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Stagnant Manufacturing Growth in India: The Role of the Informal Economy

Gbenoukpo Robert Djidonou[1] & Neil Foster-McGregor[2]

Abstract

The growth of the manufacturing sector is important for overall productivity growth. Indeed, the rising importance of the manufacturing sector at early levels of development is considered one of the stylised facts of development. Recently, several developing countries have skipped this step however, with stagnant growth of the manufacturing sector. In this paper, we investigate the role of the informal segment in the stagnant growth of the manufacturing sector in the context of India. To do so, we initially compute the drag imposed by informality on the productivity growth of the manufacturing sector before investigating whether the movement of workers between the formal and informal segments of the manufacturing sector is having an impact on manufacturing productivity growth using a relatively long time series of data for the period 1980-2011. We find that the informal segment is harmful to the growth in productivity of the manufacturing sector. Using a modified shift-share analysis with the introduction of the informal segment, we find that labour reallocation to the informal segment of the manufacturing sector is growth reducing in the Indian manufacturing sector. The main source of this growth reduction is the within sub-sector structural change effect, indicating that workers move on average from productive formal to less productive informal employment within sub-sectors. In terms of movements across sub-sectors, there has been a movement towards more productive informal activities, but this has not been enough to offset the negative within sub-sector effect. Mainly, we have seen limited growth-reducing structural change after the 1994 liberalisation, implying that employment has moved to less productive informal firms after liberalisation.

Keywords: Manufacturing, Stagnant, formal, informal, productivity, worker's movement

JEL Codes: E26, L16, L60, O17

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1. Introduction

The importance of the manufacturing sector as an engine of growth has long been recognised (e.g. Kaldor, 1960). According to the engine of growth hypothesis, the relationship between the level of GDP per capita and the share of the manufacturing sector arises due to the special characteristics of the manufacturing sector (Pacheco-López and Thirlwall, 2013). Szirmai and Verspagen (2015) organise the literature into a list of six arguments on the importance of the manufacturing sector: (i) productivity is relatively higher in the manufacturing sector (Fei and Ranis, 1964); (ii) the manufacturing sector is assumed to favour capital accumulation (Rowthorn and Coutts, 2004); (iii) the manufacturing sector offers opportunities for economies of scale (Kaldor, 1966, 1967); (iv) higher rates of technological progress in the manufacturing sector (Cornwall, 1977); (v) linkage and spillover effects are stronger in the manufacturing sector than in agriculture and services (Hirschman, 1958); and (vi) demand effects associated with Engel's law.[3] Furthermore, Szirmai (2012) added three further arguments highlighting the potential importance of manufacturing: (vii) the transfer of resources from manufacturing to services provides a structural change burden in the form of Baumol's disease; (viii) the transfer of resources from agriculture to manufacturing provides a structural change bonus, since the manufacturing sector is assumed to be more dynamic; and (ix) the empirical correlation between the degree of industrialisation and per capita income in developing countries. In this context, the relationship between economic growth and the growth of the manufacturing sector has been investigated by several scholars in different contexts (see Fagerberg and Verspagen, 1999; Fagerberg and Verspagen, 2002; Rodrik, 2009; Szirmai, 2012, Szirmai and Verspagen, 2015), with a variety of empirical results being found.

Using a regression approach to relate real GDP growth rates to growth rates of the manufacturing sector, Fagerberg and Verspagen (1999) conclude that the manufacturing sector is an engine of growth in East Asia and Latin America, but that this result is not significant in developed countries. In the same vein and with data on 67 developing and 21 advanced countries, Szirmai (2012) found mixed results. While his results support the engine of growth hypothesis, this does not hold for some periods in which service and industry capital intensity are higher than that of the manufacturing sector. He also found that agriculture grows faster than manufacturing in terms of productivity in developed countries.

Several studies have tested whether manufacturing is an engine of growth for India, with again mixed results (Szirmai and Verspagen, 2015). Kathuria and Natarajan (2013) studied the role of the manufacturing sector in GDP growth for the Indian states in the post-1990 period by regressing state domestic product growth rates on growth rates of manufacturing. They found that regions with faster growing manufacturing sectors also grew relatively faster. In contrast, Dasgupta and Singh (2006) find that the service sector grows faster than the manufacturing industry in India, challenging the idea that manufacturing is the main engine of growth in economic development. Recently, Erumban et al. (2019) took a similar position. They hypothesise that a large expansion of the informal segment is a potential consequence of the deindustrialisation of the Indian economy. The current paper picks up on these arguments, questioning whether the informal manufacturing segment is an important constraint on manufacturing sector performance in India.

[3] Engel's law stipulates that as per capita income increases, the share of agricultural consumption in total consumption declines because of a low income elasticity of demand, with the share of manufacturing goods in consumption rising.

The rapid growth of the service sector has been the major source of the emergence of India's economy, making it one of the fastest-growing economies in the world in the 1990s. Meanwhile, the growth of the value-added share of the manufacturing sector in GDP has been stagnant since 1980. This can be seen in figures 1 and 2, which show developments in the share of GDP and employment of aggregated sectors, respectively. Between 1980 and 2011, the share of agriculture in total GDP was halved, falling from 39.18 percentage points in 1980 to 16.62 percentage points in 2011. Similarly, the employment share has declined from 70.36 percentage points in 1980 to 48.63 percent points in 2011. This relocation of labour away from the agriculture sector has been intensively discussed in the structural change literature (e.g. McMillan & Rodrik, 2011), which confirms that a substantial drop in the share of agriculture in output and employment characterise the process of economic development.

Figure 1: Sectoral Share in GDP (%)

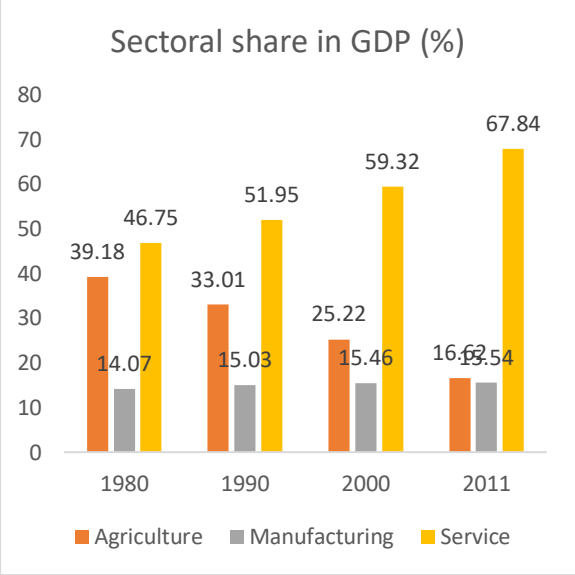
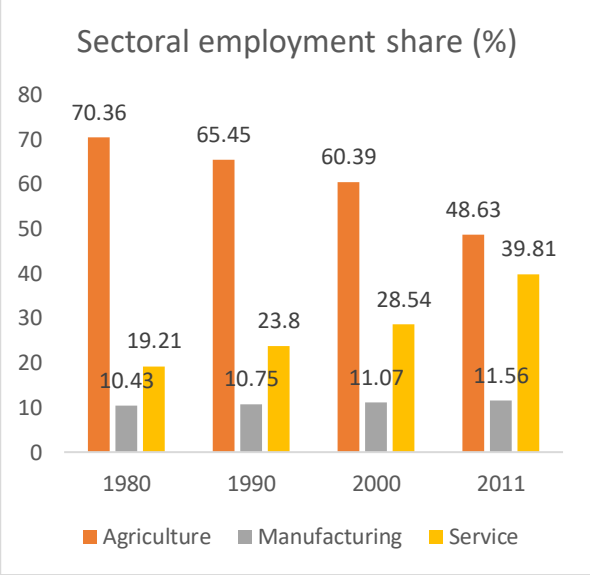


Figure 2: Sectoral Employment Share (%)



Note: The figures report information on the shares of aggregated sectors in both GDP (Figure 1) and employment (Figure 2) in India for 4 different years, 1980, 1990, 2000 and 2011.

Source: Authors' calculations with Indian KLEMS[4] data

In India, the decline in the value-added share of agriculture in GDP is compensated by the increase in the value-added share of the service sector. The share of the service sector in GDP increased from 46.75 percentage points in 1980 to 67.80 percentage points in 2011. The employment share of the service sector has also significantly increased over time, increasing from 10.21 percentage points in 1980 to 39.81 percentage points in 2011. These patterns are in line with existing results for other developing countries, which show a reallocation of labour toward the service sector (Rodrik, 2014; Nayyar, Cruz & Zhu, 2018; Mensah, Owusu, Foster-McGregor, & Szirmai, 2018).

Conversely, the contribution of the manufacturing sector to GDP in India is modest and has shown little growth over time. The contribution of the manufacturing sector to GDP has been

[4] KLEMS refers to capital (K), labour (L), energy (E), materials (M) and service (S) inputs

constant at around 15 percentage points over the period 1980-2011. The relatively slow growth of the manufacturing sector compared to services in India has become a concern discussed in the recent growth literature (e.g. Krishna et al., 2018; Thomas, 2009; Dasgupta and Singh, 2006). The employment share of the manufacturing sector has also shown little growth, increasing only marginally from 10.4 to 11.6 percentage points between 1980 and 2011. The development of a rapidly rising services sector combined with a stagnant manufacturing sector in India align with the recent debate on premature deindustrialisation (Rodrik, 2016, 2017), in which take-off in the manufacturing sector is limited and employment shares begin to decline before countries become rich. Given the importance attached to the manufacturing sector, in particular with respect to opportunities for innovation, it is relevant to investigate why this sector has been stagnant across time in India.

This paper investigates empirically the role of the informal segment in the growth performance of the manufacturing sector in India, examining whether the informal segment of the manufacturing sector has been harmful for the manufacturing sector, and therefore limiting its contribution to the performance of the Indian economy. To examine the importance of the drag imposed by the informal segment on manufacturing growth in India, we study the impact of the movement of workers between formal and informal segments of the manufacturing sector on growth in the sector. An important contribution to development economics has been the study of the impact of structural change on labour productivity (see Lewis, 1954; Kuznets, 1966). Early studies distinguished between agricultural and modern sectors and found that productivity growth depends on the reallocation of workers between low productive agricultural sectors and the high productive industrial sector. Such structural changes can also occur within the manufacturing sector however, with labour moving between different manufacturing sub-sectors and potentially between the formal and informal segments of the manufacturing sector. Dividing employment and GDP data into formal and informal segments when examining the impact of structural change on growth is important for many reasons, with de Vries et al. (2012, p. 219) observing that when formal and informal activities within industries are not separated, estimation of the effect of structural change on growth may be biased. To capture the importance for manufacturing labour productivity growth of movements between formal and informal segments within the manufacturing sector, we use data on value-added and employment that is split into formal and informal segments for 13 sub-sectors in the manufacturing sector.

India has implemented various economic policies in response to different shocks that have affected the economy over time. In the mid-1980s, India implemented pro-business policies (partial liberalisation) followed by the more aggressive liberalisation and globalisation policies (pro-liberalisation) in the mid-1990s. Rodrik and Subramanian (2005) studied the impact on growth of the shift towards a pro-business regime. They found that the adoption of a pro-business approach triggered economic growth, something not observed for the pro-liberalisation approach. Using data from the India KLEMS database and the same split of the period 1980-2011, as in this paper, Erumban et al. (2019) studied the role of structural change in determining India's aggregate productivity growth during 1980–2011. They observed that static worker reallocation – i.e. the movement of workers towards sectors with higher initial productivity – has been productivity-enhancing while gains from dynamic reallocation are hardly present, with workers not showing a significant movement towards fast growing sectors in India. Following the time intervals that are used in these existing studies, we divide the period 1980-2011 into three intervals of time to cover the three phases of economic reforms. The first period 1980-1993 corresponds to the pro-business period, a period of partial liberalisation that has shown its

weaknesses through the severe balance of payment crisis that began in the early 1990s. To counterattack the balance of payments shock, several reforms were introduced. Ahluwalia (2002) argues that in 1991 the Indian government shifted from partial liberalisation to a more open economy, a stronger reliance on market forces, a larger role for the private sector including foreign investment, and a restructuring of the role of government. Following Erumban et al. (2019), the post-reform period has been divided into two periods, 1994-2002 and 2003-2011, with 2003 seeing the start of a boom period in the economy (also characterised by a rise in labour productivity, see Figure 4). Furthermore, the period 1994-2002 (precisely 2001) coincides with the period just prior to China becoming a member of the World Trade Organization (WTO). The dynamics of the Indian economy following the integration of China into the WTO are captured in the period 2003-2011.

Using a modified shift-share decomposition that accounts for movements between the formal and informal segments of manufacturing, we show that informality constitutes a drag for the growth of the manufacturing sector. In investigating the source of this drag, we find that labour reallocation to the informal segment of the manufacturing sector is growth reducing in the Indian manufacturing sector. The main source of this growth reduction is the within sub-sector structural change effect, indicating that workers move on average from productive formal to less productive informal employment within sub-sectors. In terms of movements across sub-sectors, there has been a movement towards more productive informal activities, but this has not been enough to offset the negative within sub-sector effect. Overall, we see limited growth-reducing structural change after the 1994 liberalisation driven by the inability of the within subsector structural change to offset the negative impact of the cross subsector structural change on labour productivity, implying that employment moved to less productive informal firms after openness to trade policy in 1994.

Our paper builds on and contributes to a number of literatures. Recently, Krishna et al. (2018) postulate that the informal segment of the manufacturing sector, which in their data accounts for more than 90 percent of total employment in the manufacturing sector in India[5], is the major cause of the stagnation of manufacturing sector output growth in India. In their paper, they compared total factor productivity (TFP) growth in the formal and informal segments of Indian manufacturing sub-sectors over the period 1980-2011. They found that the average growth rate in TFP in the informal manufacturing sector during 1980-2011 was significantly lower than that in the formal manufacturing sector. They concluded that informality is the source of the stagnant nature of the manufacturing sector in India. Erumban and Das (2016) studied the sources of economic growth in India since 1980 with a particular focus on the importance of information and communication technology (ICT) and found a similar result. They decompose aggregate GDP growth into factor input contributions and TFP growth. They concluded that TFP growth during the period 1991–1995 was negative and has decelerated over time, arguing that the large informal sector is the primary reason for the relatively weak performance of the Indian economy in terms of productivity. Neither of the papers looked to quantify the drag and the cost imposed by the informal segment on the manufacturing sector's growth.

In a different context, Erumban et al. (2019) examined the role of structural change in understanding India's aggregate productivity growth during the period 1980–2011 using Indian KLEMS data. They found that worker movement to fast-growing industries through a dynamic reallocation effect has not been observed even though the impact of static structural change on

[5] See, de Vries et al. (2012) and Moreno-Monroy et al. (2012).

aggregate labour productivity growth has been positive. Moreover, they postulated that the relatively informal construction sector absorbs workers leading to stagnant employment in manufacturing sectors. The rigidity in the formal labour market restricts the expansion of the formal manufacturing sector (Erumban and Das, 2016). Moreno-Monroy et al. (2014) found that formal firms subcontracting some of their activities to the most modern segments of the informal sector makes the former less dynamic in India. Our paper differs from these studies in two main ways. Firstly, in terms of methodology, we adopt and extend the traditional shift-share analysis by introducing in the model the informal segments of the manufacturing sector. Secondly, and different to existing studies, we capture the reallocation effect between formal and informal segments on the productivity growth of the manufacturing sector.

The rest of the paper is structured as follows: Section 2 briefly describes the literature on formal-informal linkages; Section 3 discusses the methodology; Section 4 presents the data structure; Section 5 presents the results; and Section 6 concludes.

2. Formal-Informal interaction: An Overview

Before we discuss the interaction between formal and informal segments, we briefly clarify the meaning of informality, its characteristics, and its origins.

2.1. Definition, Characteristics and Causes of Informality

The use of the term "informal sector" originates from the theoretical model of economic development developed by Arthur Lewis in the mid-1950s in his classic article "Economic Development with Unlimited Supplies of Labor" and describes traditional employment that was not absorbed by the modern industrial sector (Fields, 2004). His model assumes that as soon as the modern industrial sector develops, it will absorb the surplus of labour supply that exists in the traditional economy and the latter will disappear. Unfortunately, the modern sector has been unable to absorb the surplus of labour in most developing countries (Chen et al., 2002).

Later in the second half of the 1990s, the informal sector denomination was replaced by the term "informal economy" to feature the fact that informality is not confined to a specific sector of economic activity but exists across various sectors of the economy (Chen et al., 2002). The informal economy has also been adopted to refer to a broader concept that includes enterprises as well as employment in informality. In other contexts, the informal economy is also termed the grey economy, shadow economy, unorganised economy, dual economy, or unregistered economy.

In broad terms, the informal economy is the unregulated part of the economy that produces goods and services for sale to make a profit. It does not consider the reproductive or care economy comprised of unpaid domestic work and unpaid activities, nor does it comprise the criminal economy (Medina and Schneider 2018). Most informal sector activities provide goods and services whose production is perfectly legal (Becker, 2004). The informal economy can be defined based on activity, employment categories, or the location of informal economy actors.

Enterprises are said to be informal when they do not comply with all regulations that apply to their activities, for instance, if they do not officially register their activities, if they avoid tax payments, if they do not hold a formal account, or if they do not respect employment and

operating licenses. According to ILOSTAT of the International Labor Organization[6], the definition of an informal sector enterprise satisfies the following criteria:

- *It is an unincorporated enterprise, which means that:*
    - *It is not constituted as a legal entity separate from its owners, and*
    - *It is owned and controlled by one or more members of one or more households, and*
    - *It is not a quasi-corporation (it does not have a complete set of accounts, including balance sheets);*
- *It is a market enterprise: this means that it sells at least some of the goods or services it produces. It therefore excludes households employing paid domestic workers;*
- *And at least one of the following criteria:*
    - *The number of persons engaged / employees / employees employed on a continuous basis, is below a threshold determined by the country*
    - *The enterprise is not registered*
    - *The employees of the enterprise are not registered.*

On an employment basis, informal employment is composed of all remunerative activities that are not regulated or are not protected by the legal system and may include wage employment or self-employment. Informal employees are not covered by any social protection. It may also involve non-remunerative activity undertaken in an enterprise. The global network Women in Informal Employment: Globalizing and Organizing (WIEGO)[7] describes informal workers as covering the following groups of individuals:

Persons employed within the informal sector (including those rare persons who are formally employed in the informal sector):

- *own-account (self-employed) workers in their own informal enterprises*
- *employers in informal enterprises*
- *employees of informal enterprises*
- *contributing family workers working in informal enterprises members of informal producers' cooperatives*

Persons in informal employment outside the informal sector:

- *employees in formal enterprises not covered by national labour legislation, social protection or entitlement to certain employment benefits such as paid annual or sick leave*
- *paid domestic workers not covered by national labour legislation, social protection or entitlement to certain employment benefits such as paid annual or sick leave*
- *contributing family workers working in formal enterprises*

Many economic and non-economic reasons explain why the informal economy continues to grow in developing countries. The weak capabilities of formal institutions to provide better

[6] https://ilostat.ilo.org/resources/methods/description-informality/
[7] https://www.wiego.org/informal-economy/statistics/concepts-definitions-methods

education, training, and infrastructure; the excessive demand for low-cost goods and services; economic hardship and poverty are important reasons for the expansion of the informal economy (La Porta, 2014). Poor infrastructure related to electricity, water, transport, routes, and storage facilities have also been cited as causes of limited investment in the formal economy, which in turn can lead to an expansion of the informal sector. In addition, de Soto & Diaz (2002) have argued that excess costs of regulation as well as corruption are important in keeping firms in informality.

Economic restructuring and economic crises are also considered a source of the rise of informality. The structural adjustment programs in the 1980s led to the closure of less competitive firms in many developing countries and to the disappearance of public sector jobs leading to an expansion of the informal sector. Furthermore, economic crises in a context of countries with few resources to offer government support lead to the loss of many formal firms and to many formal workers losing their jobs and complementing their income by creating an informal firm.

The globalisation of the world economy may also tend to favour informality in some conditions. Rodrik (1997) argues that globalisation and trade tend to privilege capital to the detriment of labour. Capital can easily move across countries while workers, especially less productive workers, cannot. To make more profit and be more competitive, formal firms move to countries that have low costs or with informal worker subcontracting arrangements. In the same sense, Chaudhuri (1989) shows that when capital is mobile between formal and informal sectors, the global integration of the economy increases informal employment.

There also exist other economic and non-economic reasons why workers stay in informality. Economic reasons include that informal sector remuneration may complement the weak salary that workers get from the formal sector, workers believing that they can earn more in the informal sector through tax evasion, the freedom to circumvent regulations and licensing requirements, and the capacity to maintain certain government benefits by entrepreneurs in informality (Gerxhani, 2004). Non-economic reasons include the independence that comes from working in the informal sector and the freedom to choose working hours and spend more time with friends and relatives (Meier & Rauch 1995). Women, in particular, often open their establishments close to their houses to combine their employment activities with other activities, such as childcare.

2.2. Interaction between formal and informal segments and productivity growth in developing countries.

Three contending schools of thought have discussed the linkages between the formal and informal sectors: the structuralists, the dualists, and the legalists (Bacchetta, Ernst and Bustamante, 2009) as summarised in Table 1.

The structuralist school of thought, also called the neo-Marxist approach, believes that informal sectors are heavily linked with the formal sectors (Portes, Castells and Benton, 1989). Among structuralists, there are two competing views on the relationship between formal and informal segments in an economy. The "stagnant view" is pessimistic about the coexistence of the formal and informal sectors in an economy. It stipulates that the informal sector competes with registered formal firms and in many cases leads to their exit from the market. This competition takes place for several reasons. One reason is the production cost advantage of the informal

sector. The access to labour at a lower cost and tax payment avoidance are some sources of their lower costs of production, making them more competitive in the production of the labour-intensive goods in which they are specialised. Another source of competition is their propensity to produce goods and services that satisfy the needs of lower-cost consumers (Ranis and Stewart, 1999). For instance, repairing a motorbike in an informal shop is generally more affordable than repairing it in formally registered firms and is thus an attractive option for low-end consumers. Furthermore, it is generally common to find an informal repairer in many parts of developing countries, making access to such services relatively easy. This combination of low-cost and ease of access makes informal firms an attractive option for consumers. The stagnant view further considers that the coexistence of the formal and informal sectors results in a vicious circle of worsening labour conditions and downward pressure on wages because the formal sectors subcontract labour activities with informal sectors (Krishna et al., 2018).

On the contrary, the "modernisation view" thinks that the coexistence of the formal and informal sectors leads to the modernisation of the informal sector (Ranis and Stewart, 1999). To reduce their production costs and increase profitability, formal sectors source their resources from the informal sector. This kind of linkage is prominent in India and other developing countries in the manufacturing sector. One important means of linking formal manufacturing with the informal sector is through subcontracting. Formal firms subcontract their labour-intensive activities to informal firms to reduce their production costs. For instance, a registered stylist (cloth designer) may contract with an unregistered street tailor to produce their cloth design. Moreover, in the manufacturing sector, workers are known to move easily between the formal and informal sectors in developing countries. Few informal firms, except the least productive informal firms, operate in isolation from formal firms, especially in the manufacturing sector (Chen, 2005).

The interaction between formal and informal firms can also take place through production and consumption linkages. The literature shows that there is a substantial relationship between formal and informal sectors in the production chain in developing countries (Chen et al., 2005). Considering a sample of 13 Sub-Saharan African countries, Xaba et al (2002) identify important interlinkages in the final output market, with the formal and informal sectors being a strong supplier to or consumer for each other. Hugon (1990) points out that formal firms are substantial suppliers of inputs to informal firms but that flows from informal to formal firms are negligible. Using the Enquêtes 1-2-3 dataset, covering almost 6,000 informal firms from six West African urban cities, Böhme and Thiele (2012) explore the backward and forward linkages of these firms to the formal sector. They find that formal backward linkages, where informal firms buy intermediate goods and services from formal firms, are much more prevalent than formal forward linkages and that the extent of linkages differ with the size of informality. The results are similar in India, with Majumdar (2015) finding that more than 52% of the surveyed informal firms in Assam (a state of India) have backward linkages with the formal sector in terms of sourcing of raw materials and intermediate goods but that these linkages are concentrated among the larger informal firms. The extent of linkages is also found to depend on the sector, with nearly 100% of informal steel fabrication firms and 62.9% of informal furniture firms in the study of Majumdar (2015) purchasing their intermediate goods entirely from the formal sector. Forward linkages, that is, the supply of final and intermediate products to the formal industry by the informal manufacturing firms, in contrast, are found to be limited in India. The patterns of forward linkages further depend on the sector, however. The highest forward linkage with the formal sector is seen in the case of the steel fabrication industry where more than 50% of

informal manufacturing firms sell their products to formal firms. The forward linkage mostly involves subcontracting agreements with large formal firms.

Most of the literature on the value chain has shown that vertical integration tends to introduce knowledge spillovers among firms (see for example Ernst and Kim, 2002; Humphrey and Schmitz, 2002). Spillovers are thus believed to positively affect firms that are in this formal-informal value chain through their interactions, with trade in goods and services between formal and informal segments being productivity-enhancing in the sense that informal firms learn from highly productive formal firms (Amirah, 2001; Böhme and Thiele, 2012). It should be kept in mind, however, that there is a great deal of heterogeneity in firm performance, with some informal firms being more productive than formal firms, meaning that the learning process may take place in the opposite direction. In terms of worker movement, productivity transfer may also take place in both directions. Voskoboynikov (2019), while studying the impact of expanding informality on productivity growth in Russia, found that workers' movement from formal to informal firms is productivity reducing while the opposite movement of workers is productivity-enhancing. The informal sector is known to be, on average, less productive than the formal sector. The movement of workers from the more productive formal to the less productive informal sector results in lower labour productivity according to the structural change literature. Erumban et al. (2019), using India KLEMS data, studied the importance of structural change in determining India's aggregate productivity growth during 1980–2011. They found that workers do not move to fast-growing industries. They concluded that workers move mainly to the less productive and informal segments of construction, services, and manufacturing sectors.

The legalist, or orthodox, school of thought argues that the proliferation of the informal economy is the normal response of firms to over-regulation and corruption from the governance system (de Soto, 1989). This school of thought overlooks the heterogeneity that exists among informal firms. If we consider that the informal sector ranges from small-scale modern manufacturing and service enterprises to street vendors, shoe repairers, and waste collectors (Becker, 2004 and Ulyssea, 2018), then the legalist school is largely focused on informal firms at the upper-end of the spectrum, which is composed of potential productive entrepreneurs or contributors, who decide to stay in the informal sector because the formal activities are over-regulated and because the costs and time associated with formalisation are high. These firms can compete with productive formal firms and on international markets. The middle segment is composed of firms that are also productive enough to stay in the formal sector but decide to go to the informal sector to make more profit from non-payment of tax and non-compliance of regulation. The fact that informal activities are unregulated and untaxed is what incentivises these firms to be informal.

Finally, the dualist school considers informality as a residual component of the market (Lewis, 1954; Harris and Todaro, 1970). They believe that informal firms are a refuge for the poor and do not have any direct link with formal firms (ILO, 1972). This school alludes to the lower end of the spectrum that contains the most important and extreme cases. It is composed of household home-based workers and street vendors with low skills that decide to work in the informal sector to survive. They are "parasite groups" that engage in informal activities for survival purposes and are generally too unproductive to become formal. The dualist school of thought tends to concentrate on this "parasite group".

Table 1: Schools of Thought on Informality

Main focus	The three main economic approaches to the informal economy		
Economic school	***Dualist School***	***Structuralist School***	***Legalist School***
Seminal Author	Production techniques	Public regulations	Public regulations
Economic behaviour	Keynesian	Neo-Marxist	Liberal
Main characteristics	(ILO, 1972)	(Portes ***et al.,*** 1989)	(De Soto, 1986)
Economic behaviour	-Households' strategy is to generate their own job and income -Subsistence, poverty	-Strategy of international capital to lower labour costs -Precarisation	-To escape inhibitive State intervention -Prohibitive transaction costs of legalisation
Main characteristics	Micro-enterprises, labour intensive	Large firms (international), Unprotected labour	Micro-enterprises, entrepreneurial skills
Economic policies	Capacity building, micro-credit, sub-contracting, Workfare programmes	Welfare state enforcement, labour and social security legislation	Market-friendly policies, liberalisation, State retrenchment, property right

Source: Based on Roubaud (1994)

3. Methodology

In this section we describe how we adjust the standard shift-share methodology to identify the role of informal activities in affecting the productivity of the manufacturing sector in India. The labour productivity level of the manufacturing sector in time t, y_t, is defined as the ratio of total value added (VA_t) to total employment (L_t) of the sector. Alternatively, it can be expressed as the weighted sum of labor productivity levels of individual sub-sectors, j, $y_{j,t} = \frac{VA_{j,t}}{L_{j,t}}$, with the weights being sectoral employment shares in total manufacturing employment ($s_{j,t} = \frac{L_{j,t}}{L_t}$). Given that we have information on 13 sub-sectors of the manufacturing sector, the labour productivity level of the manufacturing sector at a given time t is therefore expressed as follow:

$$y_t = \frac{VA_t}{L_t} = \sum_{j=1}^{13} y_{j,t} \; s_{j,t} \tag{1}$$

Next, we consider the formal and informal segments in our definition of productivity. The sectoral labour productivity level of the formal segment within the manufacturing sector, ${y^F}_t$, is the sum of sectoral labour productivities of the formal segment within each sub-sector j, ${y^F}_{j,t} = \frac{{Y^F}_{j,t}}{{L^F}_{j,t}}$, weighted by the sectoral employment share of the formal segment within each sub-sector j, ${s^F}_{j,t} = \frac{{L^F}_{j,t}}{L_{j,t}}$. Similarly, the labor productivity of the informal segment within the manufacturing sector, ${y^I}_t$, is the sum of sectoral labor productivity of the informal segments within sub-sector j, ${y^I}_{j,t} = \frac{{Y^I}_{j,t}}{{L^I}_{j,t}}$, weighted by the sectoral employment share of the informal segment within each sub-sector j (${s^I}_{j,t} = \frac{{L^I}_{j,t}}{L_{j,t}}$). The labor productivity of each segment is then defined as follows:

$$\begin{cases} y^F{}_t = \sum_{j=1}^{n} y^F{}_{j,t}\, s^F{}_{j,t} \\ y^I{}_t = \sum_{j=1}^{n} y^I{}_{j,t}\, s^I{}_{j,t} \end{cases} \tag{2}$$

The labour productivity level of the manufacturing sector at time t, y_t, can then be defined as the weighted sum of the productivity level of the formal and informal segments respectively weighted by the employment share of the sector j at time t ($s_{j,t}$):

$$y_t = \sum_{j=1}^{n} s_{j,t} \left(s^I{}_{j,t} y^I{}_{j,t} + s^F{}_{j,t} y^F{}_{j,t} \right) \tag{3}$$

To quantify how disruptive the informal segment is for the manufacturing sector, we determine the cost imposed by the informal segment by decomposing the aggregate productivity level. The cost imposed by the informal segment to the productivity level of the manufacturing sector is obtained by rearranging Equation (3). Using the fact that $s^F{}_{j,t} = 1 - s^I{}_{j,t}$, we obtain the following expression:

$$y_t = \sum_{j=1}^{n} s_{j,t} y^F{}_{j,t} + \underbrace{\sum_{j=1}^{n} s_{j,t} s^I{}_{j,t} \left(y^I{}_{j,t} - y^F{}_{j,t} \right)}_{Cost\ of\ informality} \tag{4}$$

The first expression on the right-hand side of Equation (4) refers to the productivity level of the manufacturing sector in the absence of informality. It is the weighted sum of labour productivity in the formal segment weighted by the (overall) sectoral employment shares. It represents the counterfactual situation. The second expression is the cost imposed by informality to the productivity level of the manufacturing sector. For the second term to be a cost, it must be negative. In our case, it is negative because the informal segment is on average less productive than the formal segment of the manufacturing sector.

Differentiating Equation (4) with respect to time allows us to obtain the drag imposed by the informal segment to the productivity growth of manufacturing as follows:

$$\hat{y}_t = \underbrace{\frac{1}{y_{t-1}} \sum_{j=1}^{n} \Delta \left(s_{j,t} y^F{}_{j,t} \right)}_{Growth\ with\ no\ informality} + \underbrace{\frac{1}{y_{t-1}} \sum_{j=1}^{n} \Delta \left[s^I{}_{j,t} s_{j,t} \left(y^I{}_{j,t} - y^F{}_{j,t} \right) \right]}_{Drag\ imposed\ by\ informality} \tag{5}$$

where $\hat{y}_t$ is the annual productivity growth rate between two consecutive years t-1 and t, and the operator Δ denotes the change of components between the periods t-1 and t. The first component on the right-hand side of the equation represents the productivity growth of the manufacturing sector in the absence of informality. The second component represents the drag imposed by the informal sector to the growth of manufacturing sector. The drag of informality depends mainly on the employment share of the informal segment in sectoral employment, $s^I{}_{j,t}$, as well as differences in productivity between the formal and informal sectors, which as we have seen vary widely. A very small value (tending to zero) of $s^I{}_{j,t}$ leads to an insignificant burden of informality on the productivity growth of the manufacturing sector, which can be seen as the situation that characterises developed countries with low levels of informality in their economy. On the contrary, $s^I{}_{j,t}$ tends to be larger for developing countries making the drag of informality disruptive for productivity growth in the manufacturing sector.

In the next step, we evaluate the contribution of structural change to labour productivity growth in the manufacturing sector, further decomposing the structural change component into formal and informal segment contributions. To compute the impact of labour reallocation between

sectors on productivity growth, researchers use the canonical shift-share decomposition of Fabricant (1942). The approach decomposes productivity growth into a within effect (also known as intra-sectoral effect) and a between effect (also called the reallocation, shift or structural-change effect). Researchers have measured such effects for many developing countries, but they generally overlook informality. The study of the impact of structural change on labour productivity growth by considering explicitly informality is rare in the structural change literature, despite de Vries et al. (2012) observing that when formal and informal activities within industries are not separated, estimation of the effect of structural change on growth may be biased. We fill this gap by adapting the standard shift-share decomposition for our analysis.

From Equation (3), we calculate the change in productivity growth of the manufacturing sector between two consecutives periods t-1 and t as follow:

$$\Delta y_t = \sum_{j=1}^{n} \left(s_{j,t} s^I{}_{j,t} y^I{}_{j,t} + s_{j,t} s^F{}_{j,t} y^F{}_{j,t} - s_{j,t-1} s^I{}_{j,t-1} y^I{}_{j,t-1} - s_{j,t-1} s^F{}_{j,t-1} y^F{}_{j,t-1} \right) \quad (6)$$

In order to decompose labour productivity growth into the within and between effects, we add and subtract $s_{j,t-1} s^F{}_{j,t-1} y^F{}_{j,t}$ and $s_{j,t-1} s^I{}_{j,t-1} y^I{}_{j,t}$ to Equation (6). By rearranging the previous equation, we obtain the following equation:

$$\widehat{y_t} = \frac{1}{y_{t-1}} \sum_{j=1}^{n} \underbrace{\left[s_{j,t-1} s^F{}_{j,t-1} \left(\Delta y^F{}_{j,t} \right) + s_{j,t-1} s^I{}_{j,t-1} \left(\Delta y^I{}_{j,t} \right) \right]}_{Within\ component} +$$
$$\frac{1}{y_{t-1}} \sum_{j=1}^{n} \underbrace{\left[y^F{}_{j,t} \left(\Delta s_{j,t} s^F{}_{j,t} \right) + y^I{}_{j,t} \left(\Delta s_{j,t} s^I{}_{j,t} \right) \right]}_{Structural\ change\ component\ (SC)} \quad (7)$$

where the first component on the right-hand side is the contribution of the within component to the productivity growth in the manufacturing sector. The within manufacturing sector component captures technological and institutional improvements that happen within the manufacturing sub-sectors as well as intra-sectoral reallocation. The second component is the contribution of the structural change component to productivity growth. A positive value of the reallocation term means that workers move on average from less productive to more productive sub-sectors, an outcome which leads to the conclusion that structural change is growth enhancing. Our extension of the standard shift-share decomposition allows us to identify the contributions of the formal and informal segments to the within and structural change effects on labour productivity growth.

By adjusting this decomposition, the approach further allows us to report information on whether the structural change components of labour productivity growth are driven by structural change within the formal and informal segments or by movements between formal and informal segments. To do this, we initially consider the formal and informal segments of Equation (7) separately. By adding and subtracting $s_{j,t} s^F{}_{j,t-1} y^F{}_{j,t}$ to the structural change component of the formal segment from Equation (7), we obtain the following expression for the formal segment:

$$y^F{}_{j,t} \left(\Delta s_{j,t} s^F{}_{j,t} \right) = s_{j,t} y^F{}_{j,t} \left(s^F{}_{j,t} - s^F{}_{j,t-1} \right) + s^F{}_{j,t-1} y^F{}_{j,t} \left(s_{j,t} - s_{j,t-1} \right) \quad (8)$$

Similarly, the addition and subtraction of $s_{j,t} s^I{}_{j,t-1} y^I{}_{j,t}$ to the structural change component of the informal segment of the structural change term from Equation (7) gives:

$$y^I{}_{j,t}\left(\Delta s_{j,t} s^I{}_{j,t}\right) = s_{j,t} y^I{}_{j,t}\left(s^I{}_{j,t} - s^I{}_{j,t-1}\right) + s^I{}_{j,t-1} y^I{}_{j,t}\left(s_{j,t} - s_{j,t-1}\right) \tag{10}$$

Combining and rearranging these two equations we obtain a new expression for the structural change (SC) component:

$$SC_t = \sum_{j=1}^{n} \underbrace{\left[s_{j,t} y^F{}_{j,t}\left(\Delta s^F{}_{j,t}\right) + s_{j,t} y^I{}_{j,t}\left(\Delta s^I{}_{j,t}\right)\right]}_{Within\ Subsector\ Structural\ Change} + \sum_{j=1}^{n} \underbrace{\left[s^F{}_{j,t-1} y^F{}_{j,t}\left(\Delta s_{j,t}\right) + s^I{}_{j,t-1} y^I{}_{j,t}\left(\Delta s_{j,t}\right)\right]}_{Cross\ Subsector\ Structural\ change} \tag{11}$$

Equation (11) decomposes the structural change component into a within and between segment labour reallocation. The first term on the right-hand side of Equation (11) expresses the impact of the workers (re)allocation within sub-sectors of formal and informal segments. In other words, this first term fixes overall sub-sectoral shares and labour productivity levels, with the only term varying being the sub-sectoral shares of formal and informal workers. As such, this term will be non-zero if there are movements between formal and informal segments within sub-sectors, with a negative value generally implying that workers move, on average, from more productive formal segments to the less productive informal segments within sub-sectors. The second term on the right hand side of Equation (11) fixes the shares of formal and informal segments within sub-sectors as well as the productivity levels of formal and informal segments, meaning that non-zero values for this term will arise if there are movements of workers across sub-sectors. This additional decomposition, therefore, allows us to examine whether the structural change component of labour productivity growth is driven by movements between formal and informal segments within sub-sectors or by the movement of workers across sub-sectors.

4. Data

The data used for this study is from the Indian KLEMS database. The KLEMS dataset is based on the National Accounts Statistics (NAS)[8] published annually by the Central Statistics Office (CSO) of India. Input-output tables, the Annual Survey of Industries (ASI) published by CSO and various rounds of the NSSO (National Sample Survey Office) surveys on employment and unemployment of formal and informal manufacturing are also used in the construction of the dataset. The Reserve Bank of India (RBI) publishes the annual KLEMS[9] dataset. Unni et al. (2001), Kathuria et al. (2014) and Goldar (2014) have used this dataset to compare the productivity growth and level of formal and informal manufacturing in India. For this work, we consider the period 1980-2011 because the national institute of statistics of India stops disaggregating the employment and GDP data into formal and informal segments from 2012 (Kristina et al., 2018). In the database, registered, organised and unregistered or unorganised sectors refer respectively to the formal and informal segments considered in this paper. Besides considering informal firms as those without a formal account or unregistered, one of the series of definitions for the informal sector proposed by the National Commission for Enterprises in the Unorganized Sector (NCEUS henceforth) is as follows:

[8] http://www.mospi.gov.in/publication/national-accounts-statistics-2019

[9] https://m.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=936 or http://www.worldklems.net/data.htm

"The informal sector consists of all incorporated private enterprises owned by individuals or households engaged in the sale and production of goods and services operated on a proprietary or partnership basis and with less than ten total workers."

We use the following variables from the dataset:

Gross Value-added: The National Accounts of Statistics (NAS) of India provides GDP and Value Added by industries at constant prices from 1950 onwards. Since 1980, NAS further provides value-added and GDP data separately for registered and unregistered firms for 13 manufacturing sub-sectors at current and constant (2004-2005) prices. They stopped disaggregating the manufacturing sector into formal and informal segments in 2012. For this paper, we use the value-added data at 2004-2005 constant prices for 13 sub-sectors in the manufacturing sector from 1980 to 2011.

Employment: Employment data are drawn from the quinquennial rounds of Employment and Unemployment Surveys (EUS) made available by the National Sample Survey Office (NSSO) and from ASI data for various years. The EUS has been used to estimate the employment of each industry. The National Sample Survey Office (NSSO) includes the following jobs in the informal employment:

(i) *own-account workers employed in their own informal sector enterprises*
(ii) *employers employed in their own informal sector enterprises*
(iii) *contributing family workers, irrespective of whether they work in formal or informal sector enterprises*
(iv) *members of informal producers' cooperatives*
(v) *employees holding informal jobs in formal sector enterprises, informal sector enterprises, or as paid domestic workers employed by households*
(vi) *own-account workers engaged in the production of goods exclusively for own final use by their household, if considered employed according to paragraph 9 of the Resolution concerning statistics of the economically active population, employment, unemployment and underemployment adopted by the Thirteenth ICLS*

This definition of informal jobs is drawn from the NSS 66th ROUND report[10] (page 30).

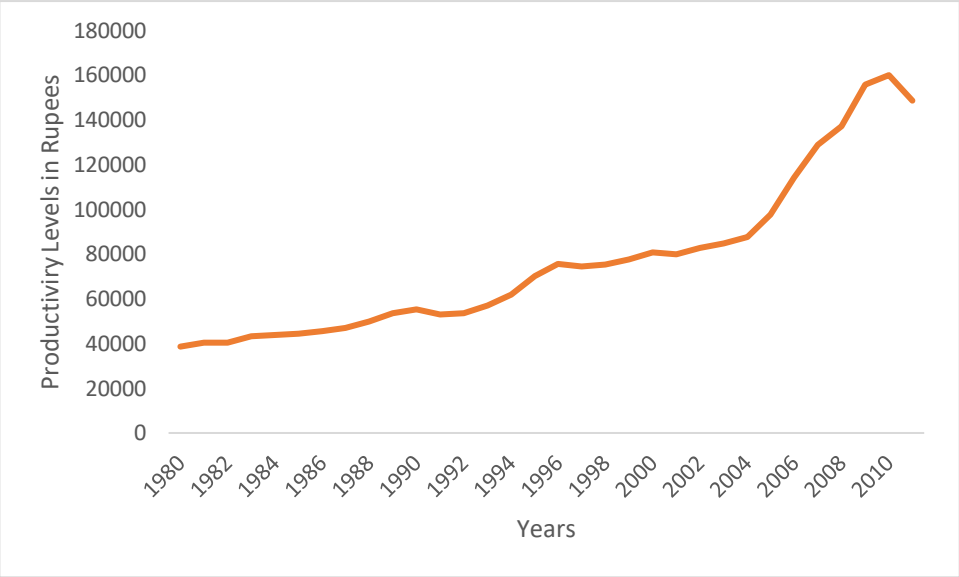
5. Results

5.1. Evolution of the productivity of manufacturing and the employment share within the manufacturing sector in India

Figure 3 shows the evolution in labour productivity in the manufacturing sector in India over the period 1980-2011. Labor productivity in the manufacturing sector has, except for a small drop in the most recent period, increased consistently over the period 1980-2010. The rate of growth of labour productivity began to accelerate in the mid-1990s but rose dramatically from around 2004 onwards. This jump in labour productivity of the manufacturing sector in around 2004 corresponds to the time when India became fully integrated into global trade.

[10] http://mospi.nic.in/sites/default/files/publication_reports/nss_rep_539.pdf

Figure 3: Developments in Labor Productivity of the Manufacturing Sector (Rupees 10^7)



Note: This figure reports information on the level of aggregate labour productivity of the manufacturing sector in India during the period 1980-2011. All values are given in constant 2004-2005 prices (rupees).

Source: Authors' calculations using Indian KLEMS data

Table 2: Descriptive Statistics

KLEMS Industry Description	Value Added		Sub-sectoral Labor Productivity		Employment share (%)	
	1980 (in 10^7 rupees)	Average % change (1981-2011)	1980 (in 10^7 rupees)	Average % change (1981-2011)	1980	Average % change (1981-2011)
Foods, Beverages & Tobacco	12141.1	6.83	19224.74	4.87	21.35	-0.11
Textiles, Leather & Footwear	21612.75	5.53	20576.35	4.83	35.50	-1.14
Woods & Products of wood	19594.61	0.22	73479.84	-0.64	9.01	-0.77
Pulp, Paper, Printing Publishing	3552.72	6.59	49751.67	3.99	2.41	0.61
Coke, Refined Petroleum & Nuclear fuel	3801.13	9.61	819986.6	6.04	0.15	2.05
Chemicals & Chemical Products	6404.04	9.85	62755.45	7.53	3.44	0.22
Rubber & Plastic Products	1421.96	12.09	59167.28	6.95	0.81	3.17
Other Non-Metallic Mineral Prod	4607.74	8.41	17739.26	6.31	8.78	0.08
Basic Metals & Fabricated Metal	21704.85	5.88	106035.5	3.29	6.92	0.57
Machinery, nec.	5596.58	8.09	103185.8	4.31	1.84	2.40
Electrical & Optical Equipment	3077.40	10.48	64000.85	5.19	1.63	3.41
Transport Equipment	5867.19	9.40	114147.7	5.59	1.74	1.89
Manufacturing, nec; recycling	4868.80	7.94	25671.46	4.18	6.41	1.74

Source: Authors' calculations using Indian KLEMS data

Table 2 reports information on value-added, labour productivity, and employment shares of the different manufacturing sub-sectors for the year 1980 and their growth rate over the period 1980 and 2011. In terms of value-added, the largest manufacturing sub-sectors in India in 1980 were Textiles, Leather and Footwear and Basic Metals and Fabricated Metal. In the former case, this is

also reflected in employment shares, with the sub-sector accounting for over a third of manufacturing employment. The Food, beverages and tobacco sub-sector also accounts for a significant share of employment (21%), highlighting the labour-intensive nature of these particular manufacturing sub-sectors. Considering growth rates over time, we see that all sub-sectors have seen an increase in value-added over the period 1980 and 2011 with Rubber and Plastic Products having the highest increase and Woods and products of wood the lowest increase in value-added. Most sub-sectors have seen an increase in their employment shares, generally at the expense of the low-tech sub-sectors Food, beverages and tobacco, Textiles, leather and footwear, and Wood and products of wood. In terms of labour productivity, the Coke, Refined Petroleum Products and Nuclear fuel sub-sector was the most productive in 1980 and has significantly increased its productivity during the period 1980 and 2011. Other high productivity sub-sectors in 1980 included Basic metals and fabricated metals, Transport equipment, and Machinery, n.e.c. The former has seen a relatively small increase in productivity during the period 1980 and 2011. The least productive sub-sector in 1980 was Other non-metallic mineral products, with Food, beverages and tobacco and Textiles, leather and footwear also reporting relatively low productivity levels. Woods and products of wood was the only sub-sector to witness a decrease in labour productivity growth between 1980 and 2011.

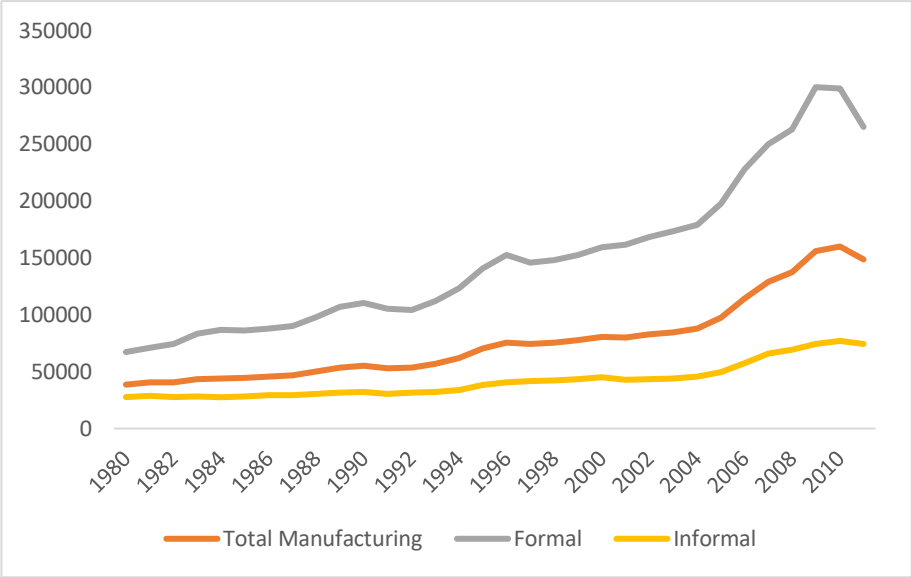
5.2. Formal/Informal-sectoral productivity and employment share patterns

For the remaining part of this paper, our units of analysis are informal and formal segments of the manufacturing sector and its sub-sectors. Using the disaggregated sectoral data and further splitting into formal and informal segments, we compute the productivity level of formal and informal segments within the manufacturing sector and its sub-sectors.

Figure 4 shows the time path of labour productivity in the manufacturing sector and the evolution of productivity in the formal and informal segments of the manufacturing sector over the period 1980-2011. The graph shows that, on average, the formal segments of manufacturing are more productive than the informal segments. The informal sector can thus be considered a drain on the growth of the manufacturing sector. In the next section, we investigate how much the informal segment is a drag on the manufacturing sector. However, when we account for heterogeneity across sub-sectors, we notice that some activities are more productive in the informal segments compared to the formal segment of the manufacturing sector.

Figure 5 shows sub-sectoral labour productivity of the formal and informal segments relative to the sectoral labour productivity of the manufacturing sector as a whole. A value of less than one thus equates with productivity below the labour productivity of manufacturing as a whole. The graph shows that there is heterogeneity in terms of labour productivity of formal and informal segments within the manufacturing sector. There are a couple informal sub-sectors – Wood and products of wood and Manufacturing n.e.c., recycling. – that are, on average, more productive than the corresponding formal sub-sectors, though only in one case (Wood and products of wood) is the level of productivity higher than the average for manufacturing as a whole. In the remaining cases, however, labour productivity in the formal segment of each sub-sector is higher than the productivity in the corresponding informal segment, with the differences being large in many cases, notably Other non-metallic mineral products, Food products, beverages and tobacco, and Coke, refined petroleum and nuclear fuel.

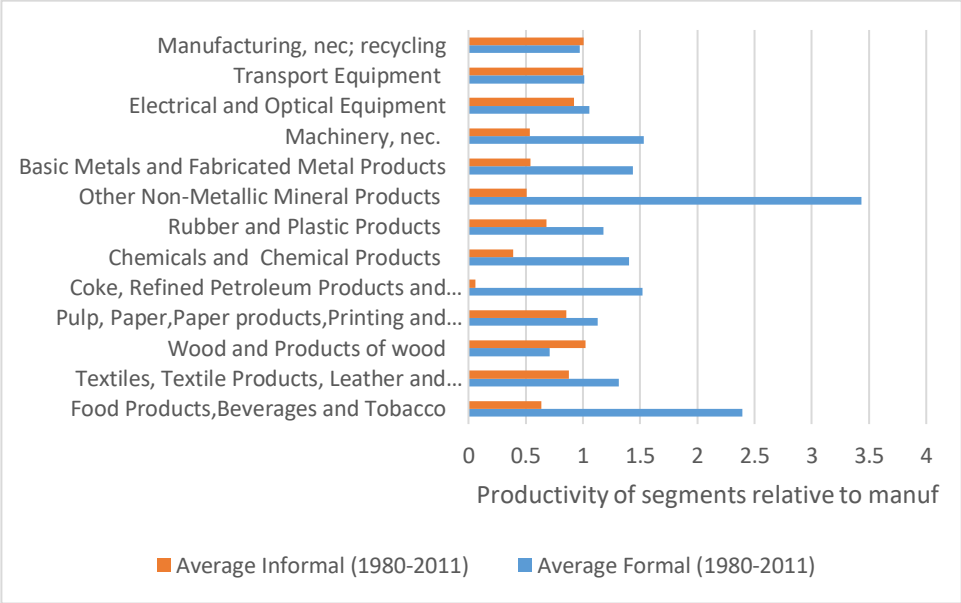
Figure 4: Developments in Labor Productivity of Formal and Informal Manufacturing Segments



Note: This figure reports information on labour productivity disaggregated into formal and informal segments of the manufacturing sector in India during the period 1980-2011. All values are given in constant 2004-2005 prices (rupees 107).

Source: Authors' calculations with Indian KLEMS data

Figure 5: Labor Productivity of Formal and Informal Segments by Sub-Sector Relative to Total Manufacturing Productivity



Note: This figure reports information on labour productivity of formal and informal segments relative to total manufacturing productivity.

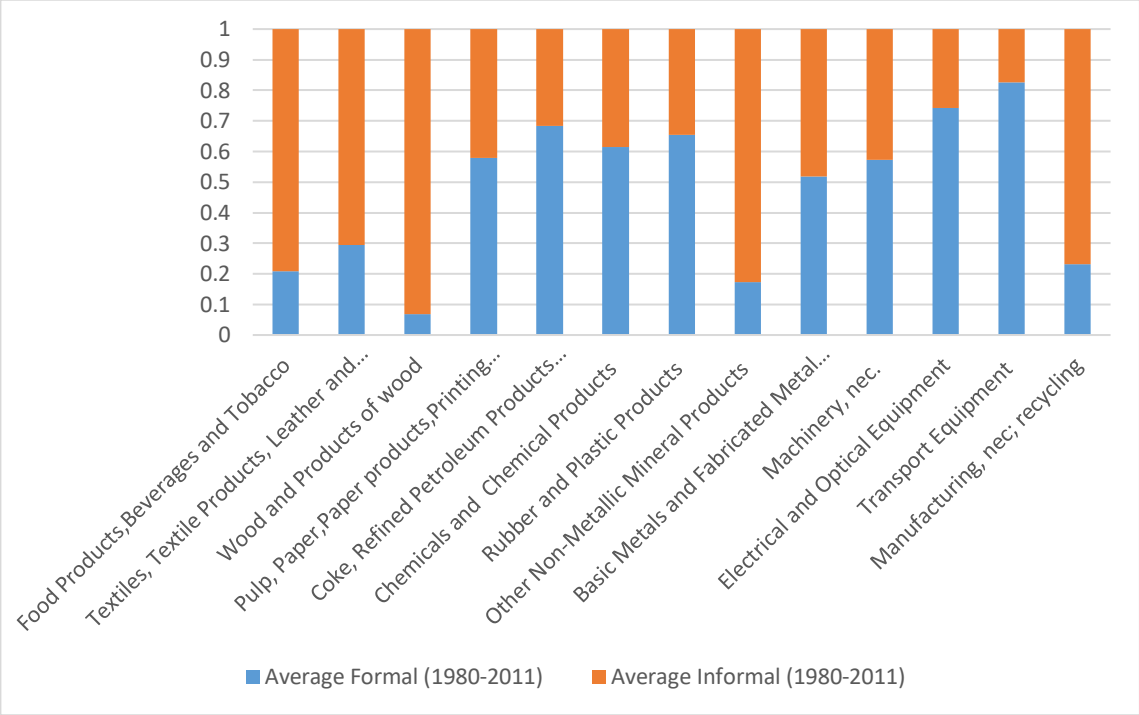
Source: Authors' calculations with Indian KLEMS data

In Figure 6, we report information on the share of employment in both the formal and informal segments of each sub-sector, with data averaged over the period 1980-2011. The figure reveals

that informal employment dominates total employment in certain manufacturing sub-sectors. These include the relatively low-tech sub-sectors, Food products, beverages and tobacco, Textiles, textile products, leather and footwear, Wood and products of wood, Other non-metallic mineral products, and Manufacturing, n.e.c.; recycling. In other sub-sectors, formal employment predominates, especially in the sectors Transport equipment, Electrical and optical equipment, and Coke, refined petroleum and nuclear fuel.

Combined, this descriptive evidence suggests a potentially important role for structural change within the manufacturing sector, with large differences in labour productivity both across sub-sectors, but also between formal and informal segments within sub-sectors, and large opportunities for movements of labour between sub-sectors and between formal and informal segments in most sub-sectors. In the following section, we examine the extent to which structural change has impacted upon labour productivity in Indian manufacturing and the role of the formal and informal segments in this structural change.

Figure 6: Sectoral Employment Share for Formal and Informal Segments



Note: This figure reports information on the employment share of formal and informal segments within total employment within each sub-sector.

Source: Authors' calculations with Indian KLEMS data

5.3. The role of informality in the stagnant growth of the manufacturing sector in India

We have seen in Figure 4 that the informal sector is on average less productive than the formal sector, while it accounts for almost 70 percent of total employment in the manufacturing sector. To determine how disruptive the informal segment is for the manufacturing sector in India, we

determine the cost imposed by the informal segment by decomposing the aggregate productivity level as in Equation (5), with the results reported in Table 3.

Table 3: Productivity Drag from the Informal Sector

KLEMS Industry Description	1981-1993	1994-2002	2003-2011	1981-2011
Productivity Growth in absence informality	5.74	6.84	9.65	7.19
Drag of informality	-2.66	-2.51	-2.68	-2.62
Labor Productivity Growth	3.08	4.33	6.98	4.57

Source: Authors' calculations with Indian KLEMS data

As expected, the results show that the drag imposed by the informal sector is negative for all periods considered in the study. This means that the informal segment is disruptive for productivity growth in the manufacturing sector in India. However, the relative importance of informality decreases over time. In the period 1981-1993, informality reduces the productivity growth by around a half, while in the period 2003-2011, it reduces productivity growth by around a third. This reduction is largely driven by differences in the rate of labour productivity in the different time periods, however, with the absolute value of the drag on productivity varying little over the different time periods. As such, it may be argued that the declining relative importance of informality is to a large extent an outcome of the higher productivity growth of Indian manufacturing in the more recent period, which may in turn be driven by India's reform programs and its increasing integration into the global economy.

5.4. Formal and Informal structural change and within-sector components patterns

In this section, we evaluate the contribution of structural change to labour productivity growth in the manufacturing sector in India, further decomposing the structural change component into formal and informal segment contributions.

To compute the structural change contribution to the labour productivity growth of the manufacturing sector, we adapt the shift-share decomposition to our analysis by introducing formal and informal segments of the manufacturing sector into our decomposition, as described above. We split the manufacturing data into the formal and informal segments to capture the effect of the workers' (re)allocation between both segments to manufacturing sector productivity growth.

Table 4: Decomposition of Productivity Growth in the Manufacturing Sector

KLEMS Industry Description	Component due to: Within			Structural Change			Productivity Growth
	Formal (1)	Informal (2)	Total (3)	Formal (4)	Informal (5)	Total (6)	
1981-1993	1.23	0.55	1.78	1.47	-0.17	1.3	3.08
1994-2002	3.19	1.2	4.38	-0.11	0.06	-0.06	4.33
2003-2011	3.73	2.02	5.76	1.52	-0.3	1.22	6.98
1981-2011	2.53	1.17	3.69	1.03	-0.14	0.89	4.57

Source: Authors' calculations with Indian KLEMS data

The results from calculating Equation (7) are summarised in Table 4. The annual aggregate labour productivity growth rate in the manufacturing sector in India over the period 1981-2011 – as well as the three sub-periods – is decomposed into the within and structural change components. On average, annual productivity growth of the manufacturing sector in India over the full period is about 4.57 percent. This hides differences across the sub-periods however, with labour productivity growth in the manufacturing sector increasing from 3.08 percent in the period 1981-1993 to 4.33 percent in the period 1994-2002 and 6.97 percent in the period 2003-2011

The within component is the main contributor to aggregate productivity growth in the manufacturing sector, both for the full sample period and the sub-periods. The within effect accounts for 3.69 of the 4.57 percent growth rate of labour productivity over the period 1980-2011. With the growth of overall labour productivity over time, the within effect also rises over time, being 1.78 percent in 1981-1993, 4.38 percent in 1994-2002 and 5.76 percent in 2003-2011. As a share of overall productivity growth, the within effect accounted for around 58% of the total in the period 1981-1993, slightly more than 100% of the total in 1994-2002 (implying that the structural change effect was negative) and around 83% in the latter period 2003-2011.

On average, the impact of structural change has been positive over the period 1981-2011, but the relative magnitude is low when compared with the within effect. Over the full period, 1980-2011, the structural change effect contributed 0.89 percentage points to overall labour productivity growth, or just over 19 percent of overall productivity growth. Such a result is not inconsistent with other recent findings on the relative importance of the within and structural change effects (e.g. McMillan and Rodick, 2011; de Vries et al., 2012). Interestingly, the structural change effect was relatively large in the earlier period when compared with the latter periods. This suggests that the reforms undertaken by India in these latter periods, did not result in significant structural changes within the manufacturing sector, or at least productivity enhancing structural changes. We may conclude, however, that structural change is on average growth-enhancing, but that this contribution is modest compared to the within sector components in India in the period 1981-2011.

As our next step, we assess the contribution of formal and informal segments to the within component and to the structural change component of the manufacturing sector. The results are shown in columns (1), (2), (4) and (5) of Table 4. The within component is the main source of productivity growth for both segments except for the period 1981-1993 where the structural change of the formal segment contributes more than the within sector component. The within

contribution has also been increasing over time for both segments of the manufacturing sub-sectors on average. While within sector productivity growth has been positive in the informal segment of Indian manufacturing, it is the case that this growth rate has been consistently lower than the corresponding rate in the formal sector, indicating that not only was the informal segment, on average, less productive than the formal segment in the initial period, but that it has also been less dynamic since. This result is consistent with the view that formal segments are well organised, have access to better technology, have access to the financial market, and recruit qualified workers to grow their business (La Porta & Shleifer, 2008).

As we have seen, the contribution of the structural change effect to manufacturing productivity growth is modest. The results further confirm that this contribution comes mainly from the formal sector. The structural change contribution of the formal segment to the productivity growth of the manufacturing sector is positive, on average, for the different periods considered, except for the period 1994-2002 when workers moved towards formal segments that were on average less productive. Conversely, the structural change contribution from the informal segment was negative in two out of the three sub-periods, implying that labour moved either from productive formal to less productive informal sub-sectors or from more to less productive informal sub-sectors.[11] This result is consistent with the findings of Voskoboynikov (2019) who considered the effects of structural changes in the Russian economy on aggregate labour productivity growth. Using the aggregate labour productivity decomposition method, on a dataset for 34 industries covering the period 1995–2012, Voskoboynikov found that the labour reallocation from formal firms to informal firms tends to lessen growth through the expansion of informal employment with low productivity levels.

We can conclude that even though the informal segment employs almost 70 percent of total manufacturing employment, its contribution to the productivity growth of the manufacturing sector is low and the movement of workers towards informal and less productive activities has been growth reducing. To better understand the stagnant performance of the manufacturing sector, we proceed to further decompose the structural change component into within sector (i.e. between the formal and informal segments within sub-sectors) structural change and cross-sector structural change components.

5.5. Decomposition of the structural change component into within and between Formal/Informal segments

The objective of this section is to decompose the structural change component into a within and between subsector component, allowing us to examine whether the overall structural change effect has been driven by movements between formality and informality within sub-sectors or by the movement of workers across sub-sectors.

The results from calculating Equation (10) are summarised in Table 5. The results show that labour movement across subsectors is the main contributor to the aggregate structural change component in the manufacturing sector, both for the full sample period and for the different sub-periods, with the exception of the period 1994-2002 when the cross-subsector component is negative. The cross-subsector contribution accounts for 0.55 of the 0.89 percent growth rate of

[11] Ideally, we would like to be able to distinguish between these two possibilities. Unfortunately, we do not have information on actual flows of workers between the different sectors and between the formal and informal segments.

structural change component over the period 1981-2011. Productivity growth due to movement across sub-sectors has not been constant over time. It decreased from 0.88 to -0.1 percent between the sub-periods 1981-1993 and 1994-2002, before rising again to 0.73 percent in 2003-2011.

The impact of the movement of workers within the same subsector has been positive over the period 1981-2011, but the relative magnitude is low when compared with the cross-subsector component (except for the period 1994-2002). Over the full period, 1980-2011, the within subsector component contributed 0.33 percentage points (or just over two-thirds of the total effect) to the overall structural change component. In the different sub-periods, the within sub-sector effect accounted for around a third of the overall structural change effect in the period 1981-1993 and 2003-2011, with the small positive impact in the period 1994-2002 partially offsetting the negative cross sub-sector effect.

Table 5: Decomposition of Manufacturing Productivity Growth by Formal/Informal Segments

KLEMS Industry Description	Structural Change						Total Structural Change
	Within subsector			Cross sub-sector			
	Formal	Informal	Total	Formal	Informal	Total	
1981-1993	0.67	-0.26	0.42	0.8	0.09	0.88	1.3
1994-2002	0.05	-0.01	0.04	-0.16	0.07	-0.1	-0.06
2003-2011	0.89	-0.4	0.49	0.63	0.1	0.73	1.22
1981-2011	0.56	-0.23	0.33	0.47	0.09	0.55	0.89

Source: Authors' calculations with Indian KLEMS data

When it comes to the decomposition of the effects between the formal and informal segments, the results show that the within subsector component is negative for the informal sector while its cross sub-sector structural change component is positive – albeit small – for all periods in this study. This means that one of the drivers of the relatively low structural change component has been the movement of employment within sub-sectors to less productive informal activities. While there has also been a movement towards more formal sub-sectors over time, this has not been large enough to offset the move to informal activities within sectors. Conversely, the within and cross subsector structural change components are positive for the formal segment for the periods considered, except for the cross sub-sector component of the period 1994-2002, suggesting that overall there has been structural change both within sub-sectors and across sub-sectors to more productive formal activities.

The period 1994-2002 is the period following trade liberalisation characterised by limited growth-reducing structural change. There was not a strong positive structural change response to trade liberalisation for the following reasons: (i) negative cross sub-sector structural change; and (ii) relatively little movement towards formal activities within sub-sectors. This result is in line with existing studies. Marjit and Acharyya (2003), and Chaudhuri (1989) argue that when capital is mobile between formal and informal sectors, openness to the international market of the formal sector increases informal employment. This is the case because the mobility of capital between both sectors increases the real wage in the informal sector. Using a general equilibrium framework, Chandra and Khan (1993) have demonstrated that when the goods and services produced by informal firms are traded, openness to trade increases both employment and wages in the informal sector. Maloney (1998) considers the impact of external competition on the

informal sector in Mexico, examining the dynamics of the labour market after the integration of the Mexican economy into the North American Free Trade Area (NAFTA). He finds that openness to trade enhances outsourcing as a means of reducing labour costs, with a sharp increase in informal employment also observed.

6. Concluding remarks

Several studies have emphasised the continuing importance of the manufacturing sector in the development process of an economy. However, many countries including India are experiencing stagnant growth of the manufacturing sector. In this paper, we investigate the role played by the informal sector, which accounts for almost 70 percent of total employment in India's manufacturing sector, in the stagnant growth of the manufacturing sector.

Using the India KLEMS database and a decomposition approach that allows for a split into formal and informal segments of the manufacturing sector, we disaggregate the productivity growth of the manufacturing sector into formal and informal contributions. We find that the informal sector constitutes a drag for the growth of the manufacturing sector. The counterfactual situation shows that in the absence of informality, productivity growth would have been 7.19 percent, in comparison to an actual productivity growth rate of 4.57 percent. As such, our results suggest that informality cost more than a third of the potential productivity growth during the period 1981-2011. The drag from informality was found to diminish over time, with the period 1981-1993 witnessing the highest drag, when productivity growth was reduced by more than half.

We further examine the role played by labour reallocation between formal and informal segments on the stagnant growth of the manufacturing sector. Many studies have been conducted in developing countries to study the role of structural change in the development process, but they often overlook informality. This paper considers the impact of labour movement between informal segments and formal segments on the performance of the manufacturing sector in India. To capture the impact of this labour movement on productivity growth, we use an adapted shift-share analysis with the introduction of the informal segment in the model. We find that productivity growth in Indian manufacturing has been largely driven by within sector productivity growth, with positive contributions for both formal and informal activities, albeit with the productivity growth of the informal segments being relatively small. The results further show that labour reallocation to the informal segment of the manufacturing sector is growth reducing in the Indian manufacturing sector. The main source of this growth reduction is the within sub-sector structural change effect, indicating that workers move on average from productive formal to less productive informal employment within sub-sectors. In terms of movements across sub-sectors, there has been a movement towards more productive informal activities, but this has not been enough to offset the negative within sub-sector effect. We have seen limited growth-reducing structural change after the 1994 liberalisation driven by the inability of the within subsector structural change to offset the negative impact of the cross subsector structural change on labour productivity.

The decomposition result shows that the informal sector's productivity growth has been increasing over time in our data. We do not have detailed information to understand what drives this performance of informal firms in terms of productivity. A possible reason is that formal firms subcontract their labour-intensive activities to the informal sector, with the latter learning

through the process in terms of management and innovation. Such arguments highlight the importance of understanding formal-informal firm linkages, which provides an interesting avenue for future work.

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