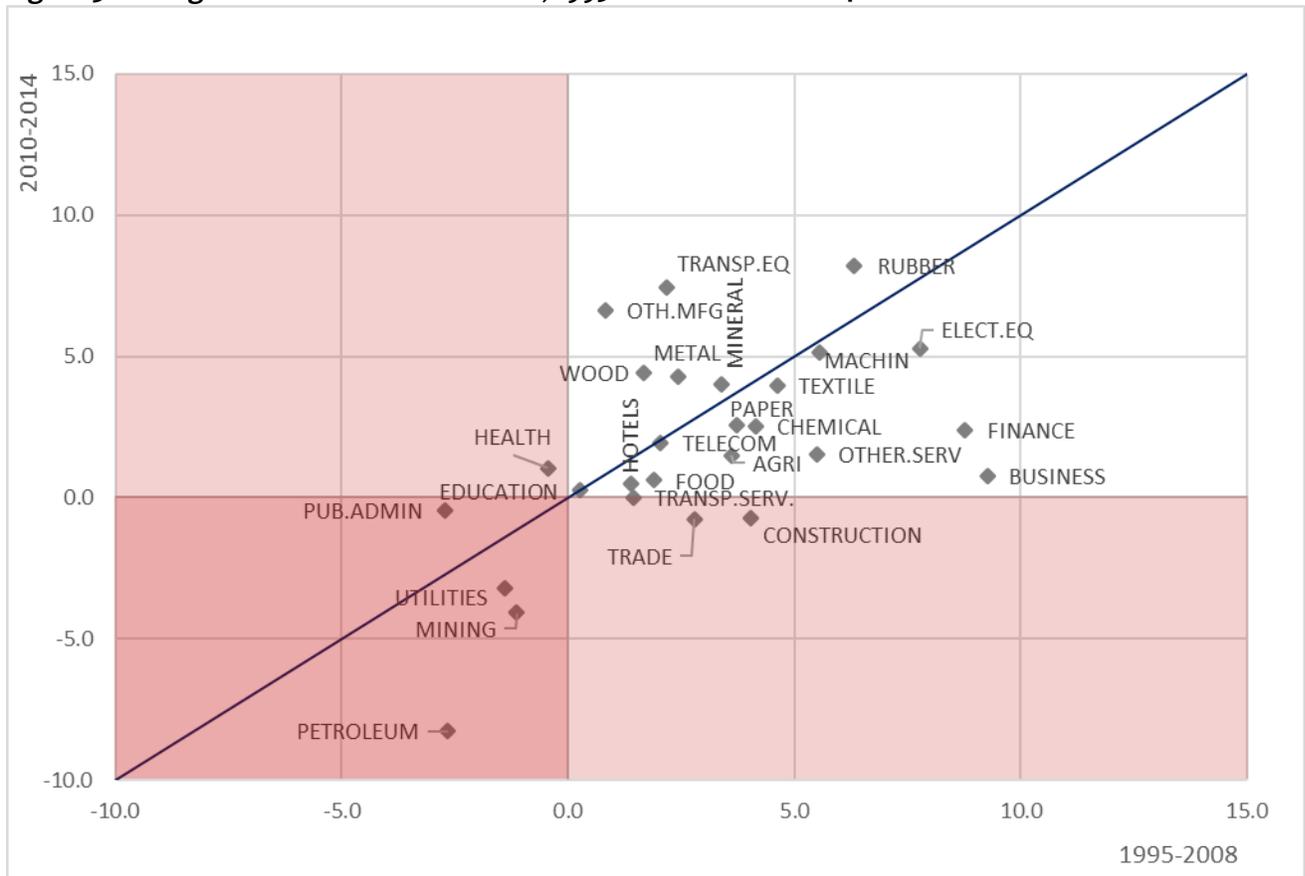
In India 13 of the 27 industries had a higher TFP growth in the post-crisis period, whereas in Russia only eight industries had the same. Clearly, there has been a productivity decline in a large number of industries in Russia. But that alone provides a misleading picture, because what is also clear from the figure is that India had negative TFP growth in 10 of 27 sectors in the first period, and in 11 in the second period. The upward movement in some of these sectors is nothing but an easing of the magnitude of productivity deceleration. At the same time in Russia, 20 of the 27 sectors had positive productivity growth in the first period, and 21 had in the second.

We see massive TFP loss in electrical equipment, hotels & restaurants, chemicals, and trade sectors in India in the post-crisis period, which did pretty well in the first period. Although TFP growth remained positive in telecom, public administration, rubber & plastic, and food manufacturing, they have also eroded over the previous period. Financial services, business services, other services, transport services, and pulp & paper products are among those with improving TFP growth in the second period. In the second period, TFP growth was highest in financial services, followed by textiles, transport & storage, telecom services, and paper products. Except in telecom, all other sectors have improved their productivity growth from the previous period as well.

In Russia, only eight sectors have seen a TFP growth uptick over the previous period, among which the prominent ones are: transport equipment, rubber & plastic, basic metals, and wood

manufacturing, and two non-market services sectors - government and health. In all other sectors productivity declined, with substantial declines in business services, financial services, other services, trade, construction, and electrical equipment. Regardless, TFPG remained impressive in rubber & plastics, transport equipment, other manufacturing, machinery, electrical equipment, wood products, textiles, while it was especially weak in petroleum, mining, and utilities.

Figure 3b: TFP growth in Russian industries, 1995-2008 and 2010-2014



Notes: See Figure 1

Source: India KLEMS, Russia KLEMS

Earlier we observed that, within the manufacturing sector, the capital goods-producing sectors machinery and electrical equipment had seen labor productivity erosion in both countries, while transport equipment has seen improvement, especially substantial increase in Russia. From our growth accounting results, it is evident that in the first two sectors, both countries also had notable TFPG decline, but a more prominent loss in India. In two of the important market services sectors, financial and business services, labor productivity growth declined in both countries - with a pronounced decline in Russia. But interestingly, India's decline was more due to capital deepening decline while its productivity growth has improved, whereas Russia has lost substantial TFP growth in these sectors.

5. Conclusion

India underwent changes in economic policies in 1991 after more than four decades of inward-looking socialist model of development based on state as the engine of growth and resources to be allocated via a central planning system. The emergence of Russia through the disintegration of USSR and the end of the Soviet Economic system in 1991 signals yet another change of economic policies in the 1990s. Against this backdrop, a study of the internal growth dynamics in both India and Russia, a comparison of the sources of growth in the post socialist regimes offers important insights in the context of comparative growth dynamics as the two economies started with closed economy regime where growth was based on socialist model of development and transited to market driven growth. Further, the onset of the global economic slowdown especially– the global financial crisis in 2008 strengthens the comparative evaluation as both economies having transited to market economies and in the process have completed more than two decades of economic transformation.

A second important consideration underlying the comparative aspect is the onset of the world KLEMS initiative which allows creation of individual country datasets on KLEMS based measure of MFP. The building of the datasets allows us to assess the world economy and its transformation to a New Global Order. An important outcome of this initiative is the datasets of Russia, India, China, Brazil etc which allow us to study the growth process and its sources at a disaggregate industry level. A previous study comparing China with India brought some very interesting findings regarding the MFP growth in that MFP growth was higher. The present exercise is an attempt to throw light on how growth and productivity performance has been in two post socialist countries- India and Russia.

The paper compared growth rates of output, employment, labor productivity, capital deepening and TFP between Russia and India over the period 1995-2014, divided into two sub-periods 1995-2008 (pre-global financial crisis) and 2010-2014 (post-crisis years). Output growth in India has been higher than in Russia in both periods, which is not unexpected, given that India has a larger potential for catch-up growth. For both countries, output, labor productivity, and job growth has declined over the two time periods, with the decline being more pronounced in Russia. The decline in labor productivity in both countries was driven by the decline in TFP, although there are differences across sectors in the relative importance of TFP and capital deepening.

In the pre-2008 years, the relative importance of labor productivity in driving value added growth was larger in India's services sector and Russia's industrial sector. But that had changed in the post-crisis period when industrial productivity in both countries had slowed, and the relative role of labor productivity in the services moved up.

The services sector, which had the highest share in overall GDP in both countries, has shown relatively faster output growth in both countries in the first period. But the sector has slowed in the post-crisis years in both the countries, with the slowdown being more pronounced in Russia. Labor productivity in the sector increased in India but was solely due to improved capital deepening. In contrast, in Russia, despite improved capital deepening heavy TFP loss has resulted in a decline in service sector labor productivity growth.

GDP growth also slowed in the industrial sector in both countries in the second period. This was accompanied by a decline in labor productivity growth in both countries, but a larger decline in India. While declines in both TFPG and capital deepening were responsible for the labor productivity growth decline in India, it was merely a decline in the TFPG that drove the productivity decline in

Russia's industrial sector. In general, the TFP setback for Russia has been larger than that for India in the post-crisis period.

Looking at the detailed sectoral data, we observe that the labor productivity growth has been negative in many manufacturing industries in India, while that was not the case in Russia, in either period. However, productivity decline in the post-crisis period as more widespread across industries in Russia. Job growth was faster in the second period compared to the previous period in India's construction sector. But also, investment goods-producing sectors have seen faster job growth in India. But these sectors are still relatively small in terms of overall jobs and output. At the same time, some of the labor-intensive sectors like textiles have lost the job momentum.

Our analysis of the sources of labor productivity, in terms of capital deepening and TFP, reveals that the TFP growth declined across sectors in both countries, except for India's agricultural sector, in the post-crisis years. The decline was more intense in Russia. In the pre-crisis years, Russia's TFP growth has been higher than in India in all broad sectors - agriculture, industry, and services. But in the post-crisis years, it has turned around with India faring better than Russia in services and agriculture. Two of the fast-growing sectors of India's service economy - business and finance sector - has seen an erosion in labor productivity growth, but driven largely by a decline in capital deepening, while its TFP growth has improved. In contrast, a massive decline in labor productivity in these sectors in Russia was driven by substantial erosion in TFPG in the post-2010 period.

The current paper is quite descriptive and sets the stage for further research that will focus on understanding the relative importance of services and industry in two distinct economies Russia and India. Moreover, we further intend to delve into the role of TFP slowdown these economies in the widely discussed global productivity slowdown. From our preliminary analysis, we observe the dominance of the services sector in driving labor productivity growth in India, whereas the services sector has lost its productivity momentum in Russia. However, TFP growth in the services sector has declined in both countries, and the labor productivity growth in the post-crisis years was primarily a result of increased capital deepening. The issue of India's lack of industrialization is widely discussed in the literature. Subsequent stages of this research will try to add to this literature, by deriving insights from our comparisons of post-industrialized Russia, which passed "the great leap forward" in 1930-1950-s, and India with no such experience. The second point that will be further analyzed is the role of India and Russia, where TFPG has declined in the post-crisis years, in the global productivity slowdown literature.

References:

- Bardhan, P (2014), "China and India: The Pattern of Recent Growth and Governance in a Comparative Political Economy Perspective", in S. Fan, R. Kanbur, S.J. Wei and X. Zhang (Eds.), Oxford China Companion, Oxford University Press
- Christensen, L. R., Cummings, D., & Jorgenson, D. (1980). Economic growth, 1947–73: an international comparison. In *New developments in productivity measurement* (pp. 595-698). University of Chicago Press.
- Conrad, K., & Jorgenson, D. W. (1984). Sectoral productivity gaps between the United states, Japan and Germany: 1960-1979 ; Referat gehalten auf der Jahrestagung des Vereins für Socialpolitik "Probleme und Perspektiven der weltwirtschaftlichen Entwicklung" Travemünde 17. - 19. September 1984. Mannheim: Inst. für Volkswirtschaftslehre und Statistik.
- Cooper, W. H. (2009, June). Russia's economic performance and policies and their implications for the United States. Library of Congress Washington Dc Congressional Research Service.
- Das, D K (2018), *Productivity Dynamics in Emerging and Industrialized Countries*, Routledge, Oxon and New York.
- Das, D.K , Erumban, A., Aggarwal, S., & Sengupta, S. (2016). Productivity growth in India under different policy regimes. In D. Jorgenson, K. Fukao, & M. Timmer (Eds.), *The World Economy: Growth or Stagnation?* (pp. 234-280). Cambridge: Cambridge University Press. doi:10.1017/9781316534502.007
- Goldar, B., Krishna, K. L., Aggarwal, S. C., Das, D. K., Erumban, A. A., & Das, P. C. (2017). Productivity growth in India since the 1980s: the KLEMS approach. *Indian Economic Review*, 52(1-2), 37-71.
- Erumban, A., & Ark, B. V. (2018). Productivity in the Global Economy. In D. K. Das (Ed.), *Productivity Dynamics in Emerging and Industrialized Countries* (pp. 58-80). Routledge.
- Erumban, A.A., Das, D.K., Aggarwal, S., and Das, P.C (2019), *Structural Change and Economic Growth in India, Structural Change and Economic Dynamics*, forthcoming.
- Jorgenson, D. W., & Kuroda, M. (1991). Productivity and international competitiveness in Japan and the United States, 1960-1985. In *Productivity growth in Japan and the United States* (pp. 29-57). University of Chicago Press.
- Jorgenson, D. W., & Nishimizu, M. (1978). US and Japanese economic growth, 1952-1974: an international comparison. *The Economic Journal*, 88(352), 707-726.
- Jorgenson, D. W., Gollop, F. M., & Fraumeni, B. M. (1987). *Productivity and U.S. economic growth*. Cambridge, MA: Harvard University Press.
- Jorgenson, D. W., Kuroda, M., & Nishimizu, M. (1987). Japan-US industry-level productivity comparisons, 1960–1979. *Journal of the Japanese and International Economies*, 1(1), 1-30.
- Jorgenson, D. W., & Vu, K. M. (2011). The rise of developing Asia and the new economic order. *Journal of Policy Modeling*, 33(5), 698-716.

Joshi, V., Little, I. M. D., & World Bank. (1998). *India: Macroeconomics and political economy, 1964-1991*. Delhi: Oxford University Press

KOTZ, D (1999), *Lessons from Economic Transition in Russia and China in Political Economy and Contemporary Capitalism: Radical Perspectives on Economic Theory and Policy*, edited by Ron Baiman, Heather Boushey, and Dawn Saunders, Armonk, NY.

Kotz, D. M. (2000). *Lessons from economic transition in Russia and China. Political economy and contemporary capitalism: Radical perspectives on economic theory and policy*, 210-17.

Motohashi , K (2007), *Assessing Japan's Industrial competitiveness by International productivity level: comparisons with China, Korea, Taiwan and the US in Dale Jorgenson, M. Kuroda and K . Motahashi edited, Productivity in Asia- Economic Growth and Competitiveness*, Edward Elgar, UK and USA

Srinivasan, T N. (2011), *Growth, Sustainability and India's Economic Reforms*, Oxford Scholarship Online, Oxford University Press, Delhi.

Srinivasan, T N and S.D Tendulkar (2003), *Reintegrating India with the World Economy*, Peterson Institute of International Economics, Washington DC.

Timmer, M., & Voskoboynikov, I. B. (2016). *Is mining fuelling long-run growth in Russia? Industry productivity growth trends in 1995-2012. The world economy: Growth or stagnation*, 281-318.

Timmer, M. P., Inklaar, R., O'Mahony, M., & Van Ark, B. (2010). *Economic growth in Europe: A comparative industry perspective*. Cambridge University Press.

Verma R (2012) *Can Total Factor Productivity Explain Value Added Growth in Services? Journal of Development Economics*, Volume 99, Issue 1, September 2012

Voskoboynikov, I. B. (2018). *Russia since 1995: Natural Gas, Catching Up and Informality. In Productivity Dynamics in Emerging and Industrialized Countries (pp. 313-330)*. Routledge India.

Voskoboynikov, I. B. (2017). *Sources of long run economic growth in Russia before and after the global financial crisis. Russian Journal of Economics*, 3(4), 348-365.

Voskoboynikov, I. B. (2012). *New measures of output, labour and capital in industries of the Russian economy. GGDC Research Memorandum GD-123*.

Wu, H. X., Krishna, K. L., Das, D. K., & Das, P. C. (2017). *How Does the Productivity and Economic Growth Performance of China and India Compare in the Post-Reform Era, 1981-2011?. International Productivity Monitor*, (33), 91-113.