Constraints to Firm Transition in the Indian Manufacturing Sector

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By

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DECLARATION

I, Golam Rabbani, hereby declare that the research work embodied in the thesis entitled "**Constraints to Firm Transition in the Indian Manufacturing Sector**" submitted to Sikkim University for the award of the degree of Doctor of Philosophy, is my original work and that to the best of my knowledge it contains no materials previously published or written by others. Whenever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions.

I further state that the contents of this thesis, in full or in parts, have not been submitted to any other institute or University for the award of any degree or diploma.

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CERTIFICATE

This is to certify that the thesis entitled **"Constraints to Firm Transition in the Indian Manufacturing Sector"** submitted to Sikkim University for partial fulfilment of the degree of **Doctor of Philosophy in Economics,** embodies the result of bonafide research work carried out by **Golam Rabbani**, Roll No. 15PDEC02, Registration No. 15SU19007 under my guidance and direct supervision. The contents of the thesis in full or in parts, have not been submitted to any other institute or University for the award of any degree or diploma.

All the assistance and help received during the research work have been duly acknowledged by him.

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"Constraints to Firm Transition in the Indian Manufacturing Sector"

Submitted by **Golam Rabbani** under the supervision of **Dr. Rajesh Raj S. N.**, Associate Professor in the Department of Economics, School of Social Sciences, Sikkim University, Gangtok.

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CHAPTER 1

INTRODUCTION

1.1. Introduction

The manufacturing sector has traditionally played a crucial role in the growth and development of many countries across the globe (Naudé and Szirmai, 2012; Haraguchi *et al*., 2017). It is regarded as the locus of modernisation, learning and innovation, skilled job creation, and a vital source of various positive spillovers (Szirmai and Verspagen, 2015; Lavopa and Szirmai, 2018). Despite its depiction as an engine of growth, the contribution of the manufacturing sector to GDP in developing countries has remained very low (Szirmai, 2009; Haraguchi *et al*., 2017). Naudé and Szirmai (2012) found that the average share of manufacturing in the GDP of developing countries witnessed only a marginal increase from 12.1 per cent in 1950 to 15.2 per cent in 2005 (about 3 per cent). However, for some developing countries, the share of manufacturing value added and employment has decreased significantly compared to the other sectors (Haraguchi *et al*., 2017).

The predominance of less productive smaller firms -- the majority of which confine themselves to the informal sector -- coupled with their relative inability to transit to medium and larger firms are known to be the major causes of the poor performance of the manufacturing sector in developing countries (Temple, 2005; WTO, 2009). These small firms, generally, pay lower wages, are operated by less-educated individuals, employ less-educated workers, and earn lower profits than formal sector firms (Perry *et al*., 2007; La Porta and Shleifer, 2008 and 2014; Ulyssea, 2020). This sharp distinction between the informal and formal sectors across various characteristics has

often been interpreted as 'dualism' in the manufacturing sector (Ulyssea, 2020). Given that a major chunk of the small firms operates in the informal sector, the transition of these firms to the formal sector could potentially enhance the overall productivity of the manufacturing sector and could be a route out of poverty for the majority of owners and for the workers who rely on these firms for their livelihood (Temple, 2005). Nevertheless, very few such small firms expand in size and improve their output and productivity.

A peculiar feature of the manufacturing sector in developing countries is the presence of missing middle -- the presence of a few large firms and many smaller ones with disproportionately few mid-sized firms (Sleuwaegen and Goedhuys, 2002; Mazumdar and Sarkar, 2009; Gall, 2010; Dasgupta, 2016; Pham and Takayama, 2017). The bulk of the employment is absorbed by small and large firms, with relatively smaller shares in the intermediate-size groups (Liedholm and Mead, 1987; Tybout, 2000).[1] This implies that there is a limited upward transition of small firms (Loayza *et al*., 2009; Gall, 2010; Dasgupta, 2016). Such lack of transition is believed to dampen the growth of the manufacturing sector in developing economies (Liedholm and Mead, 1987; Steel and Webster, 1992; Tybout, 2000; Mazumdar and Sarkar, 2013; Raj and Sen, 2016). Owing to the large productivity gap between small and large firms, the absence of small firm transition can potentially lead to losses in productivity and earnings (Temple, 2005).

[1] For Hsieh and Olken (2014) 'missing middle' is a misconception as they argue about a 'unimodal' pattern of size distribution of firms in a number of developing countries (Bandiera *et al*., 2017; Teal, 2021). Tybout (2014), however, challenges this finding and justifies the existence of a 'missing middle'. He argues that the mid-sized firms are proportionately smaller in share, as compared to the share of small or large firms, as one would expect in an undistorted economy. Assuming an efficient size distribution, such as in the case of a relatively undistorted economy like the United States, Tybout (2014) using the same data as Hsieh and Olken (2014) shows that the developing countries are characterized by a missing middle, although their size distribution is unimodal.

1.2. The Indian Context

India is one of the world's fastest-growing economies, and the rapid expansion in the past few decades has propelled India to the world's top five economies. While the growth story has garnered much attention and applause from economists and policy makers, the growth experience of India has raised eye-brows. India witnessed a shift in the base from the agriculture to the service sector bypassing the manufacturing sector. The growth has been mainly driven by the dynamism of the service sector, while manufacturing has been less robust (Panagariya, 2008). Our estimates show that the Indian manufacturing sector accounted for a mere 17 per cent share of the total GDP in 2015-16, and this share has remained more or less the same since the mid-1960s (around 15 to 17 per cent). Additionally, the manufacturing sector has not contributed much to the employment growth, and the recent growth in manufacturing employment, whatever little, has been witnessed in the informal sector (Joumard *et al*., 2015).

Much like in other developing countries, the manufacturing dualism and the related issue of the missing middle are considered to be the major factors for the poor performance of the manufacturing sector in India (Little *et al*., 1987; Hasan and Jandoc, 2010; Bollard *et al*., 2013; Mazumdar and Sarkar, 2013; Nagraj, 2018; Kesar, 2020; Raj and Sen, 2020; Parida *et al*., 2021). India has experienced a long history of manufacturing dualism (Little *et al*., 1987; Mazumdar and Sarkar, 2013; Kesar and Bhattacharya, 2020) that refuses to disappear despite episodes of high growth. Despite several measures taken by the government in the past, about $4/5^{th}$ of the manufacturing workforce still find employment in the informal sector (Ghani *et al*., 2013). Another peculiar feature of Indian manufacturing is the missing middle (Mazumdar and Sarkar, 2009; Hasan and Jandoc, 2010). The very presence of missing middle is considered to

be a major impediment to the growth of aggregate productivity in the Indian economy (Mazumdar and Sarkar, 2013). The extant literature on missing middle sees it as a by-product of the sheer inability and the reluctance of small firms to transit. The inability mainly stems from a lack of resources to expand and hire more workers, whereas the reluctance mainly emerges from the cumbersome regulations that bind firms in the higher size categories. Both inability and reluctance results in less firms making the transition.

It has also been documented that small firms in India, especially those operating in the informal sector, are characterised by lower productivity and lower wages. For instance, Hsieh and Klenow (2009) demonstrate that in India, a firm in the top productivity decile can be five times more productive than a firm in the bottom decile. At the same time, the sharp differences in the earnings between workers in small firms and large firms have resulted in a high level of income and asset inequality (Kathuria *et al*., 2013). Such differences in earnings have negative implications for pro-poor growth as the majority of the urban working poor are employed in smaller firms (Raj and Sen, 2016).

There is a dearth of research investigating the lack of mid-sized manufacturing firms in India. The existing literature on Indian manufacturing recognizes the presence of manufacturing dualism and the related problem of missing middle, and it suggests that the number of mid-sized firms is constrained by infrastructural deficiencies (such as lack of reliable electricity), labour regulations, and credit constraints (Mazumdar and Sarkar, 2013, Ramaswamy, 2013; Allocott *et al*., 2016; Raj and Sen, 2016). These elucidations, however, rely critically on suggestive evidences and are not subject to empirical scrutiny yet. As there is a great deal of interest among the policy practitioners to ease the constraints of doing business in India, therefore, from a policy perspective,

it is crucial to understand the role of these factors in dis-incentivising small firms from growing and entrepreneurs from setting up mid-size firms, and equally critical is to understand the implications of absence of transitions on manufacturing outcomes.

The main objective of this study is to depict the phenomenon of missing middle by considering all the firms (formal and informal) that come under the ambit of manufacturing sector which has not been done before. Further, we make an attempt to understand why few firms transit to the mid-size category and others do not. Particularly, our focus lies in examining the role of access to finance, infrastructure and labour regulations in explaining the transition of small firms. Lastly, we investigate the productivity and wage implications of such transition.

1.3. Objectives of the Study

1. To understand the nature, magnitude and trends of informality, and study its effect on growth, productivity and wages

2. To probe the presence and persistence of the 'missing middle' in Indian manufacturing and examine its temporal and spatial variations

3. To examine the role of access to finance, infrastructure and labour regulations in explaining the lack of firm transitions

4. To investigate the productivity and wage implications of firm transitions

1.4. Data and Methodology

1.4.1. Data

The study is based on data extracted from secondary sources. We use a very rich dataset that combines the large representative surveys of informal firms in the non-household sector with the data on formal manufacturing firms. The data are pooled cross-sections of firm-level data, available quinquennially, beginning in 2000-01 and ending in 2015-16. Data on the formal sector firms are drawn from the Annual Survey of Industries (ASI) of the Central Statistical Organisation, Government of India. These are census-cum sample surveys conducted annually, and cover the formal manufacturing units located in all the states and union territories. Data on the informal sector firms are obtained from the surveys of the unorganised manufacturing sector conducted by the National Sample Survey Office (NSSO), Government of India. These surveys cover all states and union territories, and collect information on various aspects of informal sector firms. A detail description of the data sources and its construction is presented in Chapter 2.

1.4.2. Methodology

The study employs various statistical tools and econometric techniques to address the objectives of the study. Econometric methods are employed to understand the role of access to finance, infrastructure, and labour market regulations on firm transition. Besides employing an ordered logit model (OLM) to assess their roles in firm transition, we address the endogeneity issues using the two-stage residual inclusion (2SRI) approach. Robustness of the results are also examined by employing a generalised ordered logit model, and a logit model where we categorise firms into just two categories, formal and informal. We also employ various robustness checks such as Difference-in-Differences (DiD) method and synthetic panel approach to test the robustness of our results. To understand the factors that explain the productivity and

wage gap between the small and large firms. we employ the Oaxaca and Recentered Influence Function (RIF) decomposition method. These methods are discussed in detail in the respective Chapters.

1.5. Value of the Study

The existing studies show that firms in developed countries are on average larger and their size is more dispersed. However, this is not the case with firms in developing countries that are characterised by a bimodal structure in size distribution with a missing middle. Considerably less attention has been paid to understand why few small firms make the transition in developing countries. Despite some suggestive evidences, a serious empirical investigation probing the factors contributing to the absence of mid-sized firms in developing countries is lacking. This study is an important contribution in this regard as it focuses on the firms in the non-household sector of Indian manufacturing. Second, while some studies have based their analysis on data that are not representative of the entire manufacturing sector, others have relied on datasets that are outdated. This study uses a unique dataset on manufacturing firms that combines both the informal and formal sector firms to create a continuum of firms. Third, the period that we consider for our analysis has witnessed faster growth in banking services. The Indian Government and the Reserve Bank of India (RBI), the central bank of the country, implemented several programmes that aimed to expand bank account ownership. During this period, the proportion of the banked population more than doubled. There was a simultaneous decline in the number of underbanked districts during the period. Despite theoretical propositions and empirical evidence suggesting that enhanced access to banking may be welfare-enhancing, it is not certain that this is

the case. As our dataset contains information about credit access, we investigate how firms, especially small firms, responded to the extension of financial inclusion.

Fourth, the period under study has also witnessed rapid advances in infrastructural development and provision in India. The Government of India has implemented several programmes[2] that evidently expanded the road networks and improved the quality and accessibility of electricity and various other physical and social infrastructure. During this period, India's length of road per square kilometre (km) increased from 1.03 km in 2000 to 1.71 km in 2015. The period also witnessed significant improvement in the energy infrastructure, wherein the installed capacity increased from 85,795 megawatts in 1997 to 245,259 megawatts in 2014. Since our dataset contains information about the accessibility of energy infrastructure at the firm level, we are able to investigate firms' reactions to the expansion of infrastructural provision in India.

Although the effects of labour market regulations on firms have been studied extensively in developed countries, studies probing their role in developing countries are limited. It is particularly important to probe the role of regulations on small firms as they are the ones that are affected the most, as smaller firms are reluctant to transit to the registered sector as strict enforcement of the labour laws raises the cost of production. Further, the regulations and their enforcement send a clear signal to the firms as to whom they favour, workers or the employers, which ultimately prompt the firms, especially the small ones, to decide whether to transit from informal to formal status. As the focus is on the entire continuum of firms, from the smallest to the largest firms, we are able to capture the true effects of labour market regulations on firm transition. Additionally, most of the studies have focused exclusively on the *de jure*

[2] For example, Pradhan Mantri Gram Sadak Yojana, Rashtriya Sam Vikas Yojana and Jawaharlal Nehru National Urban Renewal Mission.

nature of reforms and ignored the *de facto* measures.[3] When it comes to developing countries, a large gap between *de facto* and *de jure* regulation is observed due to weak enforcement and high evasion. Hence, examining the role of both *de facto* and *de jure* labour regulation on firm growth is extremely important. Lastly, we also study the implications of firm transition on productivity and earnings in Indian manufacturing which is not done yet.

1.6. Organisation of the Study

The thesis is organised in 10 Chapters. The First, Second and Third Chapters provide the introduction, review of literature and data and methods respectively. The various objectives set out in the study are addressed in Chapters 3 to 9.

In Chapter 4, "Informality in Indian Manufacturing", the levels and trends in informality in Indian manufacturing sector for the period 2001-2016 is captured. The Chapter also attempts to document the variation in informality across selected firm characteristics, regions and sectors. The Chapter 5 titled "Missing Middle in Indian Manufacturing" sets out the missing middle problem in Indian manufacturing. Along with providing an aggregate picture, this Chapter also investigates whether the absence of mid-sized firms is a phenomenon confined to any particular region or a recent occurrence by examining its regional and temporal variations. To understand how such skewed distribution influences overall productivity, the Chapter also delves into comparing the productivity differences among firms of different sizes.

In the next three chapters, we explore the role of important factors that explain the lack of mid-size firms in Indian manufacturing. In Chapter 6 titled "Impact of Access to

[3] *De jure* and *de facto*, measures can also be referred to as regulations on paper and regulations in practice, respectively.

Finance", we track the nexus between access to finance and firm transition. We then move on to examine the role of inadequate infrastructure in the lack of transition of firms in Chapter 7 "Infrastructure Matters". Stringent labour laws are argued to be another factor explaining the lack of firm transition in Indian manufacturing. This forms the issue for empirical scrutiny in the Chapter 8 "Role of Labour Regulations".

Along with examining the role of finance constraints, infrastructure bottlenecks, and rigid labour laws on firm transition, it is equally important to see how the lack of firm transitions influences the performance of the overall manufacturing sector. In Chapter 9 titled "Productivity and Wage Implications", we examine the productivity and wage implications of small firm transitions. We employ the Oaxaca and Recentered Influence Function (RIF) decomposition methods to understand the contribution of each factor to productivity and wage gap.

The last Chapter, Chapter 10, summarises the major findings and provides some policy suggestions. The limitations of the study as well as directions for future research are also suggested.

CHAPTER 2

REVIEW OF RELEVANT LITERATURE

2.1. Introduction

This Chapter presents the literature review related to the study. We begin by discussing the small firm growth and its relationship with informality and missing middle in the developing countries in Section 2.2. We, then, discuss the factors that explain the lack of firm growth, namely access to finance, infrastructure, and labour regulations in Sections 2.3, 2.4 and 2.5, respectively. Section 2.6 provides a brief discussion on the implication of firm growth. Finally, we conclude the discussion by presenting some evident research gaps in Section 2.7.

2.2. Small Firm Growth

Small firms play a crucial role in the development process of a nation in terms of employment creation, value addition and alleviation of poverty (Audretsch, 2002; Hijzen *et al*., 2010). Hence, small firm growth has been accorded utmost importance in both developed and developing economies. Firm growth occurs when firms increase their size, usually measured in terms of employment, sales, profits, or value-added (Coad, 2018). Firm growth can also take different forms in terms of vertical integration (of employee, assets etc.), related or unrelated diversification or be achieved through modes like licensing, alliances or joint ventures (Delmar *et al*., 2003). These different forms of firm growth have various implications in the developed and developing countries. As pointed out by various review papers, in the last couple of decades, a large number of studies have focused on firm growth, with an increasing interest in small firms (Delmar, 1997; Wiklund, 1998; Coad, 2007; Davidsson *et al*.,

2010). However, in developing countries, many small firms are formed in the informal sector and do not grow to the formal sector, creating a persistency, which turns into a large informal sector across the developing countries (Ardagna and Lusardi, 2008; Schoar, 2009; Nichter and Goldmark, 2009; Ghani, *et al*., 2013).

In many developing countries, widespread tax evasion (Dabla-Norris and Inchauste, 2007), regulation free operation (De Soto, 1989; Meghir *et al*., 2015), free entry and exit (Farrell, 2004), survival motives (La Porta and Shleifer, 2014), and various other flexibilities generated a large influx of new small firms in the informal sector. Small firms in these countries, often also use the informal sector as a steppingstone towards formalization (Nguimkeu, 2014). This has led to a persistent informality in the developing economies. For example, in India, informal sector constitutes more than 95 per cent of the total manufacturing enterprises and 80 per cent of manufacturing workforces in 2010-11 (Ghani, *et al*., 2013).

The size of the informal sector is of particular interest to policymakers concerned with promotion and development of the micro-entrepreneurial sector (Henley *et al*., 2009). The sheer size of informality in these countries is likely to have deep economic implications too. Using a panel of 161 countries over the period from 1950 to 2010, Elgin and Birinci (2016) showed that large size of informal economy is associated with a smaller growth in GDP per capita. Informal sector is also associated with high poverty rates, poor jobs, and gender discrimination (Kanbur, 2011), and evidence for India suggest that the productivity growth for the informal sector is not keeping pace with the formal sector (Kathuria *et al*., 2013). This concern assumes considerable importance for India because the informal sector firms are the least productive among all the firms in the manufacturing sector (Hsieh and Klenow, 2009) and the individuals who own,

manage, and work in these firms comprise a large proportion of the urban working poor (Raj and Sen, 2016).

In the quest to small firm growth dynamics in the developing countries, a good number of scholars focused on cross-country differences in the size distribution of manufacturing firms. A deep-rooted conjecture is that the size distribution of firms in developing countries exhibits a missing middle – indicating the lack of growth and development of small firms, which has wider implications for developing economies in terms of improving aggregate productivity and in ensuring pro-poor growth (Tybout, 2000; Sleuwaegen and Goedhuys, 2002; Gall, 2010; Mazumdar and Sarkar, 2013; Dasgupta, 2016).

Studies have long cited the problem of a 'missing middle' in the size distribution of firms in developing countries (WTO, 2009; Martin *et al*., 2017; Pham and Takayama, 2017; Teal, 2021). However, the literature assessing the presence of missing middle is not conclusive. For Hsieh and Olken (2014), the missing middle is a misconception, and they showed a unimodal pattern of size distribution in number of developing countries. Tybout (2014), however, challenged this finding and justifies the existence of a missing middle. He argued that medium-sized firms are proportionately smaller in share, as compared to the share of small or large firms, as one would expect in an undistorted economy. Assuming an efficient size distribution, such as in the case of an undistorted economy like the United States, Tybout (2014) using the same data as Hsieh and Olken (2014) showed that the developing countries are characterized by a missing middle, although their size distribution is unimodal. While the debate is still not fully settled, the concept of the missing middle is useful to explore with more precision where there is a lack of firm growth.

The presence of a large number of small firms in developing countries and their lack of growth is very often attributed to some important factors that determine whether small firms, once born, develop into larger firms, creating jobs for workers, or instead languish as tiny 'mom and pops' operations with relatively few externalities for economic development. Recent empirical literature have focused on the possibility that the aspects of the business environment (like infrastructural bottlenecks, property rights, contract enforcement, efficient regulation), entrepreneurial characteristics, and firm characteristics may be the important determinants of small firm growth process (Neshamba, 1997; Nichter and Goldmark, 2009; Davidsson *et al*., 2010). At the same time, there is considerable evidence that tax, and financial obstacles are also important determinants of small firm growth in developing countries (Dabla-Norris and Inchauste, 2007). We provide a very brief review of selected studies that examined the role of financial constraint, infrastructural constraints, and labour regulations on firm growth.

2.3. Access to Finance

There is now enough evidence to show that access to finance is an important factor positively influencing the ability of a firm to grow (Rajan and Zingales, 1998; Beck and Demirgüç-Kunt, 2006; Oliveira and Fortunato, 2006; Raj and Sen, 2016b; Donati, 2015; Beck *et al*., 2015; Fowowe, 2017; Ullah, 2020; Levine and Warusawitharna, 2021). In a recent study of Eastern Europe and Central Asian countries, Ullah (2020) found that financial constraints negatively affect sales and employment growth. A similar argument is also echoed in studies by Beck and Demirgüç-Kunt (2006) and Rajan and Zingales (1998). Fowowe (2017) reported that constraints to accessing finance exert a significant negative effect on firm growth in African countries. Firms

that face financial constraints are less likely to invest in fixed assets (Ojha *et al*., 2010; Winker, 1999) and also lack the capabilities to innovate (Winker, 1999). Levine and Warusawitharana (2021) showed that a rise in financial friction leads to an increase in the sensitivity of productivity growth to the use of external finance for European firms. Lack of finance is a significant constraint for the transition of firms in the informal manufacturing sector, according to Raj and Sen (2016b). However, compared to large firms, small firms may face more difficulties in accessing credit (Oliveira and Fortunato, 2006; Donati, 2015; Wang, 2016). The lack of credit history or insufficient collateral prevents small firms from obtaining credit, even if they are highly productive (Bigsten *et al*., 2003; Osano and Languitone, 2016).

This seems to be the case for small firms in India, where few small firms expand in size leading to the presence of a 'missing middle' in the manufacturing sector (Bagchi *et al*., 2010; Hasan and Jandoc, 2010; Mazumdar and Sarkar, 2013; Ramaswamy, 2013). The 'missing middle' along with the large productivity difference between small and large firms is often ascribed to the financial constraints they face (Gupta *et al*., 2008; Mazumdar and Sarkar, 2013; Raj and Sen, 2016b; Gang *et al*., 2020; Raj and Sasidharan, 2021). Hsieh and Klenow (2009) maintained that misallocation of capital is likely to have a negative impact on the aggregate productivity of the economy of India.[4] This view is also supported by Oura (2008) who argues that addressing the issue of resource misallocation could result in significant productivity gains. Cole *et al*. (2016) showed that, if India had a financial system similar to that of the United States, the TFP of India would have scaled up by 46%, signifying the importance of finance in enhancing the overall productivity of the economy. A study by Raj and Sen (2016b)

[4] Misallocation points to the inefficient distribution of financial resources occurring at the macro level where unworthy firms obtain capital and deserving firms do not.

exploring the importance of access to finance in aiding firm transition showed that lack of access to finance is a significant constraint for the transition of informal sector firms. Another study of interest is Gang *et al*., (2020) which highlighted the vital role played by access to finance in promoting entrepreneurship in the informal sector. Despite the surge in the literature that has examined the nexus between access to finance and firm growth, studies exploring the role of finance in explaining the transition of small firms are scanty.

2.4. Infrastructure

A growing body of empirical literature emphasizes the role of infrastructure on firm performance (Bigsten and Gebreeyesus, 2007; Straub, 2008; Aterido *et al*., 2011; Mitra *et al*., 2012; Stephen, 2014; Audretsh *et al*., 2015; Mukim, 2015; Gibbons *et al*., 2019; Chaurey and Le, 2022; Wan *et al*., 2022). Using the panel data on Indian firms, Goel (2003) showed that infrastructure plays a crucial role in improving manufacturing productivity. In a related study, Mitra *et al*. (2012) found a significant role for infrastructure in determining the total factor productivity and technical efficiency of manufacturing firms in India. Nevertheless, the observed impact appeared to be stronger for industries such as textile, transport equipment, metal and metal products, and chemical products. Echoing a similar view, Bogetić and Olusi (2013) showed that infrastructure quality gaps reduce firm productivity with water supply gaps having the largest impact. Related findings of a positive effect of infrastructure can be also traced in Tuong *et al*. (2019) who used firm-level data from Cuu Long Delta in Vietnam, in Gibbons *et al*. (2019) for firms in the UK and in Ajide (2020) who used a panel of firms in twenty African countries. In their study, Audretsh *et al*. (2015) established the

important role of telecommunications and internet facilities in promoting new start-ups in Germany.

Energy infrastructure is the most important type of infrastructure that many developing countries fail to provide to their industrial sectors (Dinkelman, 2011; Alby *et al*., 2013; Lipscomb *et al*., 2013; Geginat and Ramalho, 2015). According to a World Bank survey, electricity is the most common major obstacle for Indian manufacturing firms (World Bank, 2006). Studies have often highlighted the role of a reliable electric power supply in enhancing firm performance. Power outages are considered to be one of the key infrastructural constraints facing manufacturing firms in developing countries (Abererese *et al*., 2017; Grainger and Zhang, 2017; Asiedu *et al*., 2021). For example, in Bangladesh, the lack of access to electricity severely affected the productivity of firms (Chowdhuri *et al*., 2021). In China, firms' strategy to avoid power outages by outsourcing intermediate inputs of production resulted in higher production costs (Fisher-Vanden *et al*., 2015). Similarly, in India, power shortages reduced revenue by 6 per cent for an average firm in the short run (Allocott *et al*., 2016). They also noted that power shortages hit small firms more severely as they do not possess generators which are known to have significant economies of scale in cost. Echoing an identical view, Aterido *et al*. (2011) showed that power outages have a detrimental effect on firm growth. Similarly, Fakih *et al*. (2020) emphasized the adverse consequences of power outages on the performance of manufacturing firms in the MENA region. An estimate by Rud (2012) for India found that one standard deviation increase in electrification is associated with an increase of around 14 per cent in manufacturing output for those states at the mean of the distribution. Such impact of power outages is found to be greater for the most energy-intensive industries such as the manufacturing of metal, wood and paper (Alby *et al*., 2013; Grainger and Zhang, 2017).

Available studies mostly provide a macro picture of infrastructure availability and its impact on aggregate economic outcomes, while studies examining the role of infrastructure at the firm level are limited. We address this key gap in the literature and investigate the link between infrastructural availability and firm transition in the Indian manufacturing sector.

2.5. Labour Regulations

There is also a relatively large body of literature examining the economic effects of labour regulations in developed and developing countries (Besley and Burgess, 2004; Almeida and Carneiro, 2009 and 2012; Rodgers and Menon, 2013; Garicano *et al.*, 2016; Amirapu and Gechter, 2020; Vallanti and Gianfreda, 2021). Recent empirical literature demonstrated that labour market flexibility has substantially increased employment and productivity growth (Boeri and Garibaldi, 2007; Bjuggren, 2018; Wang *et al.*, 2021). Firms in more flexible labour markets found it less expensive to adjust the size of their workforce (Wang *et al.*, 2021) and so registered substantial gains in employment (Boeri and Garibaldi, 2007) and productivity (Bjuggren, 2018). Higher firing costs in rigid labour markets lowered firm entry, and lead to output, productivity, employment, and wage losses (Cingano *et al.*, 2016; Autor *et al.*, 2007; Balmaceda and Fischer, 2010). Belloc (2019), on the other hand, showed that complementarity between employment protection legislation and employee representation legislation determines aggregate innovation outcomes. Most of these studies focused on large, formal sector firms in developed countries.

Studies probing the impact of labour market rigidity in developing countries are scarce. Besley and Burgess (2004), in their influential work, exploited the interstate variations in amendments to the labour laws in India and showed that pro-worker labour

legislation lowered output, employment, investment and productivity. Using an amended version of the Besley-Burgess Index, incorporating the criticism of Bhattacharjea (2006), Ahsan and Page (2009) too confirmed the negative impact of protective labour legislation on manufacturing employment.[5] Rigid labour regulations adversely affect manufacturing exports too, according to Hasan *et al.* (2021). These studies are not based on the entire continuum of manufacturing firms and are focused exclusively on the firms in the formal sector. Additionally, the emphasis has been largely on assessing the role of the *de jure* nature of reforms and ignoring the *de facto* measures.[6] In developing countries, due to weak enforcement and large evasion, a big gap between the *de facto* and *de jure* regulation is observed (Almeida and Susanli, 2011). Hence, examining the role of both *de facto* and *de jure* labour regulation on firm growth is extremely important.

This study endeavours to address these gaps in the literature and study the importance of labour regulation in explaining the lack of transition of firms in the Indian manufacturing sector.

2.6. Implications on Firm Growth

Firm transition has various positive implications in both the developed and developing countries (Audretsch, 2002; Hijzen *et al*., 2010; Ayyagari *et al*., 2011; Haltiwanger *et al*., 2013). For example, Silveira (2022) found that the transition of firms from small to large size category has a strong role for enhancing productivity in developing countries.

[5] The criticism on Bhattacharjea (2006) on Besley and Burgess (2004) is twofold; firstly, inappropriate interpretation of IDA amendments made by various states and the aggregation technique used to assess the annual direction of changes is improper; secondly, the focus was exclusively on the *de jure* nature of reforms and neglected *de facto* measures (Roy *et al.*, 2020).

[6] De jure and de facto, measures can also be referred to as regulations on paper and regulations in practice, respectively.

The small firm growth creates new jobs and bring technological advancement (Audretsch, 2002; Hijzen *et al*., 2010). Similarly, Delfmann and Koster (2016) also highlighted the importance of growth of small firms creating new employment opportunities. Small firm growth is also associated with reducing the crime level and facilitate higher economic growth (Islam, 2014).

2.7. Summary and Gaps in the Existing Literature

There is a large body of literature that examines the role of access to finance, infrastructure and labour regulations in explaining the firm transition, but is limited to the experience of developed countries. The available evidence for developing countries is mostly confined to the formal sector or lacks rigorous empirical scrutiny. Little is known about the role of each of these factors in explaining the lack of firm transition. To capture the role of factors in explaining the presence of the missing middle, one needs to focus on the entire manufacturing sector, covering the continuum of firms from the smallest to the largest firms. The existing studies have relied on datasets that are not representative of the entire manufacturing sector or have based their entire analysis on datasets that are outdated.

In the Indian context, investigations are limited to providing a broader picture of firm transition, not on the factors determining the firm transition. Even the studies that highlight the possible factors driving firm transition their expositions are based on suggestive evidences. Given this gap in the literature, the present study examines the role of access to finance, infrastructure, and labour regulations in explaining the lack of firm transition in Indian manufacturing.

Additionally, while much of the focus is on examining the importance of each of these factors in firm transition, virtually no study has tried to understand the productivity and

wage implications of small firm transition. It is equally important to gauge the role each of these factors play in explaining the productivity and wage gaps in developing countries. Such an investigation would also permit us to get insights on how lack of firm transitions, especially small firm transitions, influence the performance of the overall manufacturing sector. The present study also endeavours to address this gap in the literature by examining the role of small firm transitions in enhancing the productivity and wages in Indian manufacturing. Additionally, the role of access to finance, infrastructure, and labour regulations in explaining the productivity and wage gap between small and large firms in Indian manufacturing is also analysed.

CHAPTER 3

DATA AND METHODS

3.1. Introduction

This Chapter provides a discussion on the data sources used in the study. The Chapter begins by providing a brief introduction to the various data sources on Indian firms. We then move to the detailed discussion of our main data sources, Annual Survey of Industries (ASI) and Surveys on Unorganised Manufacturing Enterprises by the National Sample Survey Office (NSSO). Besides discussing the sampling strategy employed by the ASI and the NSSO, this chapter also deliberates on the various steps employed to prepare the final dataset for analysis. Further, the measurement issues and challenges faced in estimations are also discussed. Additionally, this chapter also presents an overview of the methods employed to address the objectives of the study.

The rest of the discussion in the chapter is organised as follows. Section 3.2 provides a detailed discussion about the datasets used and their official sources. Besides, the section also explains the various steps performed to clean and process the data for final analysis. Section 3.3 provides a brief discussion on the various statistical and econometric methods employed to address the objectives of the study. Section 3.4 presents the concluding remarks.

3.2. Data on Indian Manufacturing Firms

Firms in India fall under two broad categories, formal sector and informal sector.[7] All the formal sector firms[8] (factories or units) are registered under the Section 2m(i) and 2m(ii) of the Factories Act, 1948. This includes all units employing 10 or more workers if using electricity in their operations and 20 or more workers if not using electricity in their operations (Kathuria *et al*., 2013). The Bidi and Cigar units adhering to this criterion and registered under the Bidi and Cigar Workers (Conditions of Employment) Act, 1966, are also included under the formal manufacturing sector (Manna, 2010). The Factories Act regulates the conditions of work in the formal sector as well as lays down regulations on hours of work, leave with wages and holiday provisions for workers which employers need to strictly adhere to or face stringent penalties (Kathuria *et al*. 2013). The informal sector firms, by default, are those firms which fall outside the purview of the Factories Act. These firms generally operate outside the tax net and are outside the purview of regulatory measures like industrial licensing or labour laws.

Informal sector firms are quite heterogeneous. Firms in the informal sector are found to be operating with family labour or hired labour or both. Raj and Sen (2016) classify the firms in this sector into three types based on the nature of labour employed: very small pure household firms (PHFs), mixed household firms (MHFs), which are somewhat larger, employing both family and atleast one hired worker, and non-household firms (NHFs) employing mostly hired labour. Studies have raised apprehensions on the quality of data on firms employing family labour (Kathuria *et al*., 2013; Banerjee and Duflo, 2008). One concern is related to the very reason that these

[7] The formal and informal are interchangeably referred to as organized and unorganized in the official statistics for India.
[8] The term 'firm' refers to an enterprise, a factory or an establishment.

firms are into the business. A large chunk of these firms operates their business with the sole objective of earning additional income with little effort and are unlikely to expand or invest in their businesses (Banerjee and Duflo, 2008). As this study focuses on firm transition and its possible drivers, the focus is solely on those firms that look to grab opportunities to expand their business and move to higher size category. We argue that firms that constantly look to expand are likely to modify their behaviour in response to policy changes. Hence, we exclude household firms (both PHFs and MHFs) from the purview of our analysis. Additionally, combining the formal sector firms with the NHFs, will take our analysis in line with international statistical practices as in most countries the NHFs are also part of the registered sector, where the cut-off point being generally 5 workers (Mazumdar and Sarkar, 2013).

As stated earlier, since the objective of the study is to locate the factors that explain the lack of mid-size firms in the firm size distribution, a data source that cover the entire continuum of firms in the Indian manufacturing sector is required. In other words, a dataset that can provide the relevant information pertaining to NHFs and firms in the formal sector is vital to address the objectives. Unfortunately, there exist very few datasets that impart information for both small (informal) and large (formal) firms in India. The Indian statistical system encompasses a very rich database on industrial sector, which include sources such as Annual Surveys of Industries, surveys of unorganised manufacturing firms conducted by the National Sample Survey Office (NSSO), Economic Censuses and Census-cum Survey of Micro, Small and Medium Enterprises (Manna, 2010). Besides, the enterprise survey dataset developed by the World Bank also collects data on Indian firms. The main limitation of these datasets is that their scope is limited to either formal sector firms or small firms. Moreover, most of the available datasets are outdated. For example, the recent data on MSMEs by the

Census-cum Survey of Micro, Small and Medium Enterprises (MSME), which provides wide-ranging information on MSMEs, is for the period 2006-07. In other words, there is absence of a fixed periodicity of data collection for the census of MSME sector on a regular basis. In case of combining two datasets, one needs to ensure that both are available for comparable years.

To arrive at a dataset that addresses the above concerns and also covers the entire continuum of firms ranging from small to large firms, we merge the Annual Survey of Industries (ASI) by the Central Statistical Office (CSO) with the Surveys on the informal sector firms conducted by the NSSO. While the former focuses exclusively on the formal sector firms, the latter covers firms in the informal sector. One major advantage of these two datasets is that they are available for comparable years, and also for recent years. Further, these datasets collect information that permits us to construct measures representing constraints at the firm level and their influence on firm transition. In the next section, we provide a discussion on the two data sources, which we relied upon for constructing the combined dataset.

3.2.1. Annual Surveys of Industries (ASI)

The ASI is the principal source of information on investment, employment, wages, value of inputs and output, and various other statistical information of the factory sector in India (Chattopadhyay, 2012). This is the most comprehensive database on formal sector firms in Indian manufacturing sector and covers virtually all large formal manufacturing establishments in India. The ASI was commenced in 1960 with 1959 as the reference year and is continuing since then except for 1972. The primary unit of enumeration in the survey is a factory, and data are based on the returns/questionnaire filed by factories. The survey also covers Bidi and Cigar manufacturing units registered

under the Bidi and Cigar Workers (Conditions of Employment) Act, 1996. The data produced by the ASI is widely used for national accounting purposes including estimating the share of formal manufacturing sector in GDP and GSDP. The annual data from ASI is also used in monitoring the performance of formal manufacturing sector over time.

The ASI survey frame is prepared from the lists of registered factories/units maintained by the Chief Inspector of Factories (CIF) in each state and those maintained by registration authorities in the case of Bidi and Cigar establishments. The frame is updated periodically by the Regional Offices of the Field Operations Divisions of NSSO in consultation with the Chief Inspector of Factories in the state. During revision, de-registered factories are removed, and newly registered factories are included. The ASI frame has always been classified into two sectors, namely, the Census sector and the Sample sector. All the factories employing 100 or more workers are treated as part of the Census sector (ASI, 2013). The rest are covered under the sample sector. The ASI enumerates all factories in the Census sector on a complete basis every year. A sizeable number of units under the sample scheme are also surveyed every year following a well-designed sampling procedure. A unit in the sample scheme, however, may or may not be surveyed in two consecutive years. The ASI adopt best possible mechanism of data collection for controlling the sampling errors associated with the survey-based estimates (Manna, 2010).

3.2.2. Surveys on Unorganised Manufacturing Sector

Unlike the case with formal sector firms, there is no periodical collection and publication of statistics for firms in the unorganized manufacturing sector as a whole and on an All-India basis. Realising the importance of unorganised manufacturing

sector in terms of its share in gross domestic product and employment, the NSSO has been assigned the task of collecting information on firms in the unorganised sector. Consequently, this subject has been brought under the coverage of surveys conducted by the NSSO. The first such survey, covering only the household enterprises, was carried out during October 1953 to March 1954 (7th round). Similar exercise was continued in the 10th (1955-56) and 14th (1958-59) rounds. In order to get a complete picture of the manufacturing sector, the non-household enterprises were also covered in the 23rd (1968-69) and 29th (1974-75) rounds. Incomplete coverage of enterprises in the non-agricultural sector put a damper on the efforts to provide an overall picture of the unorganised sector, and hence the manufacturing sector.

The NSSO felt the need to devise a better sampling frame to produce more precise estimates on important parameters of the unorganised sector. This led to the commencement of periodic economic censuses, which later formed the source for developing the sample frame for conducting follow-up sample surveys. Seven economic censuses followed, one each in 1977, 1980, 1990, 1998, 2005, 2013 and 2019. These censuses covered unregistered enterprises in manufacturing, trade, transport and services sectors. The surveys that followed the economic censuses focused on enterprises in the non-factory sector. These surveys constitute rich data source for firms in the manufacturing sector and provide firm-level information such as the nature of activity, employment, emoluments, inputs, output, inventory of fixed assets, working capital and outstanding loans.

Eight surveys on the enterprises in the unorganised sector were conducted in 1978-79, 1984-85, 1989-90, 1994-95, 2000-01, 2005-06, 2010-11 and 2015-16. In all the surveys, the enterprise formed the basic unit of inquiry. The eligibility criterion for

enterprises to be covered in this survey is at least 30 days of operation (15 days of operation for seasonal enterprises) during last 365 days. They are large-scale surveys covering all states and Union Territories (UTs). For instance, the surveys conducted in 2000-01 and 2005-06 covered the whole of the Indian Union except (i) Leh and Kargil districts of Jammu and Kashmir, (ii) villages situated beyond 5 kms. of bus route in the state of Nagaland and (iii) inaccessible villages of Andaman and Nicobar. In the recent surveys conducted in 2010-11 and 2015-16, Leh and Kargil districts of Jammu and Kashmir were also covered.

The NSSO adopted a stratified sampling design to arrive at the first stage units (FSUs) for the surveys; villages (Panchayat wards in the case of Kerala) in rural areas and urban frame survey (UFS) blocks in urban areas. List of villages/urban blocks were drawn from the Economic Censuses and were used as the sampling frame for selecting the FSUs. Table 3.1 presents the list of FSUs surveyed in the last four rounds (56th, 62nd, 67th and 73rd rounds). Enterprises formed the Ultimate Stage Units (USUs), which were selected by employing the circular sampling method (See Manna (2010) for details on the sampling procedure). The number of enterprises (USUs) surveyed in different rounds of NSSO is given in the Table 3.1.

Table 3.1: Number of FSUs and USUs surveyed by NSSO

Survey Round	Number of FSUs			Number of USUs		
	Rural	Urban	Total	Rural	Urban	Total
56th Round (2000-01)	5586	8942	14528	60770	91724	152494
62nd Round (2005-06)	4798	7385	12183	42050	40847	82897
67th Round (2010-11)	8296	7602	15898	51608	47647	99282
73rd Round (2015-16)	8484	7839	16323	43440	39314	82754

Source: Various rounds of NSSO.

3.2.3. Study Period

In this study, we use the unit level data for the formal and informal manufacturing sectors for four years, 2001, 2006, 2011 and 2016. The choice of years is dictated by

the fact that the data on informal sector firms are available only for these years. Our data on informal firms are drawn from four consecutive NSSO survey rounds on the unincorporated manufacturing firms, namely, 56th, 62nd, 67th, and 73rd conducted in 2000-01, 2005-06, 2010-11, and 2015-16, respectively. Consistent with the same timeframe, we obtained data on formal sector firms from the ASI for the periods, 2000-01, 2005-06, 2010-11, and 2015-16. As mentioned earlier, we limit our study to firms in the non-household sector. Hence, we merge the NHEs in the informal sector with the formal sector firms in the ASI to create a continuum of firms in the non-household sector of Indian manufacturing. Our data are in the form of repeated cross-sections, not in the panel form as the NSSO does not reveal the identity of the firms at the unit-level, and the same firms may not be surveyed in each round.

3.2.4. Data Cleaning

A key step in carrying out the analysis is extracting and cleaning the data. Since the data obtained from the NSSO and ASI were in ascii format, a program was written in STATA to extract the data.[9] Data for each survey round is divided into various levels/blocks. We extracted these levels/blocks data using the STATA software. We first imported the block/level-wise data from text file to the STATA software. Then we merged all the blocks/levels using a common identifier supplied by the NSSO and the ASI. We did the same exercise for all the survey rounds of NSSO and ASI. In the next stage, we defined the variables as tabulated in the reports published by the NSSO and ASI. We retained the variables that are used in the study and omitted the remaining variables. We then merged the NSSO and ASI datasets for each year. Finally, we appended the merged dataset for all survey years. Before we began our analysis using

[9] Of late, these datasets are available in various statistical formats, which can be readily used by researchers.

the combined dataset, we checked the accuracy of our dataset by comparing the aggregate estimates for certain relevant variables with the official estimates published by the ASI and NSSO.

3.2.5. Data Concordance

An important problem encountered while comparing the NSSO rounds is the differences in the National Industrial Classification (NIC) followed by the NSSO in its various survey reports. While NIC 1998 formed the basis for industrial classification for 56th round, NIC 2004 was followed in 62nd round. 67th and 73rd rounds followed NIC 2008. We harmonised the whole data using NIC 2008 codes and constructed twenty-three broad industry groups for all four years in our dataset. We have also carried out the same exercise for ASI firms.

Similarly, some new states were formed during the study period. For instance, Bihar, Madhya Pradesh and Uttar Pradesh were bifurcated in 2000 to form new states Jharkhand, Chhattisgarh and Uttarakhand, respectively. We merged these three states with their parent states in order to have consistent data for all the three time periods. Our study period has also witnessed the formation of new districts in many states. We followed the similar approach, merging the new districts with their parent districts, to have a consistent dataset for our study period.

Differences in sampling and conceptual modifications introduced to improve the quality of data collection are likely to affect the comparability of NSSO data over time. Survey coverage has also changed across the rounds. These differences are more of an issue for surveys conducted prior to 2000-01 (Kathuria *et al*., 2010; Raj and Sen, 2016). As our study covers the period since 2001, they are less likely to affect the comparability of NSSO data over time.

3.2.6. Correcting for Inflation

To make the values of the relevant variables comparable over time, appropriate deflators have been used. We employ two deflators, Wholesale Price Index (WPI) and Consumer Price Index (CPI), mainly to convert the nominal values of the variables to real values. We deflate output, gross value added, fixed assets, invested capital using WPI at 2004-05 prices. While output and gross value added are deflated using the WPI for manufactured products, fixed assets and invested capital are deflated using the WPI for machinery and machine tools. To deflate the emoluments, wages and salaries, we relied on the CPI.

3.2.7. Final Sample of Firms

Original sample in the combined dataset consists of a total of 687294 observations, of which 202,436 observations are from the ASI and 484,858 observations are from the NSSO. As discussed earlier, our analysis is restricted to firms in the non-household sector. Hence, we omit firms in the household sector (PHFs and MHFs) from the dataset. Observations from Sikkim, Arunachal Pradesh, Mizoram, Daman & Diu, Dadra & Nagar Haveli and Lakshadweep were also dropped as these states and UTs are not covered in all rounds. Further, in the case of ASI units, we considered only units which were reported to be in operation, and closed units were not considered for the analysis. This elimination led to dropping 477,176 observations. We were finally left with 210,118 observations, of which 160,677 observations were from the ASI and 49,441 observations from the NSSO. The year-wise sample of observations in our dataset is provided in Table 3.2.

Table 3.2: Sample of Firms Used in the Study

Years	Original Data Sample			Used Sample		
	ASI	**NSSO**	**Total**	**ASI**	**NSSO**	**Total**
2001	39074	222360	261434	29620	26465	56085
2006	54259	80525	134784	41512	7677	49189
2011	49153	99243	148396	41827	8190	50017
2016	59950	82730	142680	47718	7109	54827
All Years	202436	484858	687294	160677	49441	210118

Source: NSSO and ASI Datasets, various years.

In Chapter 4, we utilised the full dataset, including both the household and non-household firms, to document the incidence of informality in Indian manufacturing. For the rest of the Chapters, we used the truncated dataset arrived at after dropping PHFs and MHFs. We dropped observations with zero, negative and missing values on employment and invested capital. Further, observations with wrong or missing codes for location were also dropped. The chapter wise detail of the sample size is presented in Table 3.3.

Table 3.3: Size of the Sample in each Chapter

Chapters	Chapter Titles	Data Sample Used		
		ASI	NSSO	Total
Chapter 4	Informality in Indian Manufacturing	160677	484858	645535
Chapter 5	Missing Middle in Indian Manufacturing	160677	49441	210118
Chapter 6	Impact of Access to Finance	148029	48362	196391
Chapter 7	Infrastructure Matters	152841	48475	201316
Chapter 8	Role of Labour Regulations	145716	44200	189916
Chapter 9	Productivity and Wage Implications	160677	49441	210118

Source: NSSO and ASI Datasets, various years.

3.3. Methods

3.3.1. Defining Firm Transition

The primary objective of this study is to examine the role of access to finance, infrastructure and labour regulations in explaining the lack of firm transition in Indian manufacturing sector. Crucial, therefore, is how we define and measure firm transition. Using firm size as our measure of firm transition, we examine the likelihood of a firm moving from one size category to another size category. In our case, we typically expect the transition of firms from small-sized category to large-sized category. Firm size (*SIZE*) is constructed in the form of an ordered categorical variable taking the values ranging from 1 to 7. The values 1 to 7 refer to firm-size categories arrived at based on the number of persons employed by each firm. The seven size categories are as follows: firms with 6 to 9 workers (6-9), firms employing 10 to 19 workers (10-19), firms with 20 to 49 workers (20-49), firms employing 50 or more but less than 100 workers (50-99), firms employing 100-199 workers (100-199), firms with 200 to 499 workers (200-499), and firms employing 500 or more workers (500 and above). The *SIZE* variable is coded as follows: 1 for 6-9, 2 for 10-19, 3 for 20-49, 4 for 50-99, 5 for 100-199, 6 for 200-499 and 7 for 500 and above.

We provide the definition and measurement of access to finance, infrastructure, labour regulations and other relevant variables in the respective chapters.

3.3.2. Empirical Strategy

The study has employed various statistical tools and econometric techniques to address the objectives of the study. The empirical analysis of Chapters 4 and 5 is mostly based on the descriptive statistics like percentages, ratios, growth rates represented through

various charts and tables for an easy understanding of incidence of informality and missing middle in Indian manufacturing. Econometric methods are employed to understand the role of access to finance, infrastructure, and labour market regulations on firm transition in Chapters 6, 7 and 8, respectively. Besides employing an ordered logit model (OLM) to assess their roles in firm transition, we address the endogeneity issues using the two-stage residual inclusion (2SRI) approach. Robustness of the results are also examined by employing a generalised ordered logit model, and a logit model where we categorise firms into just two categories, formal and informal.

In Chapter 9, we have employed the Oaxaca and Recentered Influence Function (RIF) decomposition method to understand the factors that explain the productivity and wage gap between the small and large firms.

As mentioned in Section 3.2, we investigate the effects of access to finance, infrastructure, and labour regulations on firm transition using repeated cross-section data. While some firms might undergo this transition, but we are unable to capture this in our study due to the cross-sectional nature of data employed. In this study, the term 'transition' refers to the shift of the preponderance of firms from the smallest to the largest. This transition may be carried out by individual firms for whom various constraints on growth are relaxed, or, more likely, by the contraction of small firms and the expansion of mid-sized and large firms. We also employ various robustness checks such as Difference-in-Differences (DID) method and synthetic panel approach. These methods are discussed in detail in the respective Chapters.

3.4. Conclusion

This chapter gives an overview of the data sources and methods employed in the study. We merge the Annual Survey of Industries (ASI) by the Central Statistical Office

(CSO) with the Surveys on the informal sector firms conducted by the NSSO to cover the entire continuum of firms ranging from small to large firms. We use the unit level data for the formal and informal manufacturing sectors for four years, 2001, 2006, 2011 and 2016. The study period encounters different NIC codes which is addressed by harmonising the whole data using NIC 2008 codes and constructing twenty-three broad industry groups for all four years in our dataset. The chapter ends with a brief description of the different econometric tools employed in the study.

CHAPTER 4

INFORMALITY IN INDIAN MANUFACTURING

4.1. Introduction

In this Chapter, an attempt is made to examine the levels, trends, and patterns of informality in Indian manufacturing over the period 2001 to 2016. The Chapter also documents whether the incidence of informality varies by various firm characteristics. Besides, an effort has been made to understand the inter-industry and regional variation in informality rates. The correlates of informality and the link between informality and growth, productivity and earnings are also explored. The analysis in the chapter is performed at the firm-level and the industry-level. There do exist some studies that have tried to quantify the informal sector and its role in explaining the performance of Indian manufacturing sector (Ghani *et al*., 2013; Bollard *et al*., 2013; Ghani *et al*., 2015; Raj and Sen, 2016; Kapoor and Krisnapriya, 2018; Sanyal and Sanyal, 2019). However, most of these studies either deal with aggregate data or focus on informal sector alone and are, therefore, insufficient to capture the true nature and magnitude of informality. Additionally, most of these studies have used data that is outdated. We try to address this lacuna in the literature by using a very rich dataset that combines large representative surveys of informal firms with the census-cum-sample data on formal manufacturing firms covering a 15-year period, i.e., 2001 to 2016.

The rest of the chapter is organised as follows. Section 4.2 provides a discussion on the sectoral contribution in India's growth performance since independence. We document the levels, trends and patterns of informality in Section 4.3. The association between informality, productivity, and wages is captured in Section 4.4. We then examine the

growth implications of informality in Section 4.5. Section 4.6 provides the concluding remarks.

4.2. India's Growth Story: A Sectoral Comparison

The average growth of Indian economy has accelerated slowly but steadily since the 1950s (Panel A of Table 4.1). While the growth dynamism was less than desirable in the pre-1980 period, when the economy grew at a rate of 3.4 per cent, the post 1980 growth experience was comparatively better, when the economy grew at a rate of 6.2 per cent (Panel A of Table 4.1). In other words, India's growth rate of GDP broke out of the sluggish levels of the mid-1950s to the late-70s. In the 1980s and 1990s, the economy grew at a rate of 4.8 and 5.5 per cent per annum, respectively. India's growth rate saw a sharp jump in the 2000s and 2010s, though there was a marginal dip in the latter period. The growth rate of GDP averaged 7.1 and 6.0 per cent annually during the 2000s and 2010s, respectively. In comparison, the performance of the economy in terms of generating employment leaves much to be desired. As the long time series data on employment is not available, we rely on the estimates provided by various sources (Panel B of Table 4.1). These estimates clearly suggest that the rate of growth of employment during this period has been extremely small. The growth in employment has been virtually stagnant, at least till 1993. The post-1990s saw slow growth in employment. In fact, there has been a huge drop in jobs in the 2010s. While the annual growth rate fell to 1.1 per cent in the 1990s and to 1.5 per cent in the 2000s, the number of workers declined at a rate of 0.08 per cent per annum in 2010s. Strikingly, this period saw significant reforms in domestic as well as external sectors. The low growth of employment is also substantiated by the unemployment rates presented in Table 4.2.

The unemployment rate shows a secular increase over time by every measure of unemployment and reached alarming levels in the 2010s.

Table 4.1: Rate of Growth of GDP and Employment (in percentage)

Sources	1950-1980	1981-1990	1991-2000	2001-2010	2011-2019	
Panel A: Rate of Growth of Gross Domestic Product						
National Account Statistics, CSO	3.4	4.8	5.5	7.1	6.0	
Panel B: Rate of Growth of Employment						
	1960-1980	**1980-2004**	**1983-1993**	**1993-2000**	**2000-2010**	**2011-2019**
Bosworth, Collins and Veeramani (2007)	2.2	1.9				
Computed from the estimates of Thomas (2016)			2.3	1.1	1.5	
Padhi and Motkuri (2021)						-0.08*

Note: *Thomas (2020) too suggests a decline in employment at an annual rate of -0.04 per cent between 2012-2018.

Table 4.2: Unemployment Rate

Measurement	1972-73	1983	1993-94	2004-05	2009-10	2011-12	2018-19
UPS	1.6	1.9	1.9	2.9	2.5		
CWS	4.3	4.5	4.8	4.2	3.6		
CDS	8.3	8.2	6.0	8.2	6.6		
Padhi and Motkuri (2021)						6.1	17.4

Sources: NSSO's Employment and Unemployment Surveys, various years and Padhi and Motkuri (2021).

Table 4.3: Rate of Growth of GDP by Sector

Period	Agriculture	Manufacturing	Services
1950-1980	2.2	4.9	4.3
1981-1990	2.9	5.4	5.8
1991-2000	3.0	6.2	6.7
2001-2010	2.6	7.9	8.5
2011-2019	2.7	6.6	6.8

Source: Own estimates using National Accounts Statistics, various years.

Table 4.4: Rate of Growth of Employment by Sector

Period	Agriculture	Industry	Services
1960-1973	1.9	1.6	1.7
1973-1983	1.6	4.2	4.5
1983-1987	0.5	2.4	3.3
1987-1993	2.0	1.8	4.1
1993-1999	0.2	1.6	3.1
1999-2004	1.4	4.8	4.4
2004-2012*	-1.9	1.3	4.4

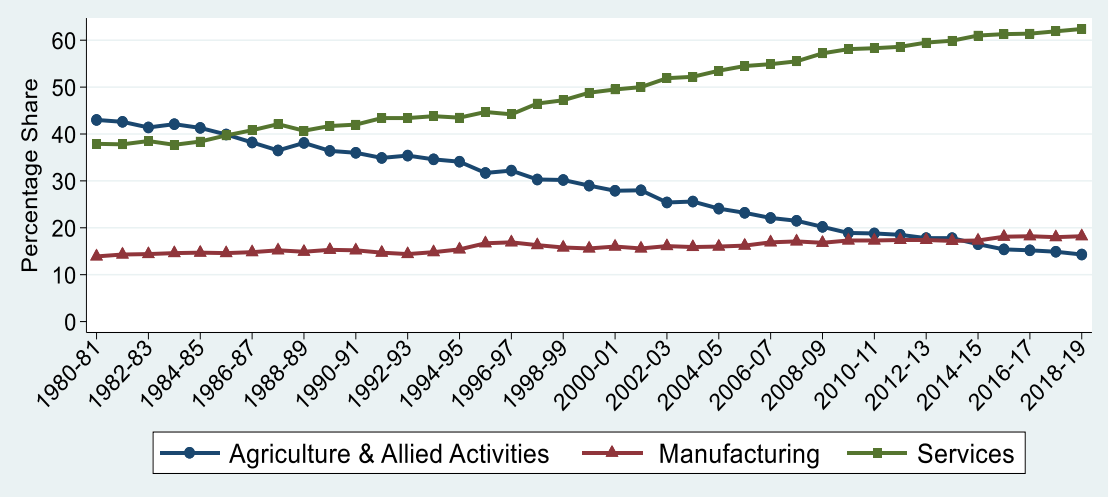
Sources: The estimates for 2004-2012 are computed from Thomas (2014). All other growth figures are obtained from Bosworth *et al*. (2007).

A similar picture can be discerned when we break down the growth of GDP and employment by sectors. Table 4.3 and Table 4.4 present the growth estimates of GDP and employment for three broad sectors of the economy, agriculture, industry, and services. Looking at the growth rates for GDP, it is clearly evident that aggregate growth has been driven more by services than industry post 1980 (Table 4.3). It is also clearly evident from the rising share of service sector as captured in Figure 4.1. The sectoral picture also shows that growth of employment has been lower than the growth of GDP, especially in agricultural and industrial sectors. On the whole, the growth experience of India has shown that production shifted base from the primary to the tertiary sector bypassing the secondary sector, and much of the growth is led by the dynamism of the tertiary sector.

Several studies have highlighted the continuing importance of the industrial sector, especially the manufacturing sector, in the development process of an economy (Bigsten *et al*., 2010; Feijo and Lamonica, 2012; Szirmai and Verspagen, 2015; Haraguchi *et al*., 2016; Lavopa and Szirmai, 2018). However, in the case of India, we observe a sluggish manufacturing sector alongside a rising service sector. The sluggish performance of the manufacturing sector has been widely attributed to the presence of large share of informal firms alongside few formal firms. Such co-existence of less productive informal firms alongside more productive formal firms is likely to have a significant impact on both manufacturing and aggregate economic performance through a misallocation of resources (Ulyssea, 2018; Djidonou and McGregor, 2022). The implication of such misallocation of resources on the growth of the manufacturing sector is negative which eventually pulls back the overall growth of the economy. Scholars have argued that empirical literature ascertaining the growth performance of the manufacturing sector largely ignored the role of informal sector, which is pervasive

in most developing countries including India (Gërxhani, 2004; Huang, 2009; Günther and Launov, 2012; Pais, 2015; Djidonou and McGregor, 2022). Therefore, excluding the informal sector would fail to depict the full picture and would certainly hide the nuances involved with the growth of the economy in general and manufacturing sector in particular. Hence, any assessment on the performance of the manufacturing sector needs a comprehensive approach that considers firms in both the formal and the informal sectors. Recognising this, we delve deeper to analyse the size, structure and trends in informality in the manufacturing sector in the next section.

Figure 4.1: Sector-wise Contribution to GDP in India, 1980-81-2018-19



Source: Own estimates.

4.3. Informality in the Indian Manufacturing

4.3.1. Defining Informality

The attempts made in the past to define informal sector has led to the use of many zoological metaphors. Hans Singer, who led the first employment mission to Kenya in 1972, compared it to a giraffe indicating that it is difficult to define by usual yardsticks but effortless to recognise when you encounter one (Dell'Anno, 2022). To Lautier (1990), it is not a giraffe but a unicorn "*because the literature abounds with definitions, but you will never have the opportunity to meet one, because it does not exist*"

(Charmes, 2016). At times, the metaphor giraffe is replaced with an elephant suggesting that the informal sector is too big for the state to ignore its existence or eliminate it through simple policy measures (Mead and Morrission, 1996; Charmes, 2016). According to Charmes (2016), one could even equate it with a chameleon for its ability to become invisible when the state or the legal system is too restrictive. The lack of agreement on the appropriate faunal metaphor for the informal sector points to the fact that the definition of informality is a complicated one and the debate on its definition is far from being settled.

The discussion above takes us to the central question in the study of informality: what constitutes informal sector and what does not. Although there have been some attempts to arrive at an international definition of informality, there still exists different approaches to understanding the phenomenon.[10] Recent efforts to reconcile these definitional approaches too failed to yield any solution (Dell'Anno, 2016; ILO, 2021; Quiros-Romero *et al*., 2021). Defining informality is further complicated as there is no strict division between formality and informality in the legal sense (De Soto, 1989). At times, one can notice compliance to one regulation and non-compliance to another causing difficulties in labelling an activity as formal or informal. In short, a common solution that can perfectly determine what is informal still eludes us, and, as a result, several criteria such as size of the activity, registration with a government agency and maintenance of regular accounts have been used to capture informality (Benjamin *et al*., 2014). One of the most common criteria often used to define informality or informal sector activity is registration with a government agency (*ibid*). For example, Gelb *et al*. (2009) employed registration with tax authorities to identify informal sector activities

[10] The four dominant approaches include the dualist approach, the structuralist approach, the legalist approach, and the voluntarist approach. See Perry *et al*. (2007) and La Porta and Shleifer (2014) for a discussion on these approaches.

and so did Henley *et al*. (2006) and Benjamin and Mbaye (2014). In this study too, we use this same criteria to define informality. In India, the firms are bound to register under the Factories Act if they employ 10 or more workers, if working with the aid of power and 20 or more workers if working without the aid of power (Mazumdar and Sarkar, 2013). Following the common approach employed in the literature, we classify firms as those belonging to informal sector if they have not been registered under the Factories Act of 1948 (Basole *et al*., 2015; Raj and Sen, 2016; Kesar and Bhattacharya, 2020).

We document the informality in the Indian manufacturing sector using the three main indicators, namely, the number of firms, employment and gross value added (GVA). The term 'firm' refers to an enterprise, a factory, or an establishment, and we use these phrases interchangeably. The total number of persons engaged directly or indirectly in the manufacturing process is taken as a measure of employment. This measure includes workers and supervisory or managerial staff members, irrespective of whether the workers are full-time, part-time, hired, or other workers. GVA is used as a proxy for output and is calculated by deducting total operating expenses and distributive expenses from total receipts. Distributive expenses include excise duties, sales tax, non-deductible value added tax, outward freight and transport charges, and commission to selling agents. We used the wholesale price index for manufactured products at 2004-05 prices to convert the nominal values of GVA to real values.

In this section, we investigate the extent and dynamics of informality across time and space in Indian manufacturing. Firstly, we examine the heterogeneity and changes over time in informality. Specifically, here, apart from analysing the magnitude and trends in informality in Indian manufacturing, we also look at the relationship between

informality and different firm-specific characteristics such as location, ownership, age of the firm, and labour intensity. Our aim here is to see whether there exist significant differences in informality across selected firm characteristics. We then look at the inter-industry and inter-regional differences in informality rates by examining the distribution of informality by sectors and regions.

4.3.2. Significant Informality in the Indian Manufacturing

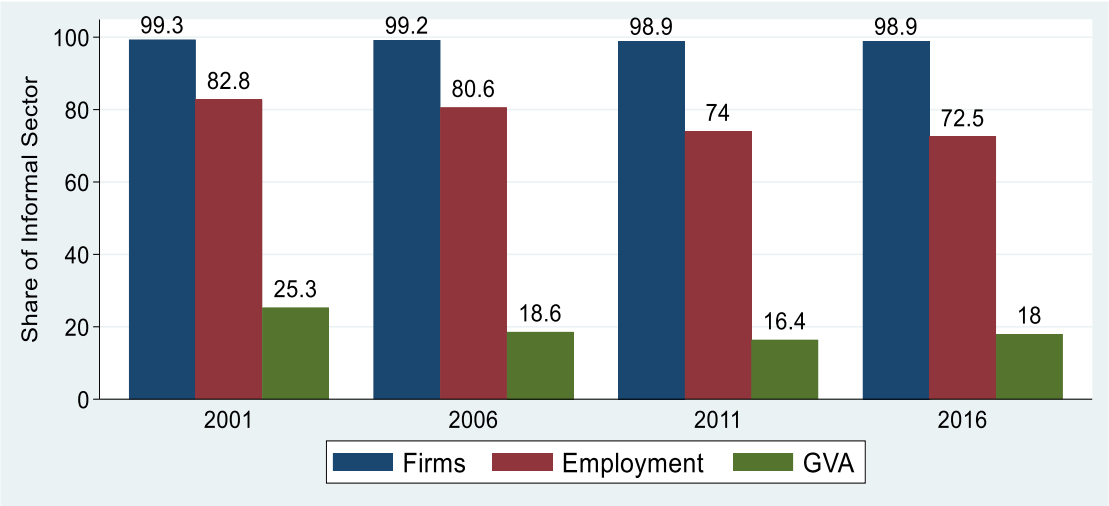
The size of the informal sector is of particular interest to policymakers concerned to promote the development of a micro-entrepreneurial sector (Henley *et al*., 2009). This concern assumes considerable importance for India because the informal sector firms are the least productive among all the firms in the manufacturing sector (Hsieh and Klenow, 2009) and the individuals who own, manage, and work in these firms comprise a large proportion of the urban working poor (Raj and Sen, 2016).

We notice a strong presence of informality in Indian manufacturing. As can be seen from Figure 4.2, about 99 per cent of the manufacturing firms are in the informal sector, with no significant changes noticed over the period 2001–2016. For the last two decades, the informal sector was the largest employment provider in Indian manufacturing. In absolute terms, the number of workers employed in the informal sector declined from 37.1 million workers in 2001 to 36 million in 2016 (Table 4.5). In relative terms, informal sector workers in total manufacturing workforce witnessed a decline from 82.7 per cent in 2001 to 72.5 per cent in 2016, a drop by 10 per cent (Figure 4.2). In consonant with the existing evidence, the share of the informal sector in value added is substantially lower; less than $1/5^{th}$ of the value added by the manufacturing sector in 2016. As is the case with employment, the informal sector's share in value-added too registered a decline by 7 per cent between 2001 and 2016,

from 25.3 per cent in 2001 to 18 per cent in 2016. Despite the decline in its share in employment and value-added, there is still a majority of workers who remain in the informal sector amidst the rapid economic growth witnessed by the country during the study period.

Interestingly, the decline in informality over the period 2001–2016 is primarily due to the faster growth of the formal sector over that of the informal sector (Table 4.5). Between 2001 and 2016, the growth of formal sector surpassed the growth of informal sector in all the three parameters. While the enterprises in the informal sector grew at rate of 1.0 per cent per annum, the formal sector firms increased at a rate of 3.8 per cent per annum in the same period. Employment, on the other hand, registered an absolute decline in the informal sector. In the formal sector, number of workers grew at a rate of 3.9 per cent per annum. Gross value added too registered a faster increase in the formal sector as compared to the informal sector; 9.4 per cent per annum in the formal sector as against 6.3 per cent per annum for the formal sector firms. In short, the growth comparison does not show an absolute decline in the incidence of informality in Indian manufacturing sector. The decline in informality is primarily aided by the faster growth of formal sector over that of the informal sector.

Figure 4.2: Informality in Indian Manufacturing: 2000 to 2015



Source: Own estimates.

Table 4.5: Size Structure of the Indian Manufacturing: 2001 to 2016

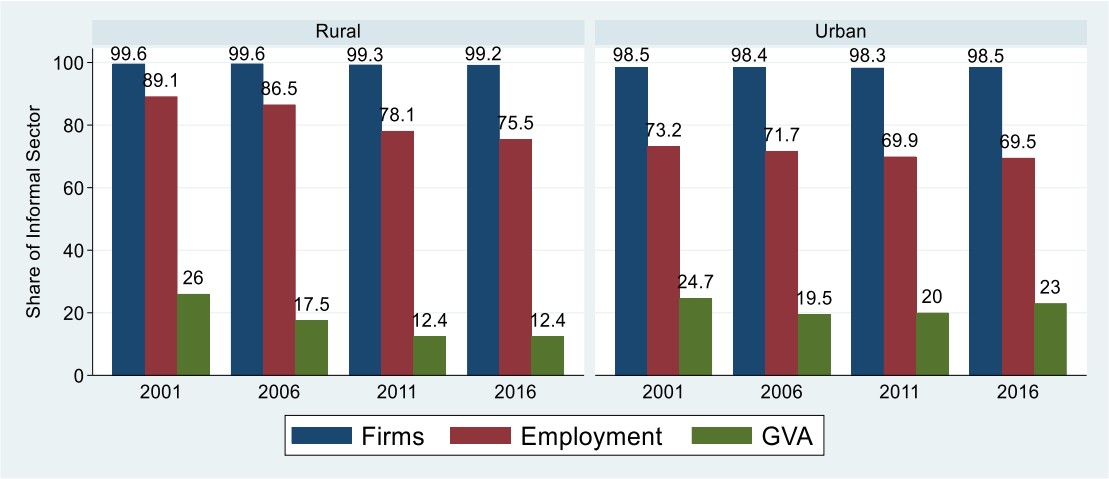
	Number of Enterprises (in Million)			Employment (in Million)			GVA (Rs. in Billion)		
	2001	2016	Growth	2001	2016	Growth	2001	2016	Growth
Informal Sector	17.0	19.7	1.0	37.1	36.0	-0.2	694.9	1737.7	6.3
Formal Sector	0.1	0.2	3.8	7.8	13.7	3.9	2054.9	7902.6	9.4
Total	17.1	19.9	1.0	44.8	49.7	0.7	2749.8	9640.2	8.7

Source: Own estimates.

Figure 4.3 plots the informality rates by location of the firm for the period 2001-2016. According to our estimates, informality is most prevalent among rural firms. Given that the rural share in Indian manufacturing sector (Figure 4.4), the higher share of informality among the rural firms seems to contribute heavily to informality in Indian manufacturing. Over 99 per cent of manufacturing firms and 3/4th of the manufacturing employment in rural areas in 2016 are informal in India. In comparison, informal sector firms and employment constituted 98.5 per cent of the manufacturing firms and 69.5 per cent of the manufacturing employment, respectively, in urban areas. This pattern is reversed for gross value added, and the informal sector occupied a larger share in manufacturing gross value added in urban areas than that in rural areas. While we observe a stagnant share of firms over time in rural and urban areas, there has been a decline in the share of enterprises and employment. The decline was much sharper for the rural firms as compared to the urban firms. The incidence of informal employment

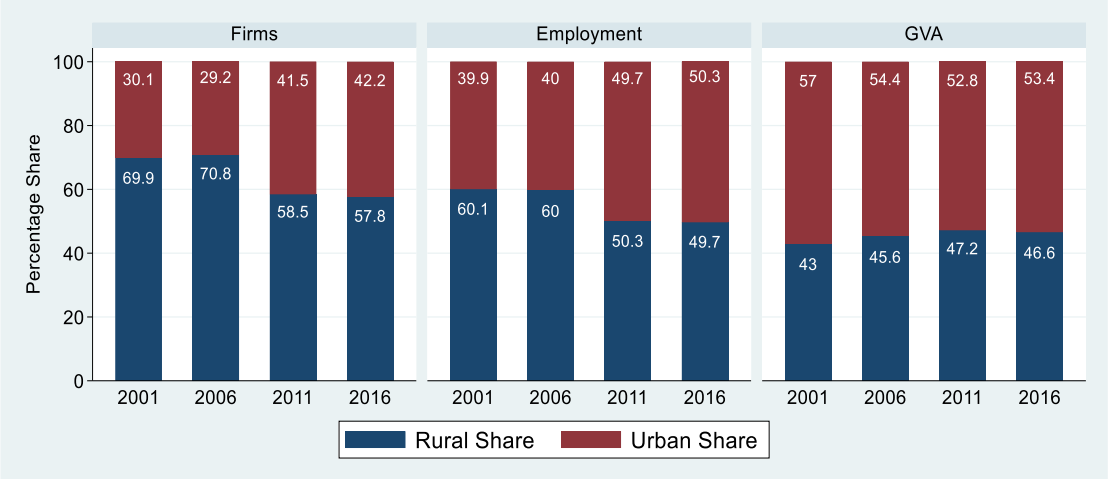
declined by 14 per cent in the rural firms as compared to 6 per cent among the firms in urban areas. The informal share in value added also declined in both rural and urban areas but the share has more than halved for the firms in rural areas. While 26 per cent of the gross value added in rural areas has originated from the informal sector firms in 2001, this ratio declined to 12.4 per cent in 2016.

Figure 4.3: Informality Rates by Location (%, 2001-2016)



Source: Own estimates.

Figure 4.4: Composition by Location (%, 2001-2016)

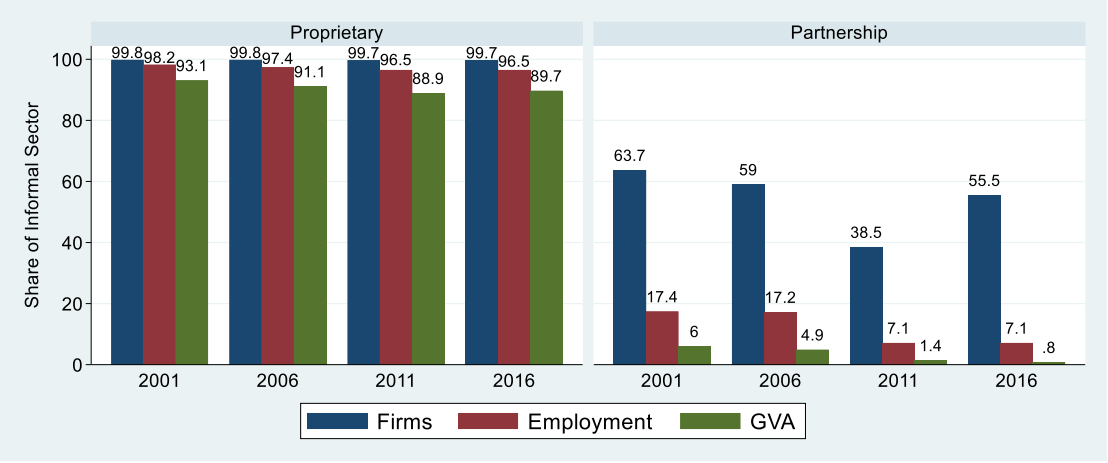


Source: Own estimates.

We next examine whether the informality rate differ considerably across different ownership categories. Based on ownership, we divide the firms into two categories, namely, (a) proprietary firms, and (b) partnership firms. Proprietary firms are those firms where an individual is the sole owner of the enterprise, and they are mostly

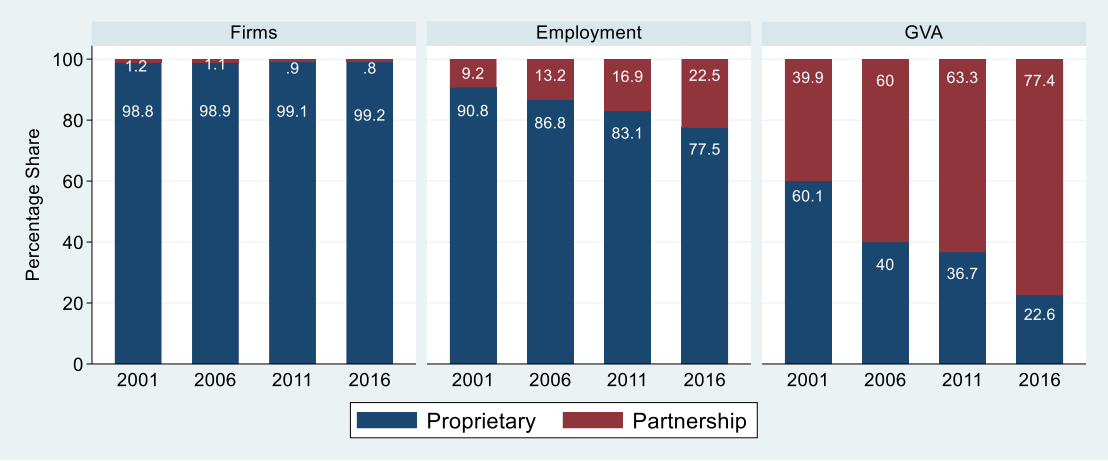
operating from the household. The NSSO define partnership as the "relation between persons who have agreed to share the profits of a business carried on by all or any one of them acting for all' (NSSO, 2002). The partners can be from the same household or can come from different households. We pool both into one category called 'Partnership'. Figure 4.5 shows the informality rates by ownership for the period 2001-2016. We find that the incidence of informality also varies by ownership. As expected, the informality rate is substantially high among firms with single owner, which form bulk of the firms and workers in the manufacturing sector in India (Figure 4.6). Informal sector accounts for over 99 per cent of firms, 96.5 per cent of workers and 89.7 per cent of value added in the proprietary firms. Instead, quite the opposite is found to be the case for partnership firms. Although more than half of the partnership firms in 2016 are informal, only 7.1 per cent of employment and 0.8 per cent of the gross value added in these firms emanate from the informal sector in the same year. While the informality rate has shown a consistent decline over time in partnership firms, this ratio has barely changed among the proprietary firms. In partnership firms, the informality rate has registered a decline of 7 per cent, 10 per cent and 5 per cent, respectively, when we use the share in firms, share in employment and share in gross value added as measures of informality.

Figure 4.5: Informality Rates by Ownership (%, 2001-2016)



Source: Own estimates.

Figure 4.6: Composition by Ownership (%, 2001-2016)

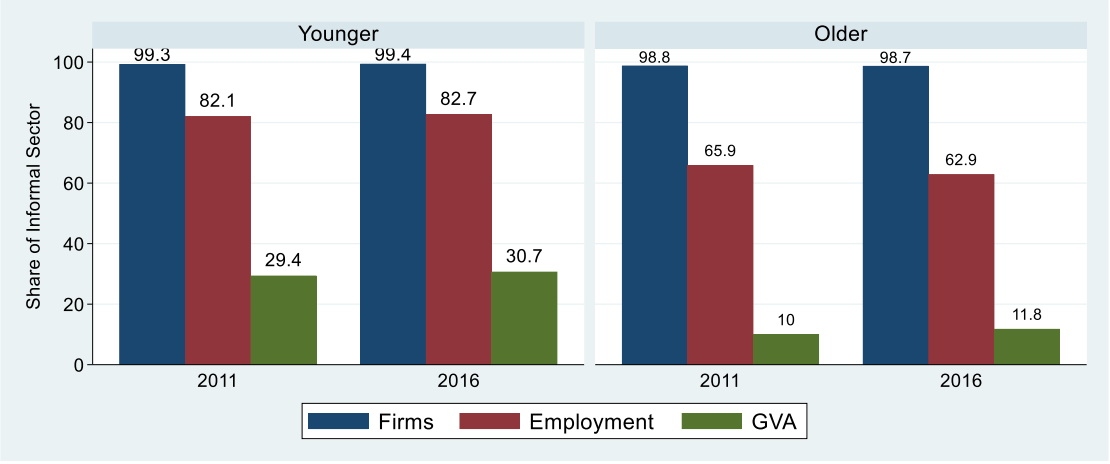


Source: Own estimates.

Is the incidence of informality higher among younger or older firms? We capture this in Figure 4.7 which displays the informality rates by age of the firm. The age of the firm is calculated as the number of years elapsed since the firm started operations. We classify a firm as young if the age of the firm is less than or equal to the median age and as an old firm if the age of the firm exceeds the median age. While younger and older firms occupy almost equal share in manufacturing enterprises and employment, older firms contribute more than 65 per cent share in value added (Figure 4.8). We confine this analysis to 2011 and 2016, as the data on the year of initial operation of

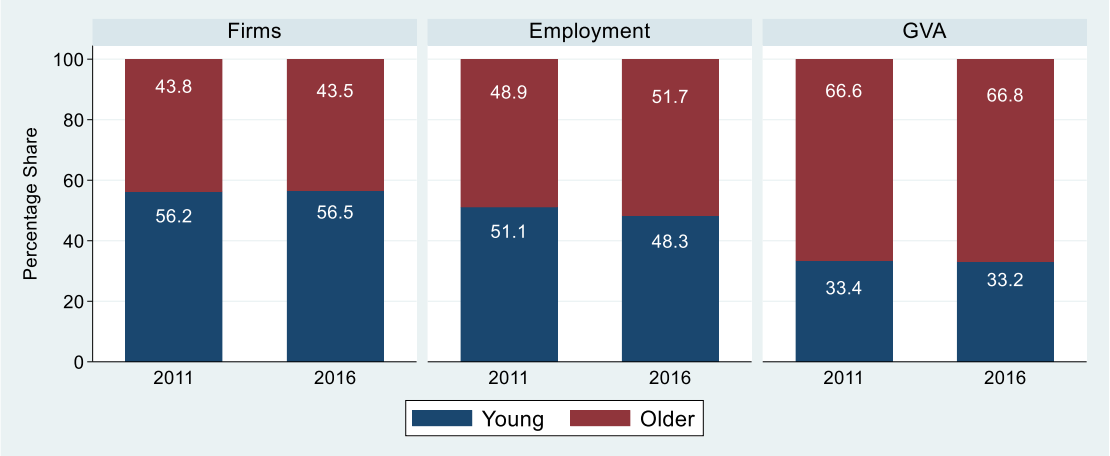
informal sector firms are available only for these two periods. It is clearly evident that the informality rate varies by the age of the firm. Though higher incidence of informality is observed in both younger and older firms, the informality rate is comparatively higher in firms that are younger in age. In younger firms, informality in terms of share in firms, share in employment and share in value added is 99.4 per cent, 82.7 per cent and 30.7 per cent, respectively, in 2016. In comparison, older firms report lower incidence of informality, 96.7 per cent in enterprises, 63 per cent in employment and 12 per cent in gross value added. In short, a higher level of informality is a principal characteristic observed across firms, irrespective of their age.

Figure 4.7: Informality Rates by Age of the Firm (%, 2001-2016)



Source: Own estimates.

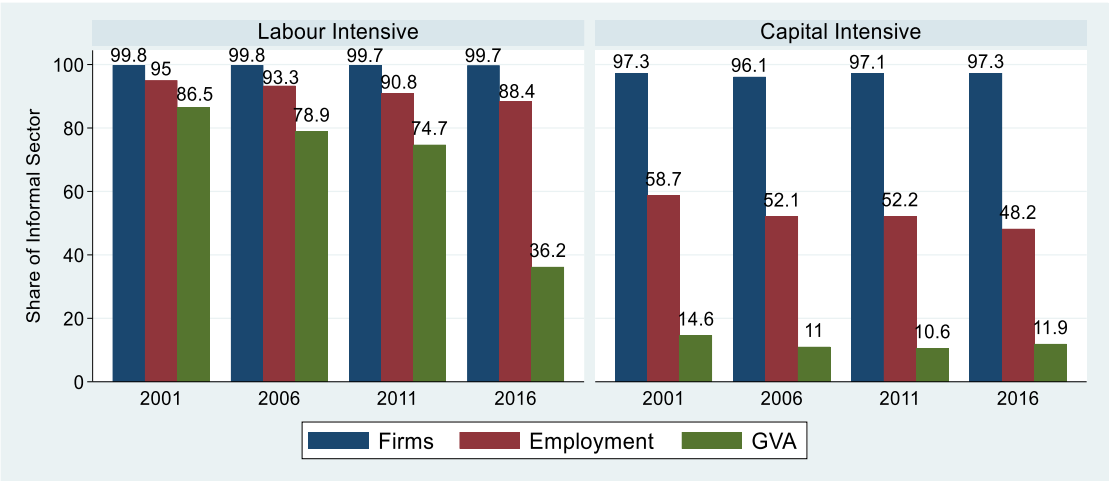
Figure 4.8: Composition by Firm Age (%, 2011-2016)



Source: Own estimates.

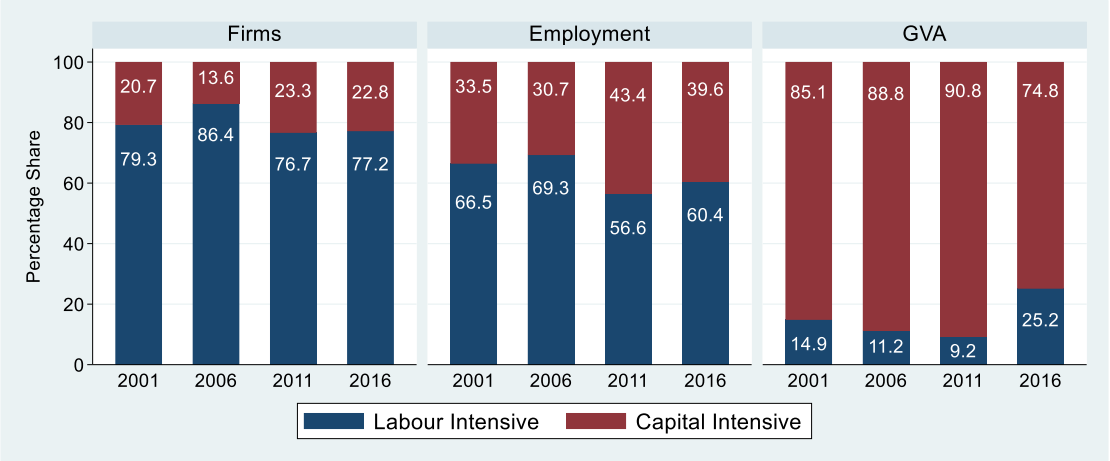
We also examine the incidence of informality separately for capital and labour-intensive firms. We measure capital intensity as the ratio of labour to invested capital. We then classify a firm as capital intensive if the capital intensity is higher than the median value of the capital intensity and as labour intensive if the capital intensity is below or equal to the median value. Based on this classification, we find that majority of firms in our sample are labour intensive (Figure 4.10). We also observe that 3/5th of the workers in our sample in 2016 are employed in labour intensive firms. On the other hand, the contribution of labour-intensive firms in manufacturing value added is considerably low. As our estimates show, informality is more prevalent among labour intensive firms (Figure 4.9). The incidence of informality is higher in labour intensive firms as compared to capital intensive firms. In labour intensive firms, the informal share in enterprises, employment and gross value added in 2016 is 99 per cent, 88 per cent and 37 per cent, respectively. In comparison, 97 per cent of firms, 48 per cent of employment and 12 per cent of gross value added in the capital-intensive firms are accounted for by the informal sector. Over time, the incidence of informality has declined in labour intensive and capital-intensive firms, but the decline is more evident in enterprises and employment.

Figure 4.9: Informality Rates by Capital Intensity (%, 2001-2016)



Source: Own estimates.

Figure 4.10: Composition by Capital Intensity (%, 2001-2016)



Source: Own estimates.

There is significant inter-sectoral variation in the rate of informality. This is what we observe when we examine informality rate by sector. Prior to discussing this in detail, we briefly look at the inter-sectoral composition in number of firms, employment and GVA (Table 4.6). We notice that bulk of the manufacturing activities in India are concentrated in four industry groups, namely, wearing apparel, tobacco products, textiles, and food products. In 2016, they accounted for about 70 per cent of the manufacturing firms and 53 per cent of employment. In GVA, the major contribution came from petroleum products, chemicals, and transport goods. Together, their contribution in GVA amounted to 28.7 per cent in 2016. Results in Table 4.6 also show that the level of concentration has declined for employment and GVA but has increased for firms over time. This is evident from the coefficient of variation and the value of the Herfindahl index; both have shown an increase for firms but a decline for employment and GVA. The share of top three industries, another measure of concentration, too indicates a decline in concentration for employment and GVA, but an increase in concentration for firms.

We now turn to the discussion on informality across industries. As stated earlier, our estimates of informality clearly show that there exists substantial variation in the rate

of informality across industries (Table 4.7). While the incidence of informality is considerably high in industries such as furniture, wood products, and wearing apparels, this ratio is found to be lower in pharmaceuticals, other transport, and petroleum products. In terms of share in enterprises, higher incidence of informality is observed in industries such as furniture, wood products, tobacco products, wearing apparel, and other manufacturing. When it comes to measuring informality using share in employment and value added, industries like furniture, wood products, and wearing apparels stand out. As expected, industries such as pharmaceuticals, other transport, and petroleum products have lower informality across all three parameters.

Table 4.6: Size Structure by Industry Groups: 2001 to 2016

Industry Groups	Firms				Employment				GVA			
	2001	2006	2011	2016	2001	2006	2011	2016	2001	2006	2011	2016
Food Products	16.4	13.7	11.9	11.6	17.1	15.6	12.6	12.8	11.8	8.3	7.5	7.2
Beverages	1.3	1.6	1.2	0.9	1.2	1.5	1.1	1.0	1.1	1.1	1.0	1.0
Tobacco Products	12.3	16.4	12.9	16.5	8.7	10.4	7.4	9.0	2.9	1.9	1.3	1.4
Textiles	13.9	14.9	15.3	13.2	16.2	16.4	15.5	13.2	9.9	7.9	8.2	6.8
Wearing Apparel	16.7	18.9	24.9	28.3	11.5	12.8	15.7	18.0	5.3	4.3	4.7	6.1
Leather Products	1.0	0.9	0.7	0.8	1.2	1.4	1.3	1.7	0.9	0.8	0.7	1.1
Wood Products	16.4	12.5	9.1	6.0	11.8	9.1	6.2	4.6	2.1	1.4	1.1	0.9
Paper Products	0.5	1.0	0.7	0.6	1.0	1.2	1.3	1.0	2.0	1.4	1.5	1.2
Media Reproduction	0.8	0.6	0.9	0.8	1.2	1.0	1.4	1.2	1.0	0.8	1.5	1.2
Petroleum Products	0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.3	3.8	11.9	9.4	11.6
Chemicals	0.6	1.7	1.3	0.9	1.4	2.2	2.4	2.2	10.5	8.3	8.3	9.3
Pharmaceuticals	0.1	0.0	0.1	0.1	0.8	0.7	1.0	1.4	3.8	3.8	4.9	6.3
Rubber and Plastics	0.6	0.5	1.1	0.7	1.3	1.3	2.3	2.1	2.8	2.3	4.1	3.9
Mineral Products	4.9	3.8	3.5	3.2	7.8	6.5	8.0	7.7	6.4	4.8	5.3	4.3
Basic Metals	0.3	0.2	0.4	0.3	1.6	1.7	2.4	2.3	9.9	12.0	10.1	6.4
Metals Products	3.8	3.7	3.7	4.1	4.2	4.5	5.3	5.4	4.5	3.9	4.9	4.3
Electronic and Optical	0.8	0.9	0.1	0.1	1.5	1.5	0.6	0.5	4.1	3.8	2.6	2.2
Electrical Equipment	0.5	0.7	0.2	0.2	1.2	1.3	1.4	1.4	3.4	3.6	4.4	3.9
Machinery	1.0	1.0	0.5	0.5	1.9	2.2	2.1	2.6	4.9	5.0	6.1	6.4
Motor Vehicles	0.1	0.1	0.1	0.1	0.8	1.0	1.7	2.1	3.3	6.3	5.7	7.8
Other Transport	0.1	0.2	0.1	0.0	0.6	0.7	0.6	0.7	1.6	2.6	2.8	2.3
Furniture	2.2	2.5	3.5	4.4	1.7	2.1	2.7	3.4	0.9	0.9	1.1	1.4
Other Manufacturing	5.6	4.3	6.0	4.8	5.3	4.8	5.4	4.4	2.9	2.8	2.2	2.4
Total	100	100	100	100	100	100	100	100	100	100	100	100
Top 3 Industries (%)	49.5	50.2	53.1	58.6	45.1	44.8	44.0	44.0	32.2	32.2	27.8	28.7
Bottom 3 Industries (%)	0.2	0.2	0.1	0.1	1.5	1.6	1.5	1.5	2.8	2.5	2.8	3.0
CV	1.40	1.40	1.50	1.63	1.20	1.15	1.09	1.10	0.75	0.77	0.68	0.70
H-Index	0.124	0.125	0.133	0.149	0.103	0.098	0.090	0.092	0.067	0.068	0.062	0.063

Note: CV stands for coefficient of variations and H-Index stands for the Herfindahl Index.
Source: Own estimates.

Table 4.7: Informality Rates by Industry Groups (%, 2001-2016)

Industry Groups	Firms		Employment		GVA	
	2001	2016	2001	2016	2001	2016
Food Products	99.2	98.4	83.6	74.9	37.0	30.5
Beverages	99.5	98.8	86.2	67.5	24.5	9.6
Tobacco Products	99.9	99.9	87.6	88.6	36.0	32.1
Textiles	99.5	99.3	83.6	76.1	34.6	32.4
Wearing Apparel	99.8	99.8	91.9	87.9	61.5	62.4
Leather Products	98.7	97.2	74.5	54.7	40.9	28.5
Wood Products	99.9	99.6	99.1	96.1	93.5	74.4
Paper Products	96.3	94.0	58.7	49.5	10.2	10.9
Media Reproduction	98.1	97.2	86.5	74.6	53.4	33.0
Petroleum Products	88.3	56.9	24.6	7.7	0.6	0.1
Chemicals	95.1	93.5	42.0	33.4	2.3	1.7
Pharmaceuticals	81.9	55.8	28.7	3.3	1.3	0.3
Rubber and Plastics	93.3	90.1	57.0	39.4	18.0	11.3
Mineral Products	98.6	95.7	87.4	73.6	32.8	24.0
Basic Metals	84.6	81.4	19.0	15.7	3.2	2.3
Metals Products	98.7	97.9	84.2	75.4	44.4	38.4
Electronic and Optical	96.1	85.7	43.0	14.5	5.2	2.2
Electrical Equipment	94.2	83.3	53.1	26.4	14.2	5.9
Machinery	94.8	86.9	53.5	42.9	14.3	17.3
Motor Vehicles	89.3	78.6	29.4	9.3	5.6	1.5
Other Transport	89.4	74.3	25.9	6.8	7.2	1.4
Furniture	99.9	99.8	97.4	96.9	81.0	83.8
Other Manufacturing	99.8	99.7	95.7	85.5	71.3	49.9

Source: Own estimates.

Do we see significant inter-regional variation in informality in Indian manufacturing? We are going to examine it here. We first look at the regional composition in manufacturing enterprises, employment and gross value added. The state-wise share in number of firms, employment and gross value added during the period 2001-2016 is reported in Table 4.8. In terms of the share in number of firms and employment, four states, namely, West Bengal, Uttar Pradesh, Andhra Pradesh, and Tamil Nadu, are the biggest contributors. These three states together contributed more than half of the total firms and about 46 per cent of the manufacturing workforce in 2016. We also notice an improvement in their combined share between 2001 and 2016. In contrast, when it comes to gross value added, Maharashtra, Gujarat and Tamil Nadu added heavily to gross value added. Their combined contribution to gross value added in 2016 stood at 45 per cent, a four percent increase from 2001. The leaders and the laggards, in terms

of the contribution in three parameters, remained more or less the same during the period under study. Results in Table 4.8 also show that the level of regional concentration has increased over time, irrespective of the indicator we employ. This is evident from the coefficient of variation and the value of the Herfindahl Index; both have shown an increase over time for all the three parameters. The share of top three industries, another measure of concentration, too indicates an increase in concentration over the period 2001-2016.

Table 4.8: Size Structure in Major States: 2001 to 2016

States	Firms				Employment				GVA			
	2001	2006	2011	2016	2001	2006	2011	2016	2001	2006	2011	2016
Andhra Pradesh	9.4	9.0	9.4	11.0	9.3	8.5	9.2	9.2	6.3	5.6	6.6	6.3
Assam	1.6	2.2	1.3	1.0	1.4	1.7	1.2	1.2	1.0	1.2	1.0	0.9
Bihar	4.7	4.5	2.6	3.9	3.5	3.4	1.8	2.7	1.3	0.6	0.8	0.9
Chhattisgarh	1.4	1.2	1.0	1.0	1.3	1.3	1.1	1.2	1.7	2.0	1.6	1.0
Delhi	1.4	0.6	1.2	0.9	2.3	1.3	1.8	1.6	2.6	1.2	1.3	1.4
Gujarat	3.2	3.9	8.3	6.4	4.9	6.0	9.5	8.3	11.3	14.5	13.6	15.8
Haryana	1.2	1.4	1.1	1.0	1.6	2.1	2.1	2.3	3.4	4.2	3.6	5.1
Himachal Pradesh	0.6	0.6	0.5	0.5	0.4	0.5	0.7	0.6	0.8	1.5	2.0	2.2
Jammu & Kashmir	1.2	1.0	1.3	1.2	1.1	0.8	0.8	0.8	0.5	0.5	0.5	0.6
Jharkhand	2.6	3.4	1.9	2.5	2.4	2.4	1.7	1.9	2.9	3.4	2.3	1.3
Karnataka	6.1	5.6	5.0	6.3	5.6	5.7	4.8	6.3	5.5	6.5	5.7	6.3
Kerala	3.0	3.9	2.9	2.8	3.1	3.8	2.9	2.7	2.5	2.3	1.7	1.8
Madhya Pradesh	4.3	5.0	5.1	4.2	3.7	4.3	3.9	3.6	3.5	2.2	2.5	2.3
Maharashtra	7.3	6.6	8.1	6.4	9.1	9.0	10.3	8.8	18.7	21.9	19.7	18.4
Orissa	5.7	5.6	3.5	2.5	5.2	4.8	3.3	2.2	2.0	2.2	2.4	1.6
Punjab	2.0	1.7	2.3	2.0	2.4	2.3	2.9	2.6	3.2	2.2	3.0	2.2
Rajasthan	3.7	3.7	3.6	3.8	3.1	3.5	3.5	3.7	3.7	3.0	3.0	3.5
Tamil Nadu	9.0	8.7	9.7	9.0	10.2	10.4	11.5	11.4	10.8	9.3	11.1	10.7
Uttar Pradesh	13.4	13.8	13.5	11.2	13.1	13.1	12.7	11.3	8.2	6.5	6.9	5.8
Uttarakhand	0.8	0.4	0.6	0.4	0.7	0.5	1.0	1.0	0.6	0.9	3.2	4.2
West Bengal	16.2	16.0	15.9	21.1	14.3	13.3	11.9	15.2	6.1	4.4	4.0	3.8
Total	100	100	100	100	100	100	100	100	100	100	100	100
Top 3 States (%)	39.0	38.8	35.1	41.0	33.8	32.7	36.1	37.9	40.8	45.6	44.4	44.8
Bottom 3 States (%)	2.5	1.6	2.1	1.8	2.2	1.8	2.5	2.5	1.9	2.0	2.3	2.4
CV	0.91	0.90	0.94	1.06	0.88	0.85	0.89	0.91	0.98	1.13	1.05	1.06
H-Index	0.083	0.082	0.086	0.097	0.080	0.078	0.081	0.083	0.085	0.098	0.091	0.091

Note: CV stands for coefficient of variations and H-Index stands for the Herfindahl Index.
Source: Own estimates.

Table 4.9 show the informality rates in 2016 at the state level. We find that the informality rate varies significantly across the Indian states. While the incidence of informality is considerably high in states such as West Bengal, Bihar and Delhi, this ratio is found to be lower in Uttarakhand, Haryana, and Himachal Pradesh. In terms of share in enterprises, higher incidence of informality is observed in states such as West Bengal, Orissa, Jammu & Kashmir, Bihar and Jharkhand. When it comes to measuring informality using share in employment and value added, states like Bihar, Jammu & Kashmir, Delhi, and Uttar Pradesh stand out. As expected, states such as Uttarakhand, Haryana, and Himachal Pradesh have lower informality across all three parameters.

Table 4.9: Regional Informality Rates (%, 2001-2016)

States	Firms		Employment		GVA	
	2001	2016	2001	2016	2001	2016
Andhra Pradesh	99.2	98.7	79.2	75.2	26.1	20.0
Assam	99.5	98.2	81.7	65.3	33.4	21.0
Bihar	99.8	99.6	96.3	91.4	69.8	66.9
Chhattisgarh	99.5	98.5	84.1	71.8	11.2	13.7
Delhi	98.6	98.2	88.9	87.8	65.1	63.6
Gujarat	97.6	98.2	67.5	64.0	15.4	15.7
Haryana	97.8	96.0	58.8	37.3	14.0	6.5
Himachal Pradesh	99.5	97.2	79.8	43.5	17.6	3.4
Jammu & Kashmir	99.8	99.6	95.3	84.0	82.2	34.0
Jharkhand	99.7	99.5	84.3	81.6	13.8	15.1
Karnataka	99.4	99.1	81.7	69.8	22.5	20.3
Kerala	99.1	98.8	77.6	76.7	33.4	37.6
Madhya Pradesh	99.6	99.5	86.4	81.6	19.2	20.0
Maharashtra	98.6	97.9	72.5	56.8	16.9	10.0
Orissa	99.8	99.4	94.6	77.4	24.4	12.6
Punjab	98.0	96.9	67.9	53.5	29.6	22.3
Rajasthan	99.2	98.9	83.5	73.3	26.4	22.9
Tamil Nadu	98.7	98.0	75.7	60.1	23.4	18.5
Uttar Pradesh	99.6	99.4	91.2	84.0	35.7	30.3
Uttarakhand	99.5	96.1	85.8	25.0	22.9	2.0
West Bengal	99.8	99.8	91.4	92.0	51.1	49.0

Source: Own estimates.

This section gives us an overview of the informality in the Indian manufacturing sector for the period 2001-2016. We observe a strong presence of informality in the Indian

manufacturing sector. We first begin with the comparison of formal and informal sector and observe that about 99 per cent of the manufacturing firms are in the informal sector and the informal sector was the largest employment provider in Indian manufacturing during 2001-2016. We then examine the variations in informality across firm ownership, location, age of the firm, and capital intensity. We observe significant variations in informality across these firm characteristics with informality being relatively higher for proprietary firms, rural firms, younger firms, and labour-intensive firms. Further, we study the variation in informality at the sectoral and regional level. Our findings unambiguously point to the fact that informality varies hugely across industries and states in India.

4.4. Correlates of Informality

The descriptive analysis carried out in the previous section shows that there is significant variation in informality rate across location, ownership, age, and labour intensity. Our analysis also reveals substantial inter-industry and inter-regional variation in informality in the Indian manufacturing. We now probe how important are these factors in explaining informality in Indian manufacturing. We estimate a basic regression where we regress these firm characteristics on the selected measures of informality. We perform these regression estimations at the 69 broad industry groups across all states and union territories. As firm characteristics, we consider the share of rural firms in total firms (*ShRural*), share of proprietary firms (*ShProprietary*), and labour-intensive industry (*Labour_intensive*). The estimated results are presented in Table 4.10. In column 1, we introduce firm characteristics along with time, industry, and state-fixed effects. We also include state-specific variables in column 2.

Endorsing what we found in our descriptive analysis, our results, using share of employment as a measure of informality, suggest that informality tend to be higher among firms located in rural areas, proprietary firms and industry that are labour intensive. This is evident from the coefficients of *ShRural*, *ShProprietary* and *Labour_intensive,* which are positive and significant at the one per cent level. Regressing these firm characteristics on other two measures of informality, we obtain a positive and significant coefficient of *ShProprietary* in all specifications. The coefficient on *Labour_intensive* is also positive and significant when we use share in GVA as the dependent variable. The results are unaffected even when we control for state-specific factors (Columns 2, 4, and 6 of Table 4.10).

Table 4.10: Regression Results (Dependent Variable: *Informality*)

	Share of Informal Sector Firms		**Share of Informal Sector Employment**		**Share of Informal Sector GVA**	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
ShRural	0.0001	0.00004	0.001***	0.001***	-0.000004	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ShProprietary	0.008***	0.009***	0.005***	0.005***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Labour_intensive	-0.0003	-0.003	0.158***	0.177***	0.147***	0.187***
	(0.007)	(0.007)	(0.009)	(0.009)	(0.011)	(0.010)
State-Specific Controls						
HDI		0.089*		0.209***		0.625***
		(0.053)		(0.064)		(0.086)
Shurban		-0.001***		0.001**		0.0003
		(0.000)		(0.000)		(0.000)
Power		0.010**		-0.052***		-0.096***
		(0.001)		(0.006)		(0.000)
Constant	0.184***	0.101**	0.337***	0.472***	0.573***	0.676***
	(0.026)	(0.042)	(0.030)	(0.048)	(0.036)	(0.061)
Time FE	Y	Y	Y	Y	Y	Y
State FE	Y	N	Y	N	Y	N
Industry FE	Y	Y	Y	Y	Y	Y
N	5562	5562	5562	5562	5562	5562
F	252.94***	302.64***	273.11***	337.93***	136.22***	148.51***
R^2	0.784	0.774	0.710	0.695	0.581	0.539

Notes: (a) *ShRural* is the share of rural firms in all firms, *ShProprietary* is the share of proprietary firms, *Labour_intensive* is a dummy variable and coded 1 if the industry is a labour-intensive industry, *HDI* is the human development index measured at the state, *Shurban* is the share of urban population at the state, *Power* is the per capita electricity consumption in the states; (b) Robust Standard errors are reported in the parentheses; *** p<0.01 and ** p<0.05.
Source: Own estimates.

4.5. Informality, Productivity, and Wages

Given that the incidence of informality is substantially higher in Indian manufacturing, it is important to look at the wage and productivity implications of this rising informality. We explore these relationships in this section. We use GVA per labour as a proxy for productivity. Wages are expressed in real terms (2015-16 prices) using the Consumer Price Index (CPI) deflator. The trends in labour productivity and wages presented in Table 4.11 clearly suggest that informal sector is less productive and workers in this sector earn lower wages compared to their peers in the formal sector. According to our estimates, workers in the informal sector are about 11 times less productive than the workers in the formal sector in 2016. Similarly, workers in the informal sector earn about 15 times lower wages compared to formal sector workers in 2016. Interestingly, the productivity gap between the informal sector and the formal sector has widened substantially during the period 2001 to 2016. During the period, the inequality in earnings has also widened. We explore these relationships further in Figure 4.11 in two scatter plots[11], where we capture the relationship between informality and productivity, and informality and wages. The two plots unambiguously suggest a negative relationship between informality and productivity, and wages. In other words, industries with higher incidence of informality tend to be less productive and tend to pay less to workers.

[11] These plots are generated at the industry level combining the data for the entire period.

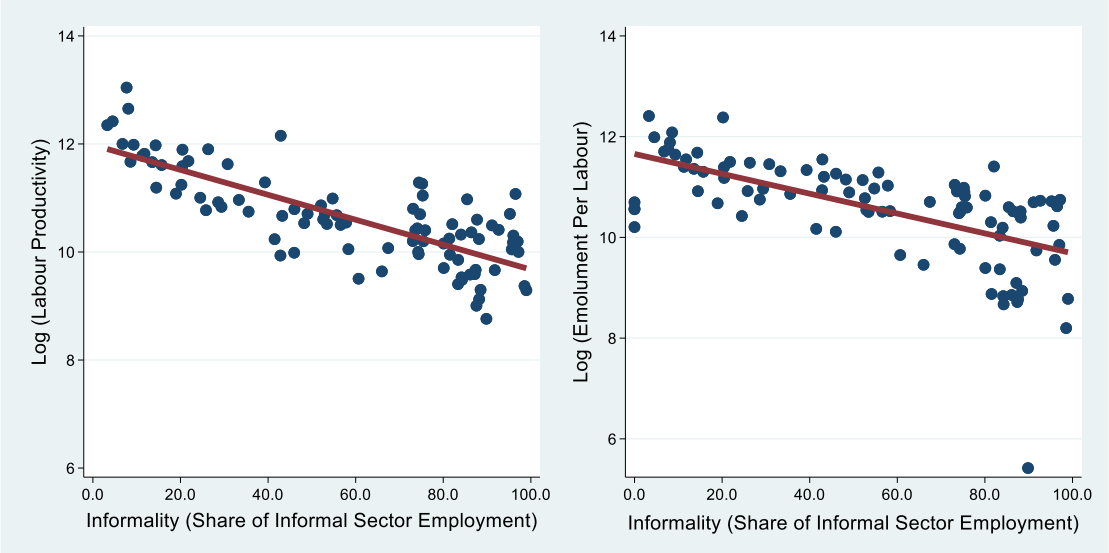
Table 4.11: Informality, Productivity and Wages: 2001 to 2016

(Rs. in Hundred Thousand)

Year	Informal Sector	Formal Sector	Total	Productivity/Wage Gap[a]
Labour Productivity				
2000-01	0.2	2.7	0.6	2.5
2005-06	0.2	3.9	0.9	3.7
2010-11	0.3	4.9	1.5	4.6
2015-16	0.5	5.8	1.9	5.3
Emoluments Received Per Labour				
2000-01	0.2	2.4	0.5	2.2
2005-06	0.4	2.4	0.8	2.1
2010-11	0.2	2.7	0.9	2.5
2015-16	0.2	3.0	1.0	2.7

Note: [a] Refers to the gap in Productivity and Wage between the formal and the informal sector.
Source: Own estimates.

Figure 4.11: Informality, Productivity and Wages



Source: Own estimates.

We also formally examine how the incidence of informality influences the level of productivity and wages in Indian manufacturing. To do this, we estimate the following expression:

$$Y_{j,s,t} = \beta_0 + \beta_1 INFT_{j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{j,s,t} \quad (4.1)$$

where the dependent variable ($Y_{j,s,t}$) is labour productivity (*LP*) in *j* industry in *s* state at time *t*. We also estimate equation (4.1) using emoluments received per labour (*EPL*) as the dependent variable. *INFT* is our measure of informality, which is share

employment in total employment.[12] $X_{s,t}$ is a vector of state-specific controls representing the state-level differences in human capital, urbanisation and power infrastructure. α_j, ε_s and γ_t stand for industry-, state-, and time-specific fixed effects, respectively.

The results are reported in Table 4.12. Our results show that informality bears a negative association with productivity and earnings. To be precise, a unit increase in informality in an industry reduces the level of productivity of that industry by 1.3 per cent. Similarly, a unit increase in informality in an industry reduces the level of wages in that industry by 3.1 per cent (Column 4 of Table 4.12). Our findings based on the analysis here perhaps endorse the argument that the significant presence of informality and the huge productivity and wage gaps between the formal and informal sector firms are perhaps pulling down the overall productivity of the Indian manufacturing.

Table 4.12: Informality, Productivity, and Wages: Regression Results

Variables	Labour Productivity		Emoluments received per labour	
	(1)	(2)	(3)	(4)
Informality	-0.012***	-0.013***	-0.031***	-0.031***
	(0.001)	(0.001)	(0.001)	(0.001)
State-Specific Controls				
HDI		-0.485		-0.895*
		(0.532)		(0.529)
Shurban		0.001		0.006***
		(0.002)		(0.002)
Power		0.317***		0.436***
		(0.050)		(0.052)
Constant	11.559***	10.316	11.914***	9.872***
	(0.201)		(0.245)	(0.412)
Time EF	Y	Y	Y	Y
State FE	Y	N	Y	N
Industry FE	Y	Y	Y	Y
N	5562	5562	5562	5562
F	40.89***	38.17***	67.79***	84.34***
R^2	0.201	0.179	0.501	0.458

Notes: Robust Standard errors are reported in the parentheses; *** p<0.01, ** p<0.05 and * p<0.1.
Source: Own estimates.

[12] We also re-estimated equation 4.1 using the other two measures of informality and our results do not vary.

4.6. Conclusion

In this Chapter, we document the presence and persistence of informality and its relationship with growth, productivity, and wages. We observe a marginal decline in the incidence of informality over time. However, this decline is primarily aided by the faster growth of formal sector over that of the informal sector. We also examine the magnitude of the informality by selected firm-specific characteristics such as location, type of firm, type of ownership, age of the firm, and labour intensity. Our focus is on three indicators namely, the number of firms, employment, and gross value added. The findings of the study reveal that there is a strong presence of informality in the Indian manufacturing sector. Most of the firms (about 99 per cent) and employment (about 72 per cent) fell into the informal sector activities in 2016. We observe significant variations in informality across the firm characteristics with informality being relatively higher for proprietary firms, rural firms, younger firms, labour-intensive firms. Further, we observe significant variation in informality at the sectoral and regional level. Thus, informality in Indian manufacturing is evident across regions, industries, and various firm characteristics.

Despite witnessing high growth in recent period, workers have not been able to escape the informal sector. Such high concentration of workers in the informal sector tends to have an impact on workers' productivity and earnings. Our results show that informality bears a negative association with productivity and earnings. Our findings endorse the argument that the significant presence of informality and the huge productivity and wage gaps between the formal and informal sector firms are perhaps pulling down the overall productivity of the Indian manufacturing.

CHAPTER 5

MISSING MIDDLE IN INDIAN MANUFACTURING

5.1. Introduction

In Chapter 4, an attempt was made to understand the magnitude of informality in Indian manufacturing over the period 2001-2016. There is evidence of significant presence of informality in Indian manufacturing. This dualism -- the co-existence of a large informal sector, alongside a few formal sector firms -- is found to be a drag on the growth and performance of the manufacturing sector. Studies have demonstrated that the lack of transition of small firms is related to the wider problem of dualism (Mazumdar and Sarkar, 2013, Ramaswamy, 2013, Raj and Sen, 2020). Consequently, few firms are found in the mid-sized category in the manufacturing sector. This phenomenon referred to as 'missing middle' in the literature is a chronic problem in the size distribution of manufacturing firms in many developing countries (Sleuwaegen and Goedhuys, 2002; Gall, 2010; Dasgupta, 2016; Pham and Takayama, 2017; Raj and Sen 2020). In this context, it would be both important and rewarding to examine the presence and persistence of missing middle in Indian manufacturing.

There is a small body of literature exploring the missing middle problem in Indian manufacturing (Little *et al*., 1987; Hasan and Jandoc, 2010; Mazumdar and Sarkar, 2009 and 2013; Nagraj, 2018; Kesar, 2020; Raj and Sen, 2020; Parida *et al*., 2021). These studies largely acknowledge the existence of a few mid-sized firms, thus confirming the existence of a missing middle in the firm size distribution of Indian manufacturing. However, most of the studies have based their analysis on data that are not representative of the entire manufacturing sector (Kesar, 2020; Parida *et al*., 2021).

In addition, it is also important to examine the changes in the firm size distribution over time, especially for the later period, as the existing studies have largely relied on datasets that are outdated. Taking cognizance of it, we set out the missing middle problem in Indian manufacturing in this Chapter, using a dataset that covers the entire continuum of firms spanning a period of 15 years. Besides providing an aggregate picture, this chapter also captures its temporal and spatial variations. Further, the Chapter also examines the missing middle problem by various firm characteristics. As it is argued that the persistence of missing middle is a drag on manufacturing productivity, we also compare the productivity differences among firms of different sizes to examine how the skewed size distribution of firms influences productivity.

The rest of the chapter is organised as follows. Section 5.2 presents a discussion of empirical strategy followed in the study. In section 5.3, we documented the missing middle and compare the productivity differentials between firms of different sizes. Section 5.4 provides the conclusion.

5.2. Empirical Strategy

To analyse the missing middle problem in the Indian manufacturing sector, we analyse the distribution of employment across size groups. We confine our analysis to non-household manufacturing sector that largely makes use of hired labour as the dominant type of employment in the enterprise. This includes both the informal sector firms with 6-9 workers that employ mostly hired labour and the firms in the formal sector. The informal sector firms of 6-9 workers include small enterprises in modern manufacturing (Mazumdar and Sarkar, 2013). They are generally considered as part of the factory sector in international comparisons. To put the Indian firm size distribution in manufacturing into perspective, we club them with the firms in the formal

manufacturing sector. We then group the firms into seven categories based on the number of persons employed in each firm. The seven size categories are: firms with 6 to 9 employees (6-9), firms that employ 10 to 19 employees (10-19), firms with 20 to 49 employees (20-49), firms employing 50 or more but less than 100 employees (200-499) and firms employing 500 or more workers (500 and Above). To understand the productivity differentials across various size groups, we present the relative productivity of labour taking the largest firm size category (500 and above) as our reference category. We measure labour productivity as gross value added (GVA) per labour.[13]

5.3. Missing Middle

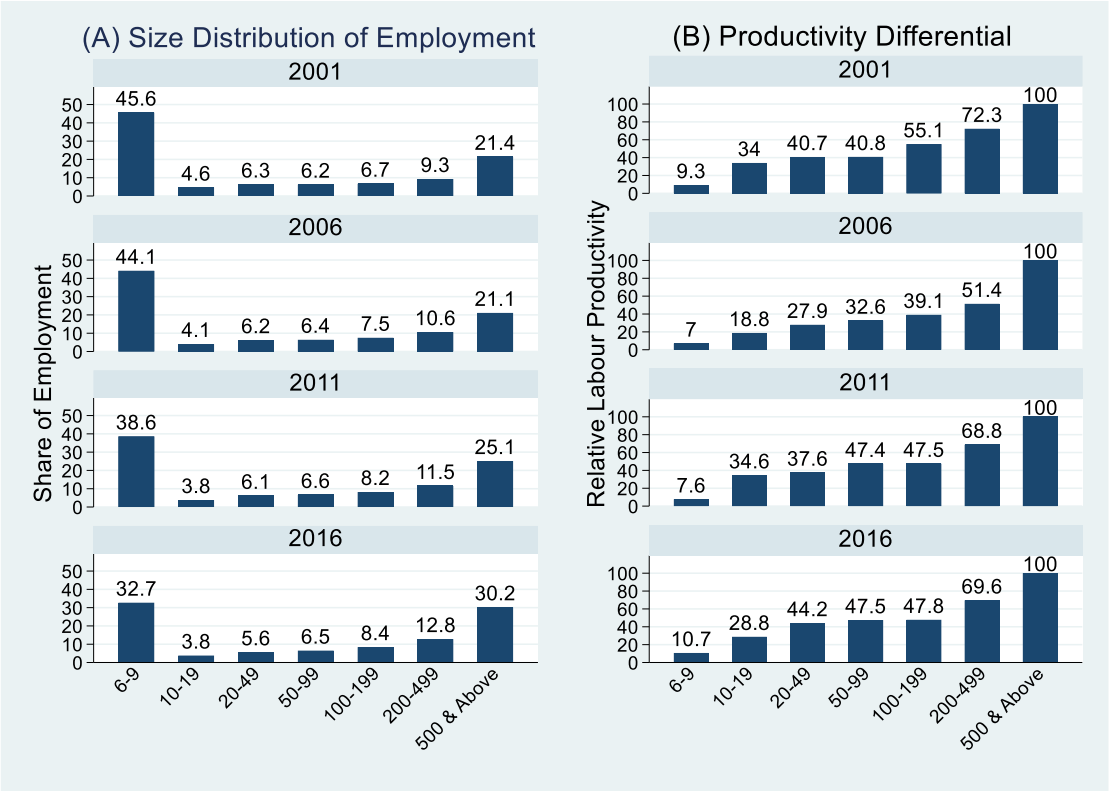
5.3.1. Aggregate Picture

We present the distribution of firm size for the Indian manufacturing in Figure 4.1. In line with the available evidence, the dualistic structure in size distribution of Indian firms is clearly evident in our analysis (Panel A, Figure 5.1). The bulk of the employment is being generated in small (6-9 size category) and large (500 and above size category) firms, with relatively little contribution from the intermediate size groups. Some changes in firm size distribution are witnessed over time, but nothing substantive, even these changes are mostly aided by the 6-9 and 500 and above size categories. This phenomenon referred to as 'missing middle' thus characterises the presence of large number of small firms, some large firms, but very few mid-size firms. In other words, firms that start as small, seldom transform to a medium-sized firm indicating a weak process of upward transition.

[13] For details, please see in section 4.3.1, Chapter 4, where we define the GVA.

In addition to the broader problem of missing middle, the bimodal distribution of employment also has wider implications for firm productivity. There exists a substantial productivity gap between small and large firms and given the vast number of workers employed in small firms it seems evident that there is a potential loss of productivity and welfare gains. This observation is corroborated by the Panel B, Figure 5.1, which points to a large productivity gap between firms employing 6 to 9 workers and those with 500 or more workers. Firms in the 500 and above size category are about nine times more productive than the firms in the 6-9 size category in 2016. Not surprisingly, the productivity gap has barely changed during the period 2001 to 2016. This is an expected outcome as the size distribution of firms has remained more or less the same during the period.

Figure 5.1: Employment and Labour Productivity Distribution by Size Group, 2001–2016



Note: Labour productivity of 500 and above size category equals 100
Source: Own estimates.

Our analysis on firm size distribution reveals two striking characteristics of manufacturing sector in India: (a) strong concentration of manufacturing workforce in small and large enterprises, with a conspicuous 'missing middle'; and (b) large economic distance between small and large firms. These two findings suggest that upward progression of small firms can lead to a significant increase in the growth and productivity of the manufacturing sector.

Next, we consider some important firm characteristics and see whether we observe a similar pattern of employment distribution by firm size across these firm attributes. We consider four important firm attributes, namely, location, type of ownership, age, and labour intensity. Besides, we also see whether firm size distribution varies by firm constraints such as access to finance and access to electricity. Finally, we look at the inter-industry and regional variation in firm size distribution.

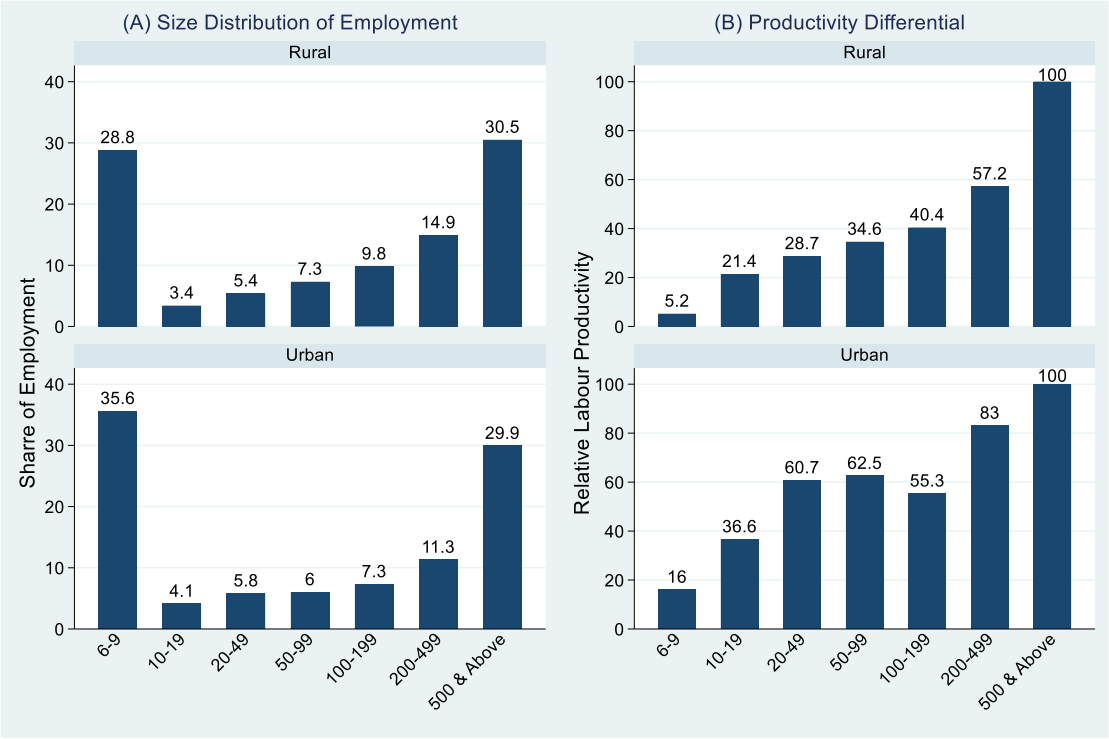
5.3.2. Employment and Productivity Distribution by Firm Characteristics

At first, we examine the missing middle problem by location of the firm. Our rural-urban comparison of the employment distribution by firm size mirrors the pattern that we observed at the aggregate level (Panel A, Figure 5.2). We see very few mid-size firms and a large gap in labour productivity between firms in the 6-9 size category and those in the 500 and above size category in rural and urban areas (Figure 5.2). However, the productivity gap is found to be larger for rural firms as compared to urban firms. In the case of rural firms, the large firms are about 19 times more productive than the small firms in 2016, which is just about 6 times for urban firms (Panel B, Figure 5.2).

We also examine the changes in firm size distribution and productivity differential for rural and urban firms for the period 2001-2016. The changes are captured in Figure A5.1 and Figure A5.2 for firms in rural and urban areas, respectively. We find that the

missing middle is a persistent phenomenon for both rural and urban firms. Although, we witness changes in the employment share of small and large firms, the share of mid-size firms remained unaffected. When we look at the distribution of employment by firm size for rural firms, we notice a surge in the employment share of large firms (500 and above) from 16 per cent in 2001 to 30 per cent in 2016 and a drastic fall in the employment share of the 6-9 size category from 50 per cent in 2001 to 29 per cent in 2016 (Figure A5.1). For urban firms, the employment share of large firms increased from 25 per cent in 2001 to 30 in 2016 and that of small firms declined from 43 per cent in 2001 to 36 per cent in 2016 (Figure A5.2). However, the relative productivity comparison across the firm size categories showed barely any changes in relative productivity for rural and urban firms.

Figure 5.2: Employment and Labour Productivity Distribution by Location, 2016



Source: Own estimates.

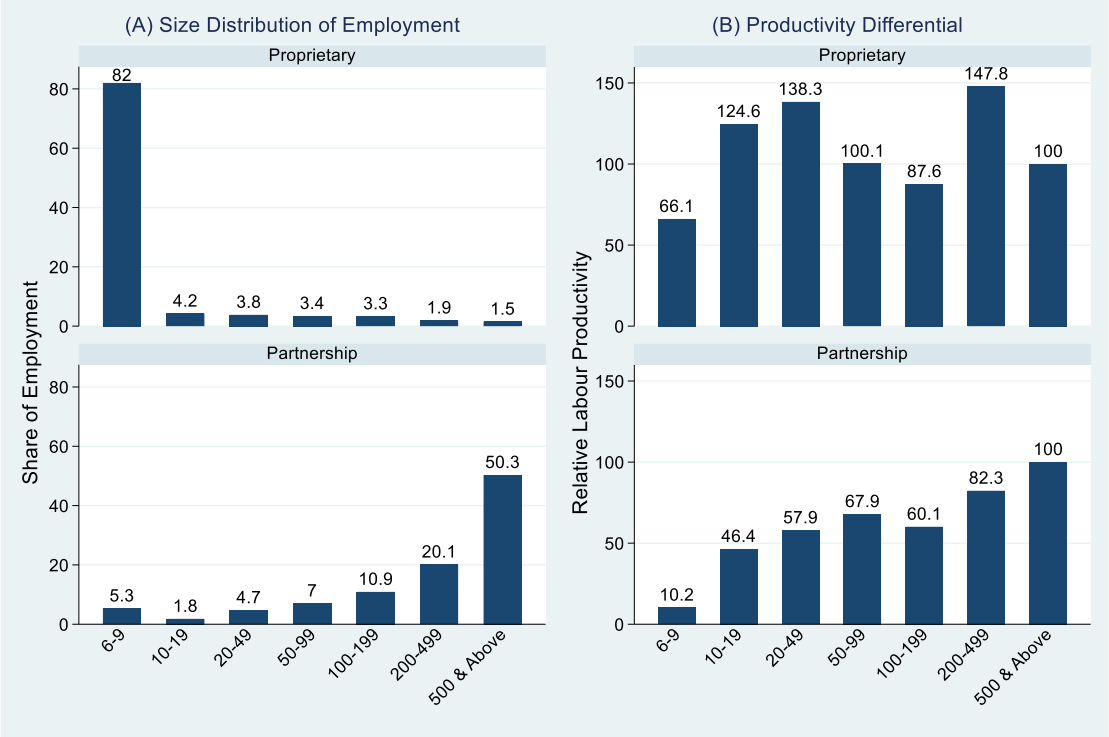
We next analyse the size distribution of employment and productivity based on type of firm ownership. We identify two types of ownership, namely, Proprietary and Partnership firms.[14] Figure 5.3 plots the distribution of employment and labour productivity by ownership across seven size categories in 2016. Unlike the pattern observed for the overall manufacturing, the employment distribution is right-skewed for the proprietary firms indicating that major chunk of the workforce is employed by firms in the 6-9 size category. Our estimates suggest that the 6-9 size category accounted for more than 82 per cent of employment in proprietary firms in 2016 (Panel A, Figure 5.3). Interestingly, the productivity comparison for different size classes in the proprietary category yields an outcome different from the one observed for the aggregate manufacturing sector. In the case of proprietary firms, we do not find significant difference in productivity between different size groups. The domination of large firms over other size categories in labour productivity is visibly absent in proprietary firms. The employment distribution for partnership firms, on the other hand, is left-skewed with the larger firms contributing to larger share in employment.

We do not observe substantial changes in the firm size distribution for proprietary firms (Figure A5.3). The right-skewed distribution of employment across size categories remained more or less the same over the period 2001 to 2016. For these firms, we observed some decline in the share of employment in the 6-9 size category, from 89.8 per cent in 2001 to 82 per cent in 2016. When it comes to the partnership firms, a substantial increase in the employment share of large firms is noticed (Figure A5.4). The share of 200-499 and 500 and above size categories has more than doubled to 70 percent between 2001 and 2016. Further, the gap in productivity between different size

[14] We have defined them in Section 4.3.2, Chapter 4.

categories has increased during 2001-2016 in both proprietary and partnership firms, with the gap being more evident in partnership firms.

Figure 5.3: Employment and Productivity Distribution by Ownership, 2016



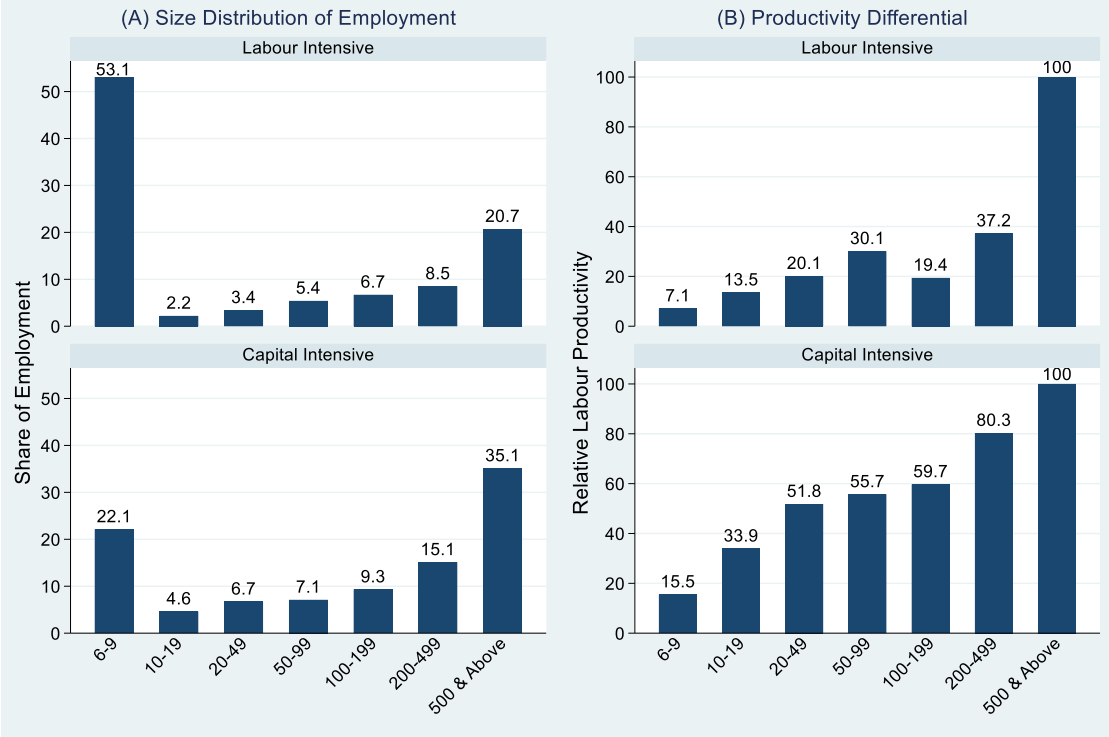
Source: Own estimates.

Figure 5.4 plots the distribution of employment and productivity by firm size separately for capital and labour-intensive industries.[15] In both labour intensive and capital-intensive firms, we observe a bi-modal distribution of employment with relatively smaller shares of inter-mediate size classes (Panel A, Figure 5.4). As compared to capital-intensive firms, a much larger concentration of employment in the 6-9 size category (about 53 per cent) is witnessed in the labour-intensive firms. In contrast, a much larger share of employment in the 500 and above size category is observed for the capital-intensive firms. The productivity difference across different firm size types is evident for both capital intensive and labour-intensive firms with the 500 and above size category is substantially more productive than the firms in the 6-9 size category.

[15] We have provided the definition in Section 4.3.2, Chapter 4.

We also capture the temporal changes in firm size and relative productivity distribution for labour-intensive and capital-intensive firms over the period 2001-2016. Though we observe some changes over time, they are largely aided by the 6-9 and 500 and above size categories (Figure A5.5 and Figure A5.6). In other words, the relative absence of mid-sized firms is evident all through the period under study. A marginal narrowing of productivity gap between large and small firms is observed for capital-intensive firms.

Figure 5.4: Employment and Productivity Distribution by Labour Intensity,2016



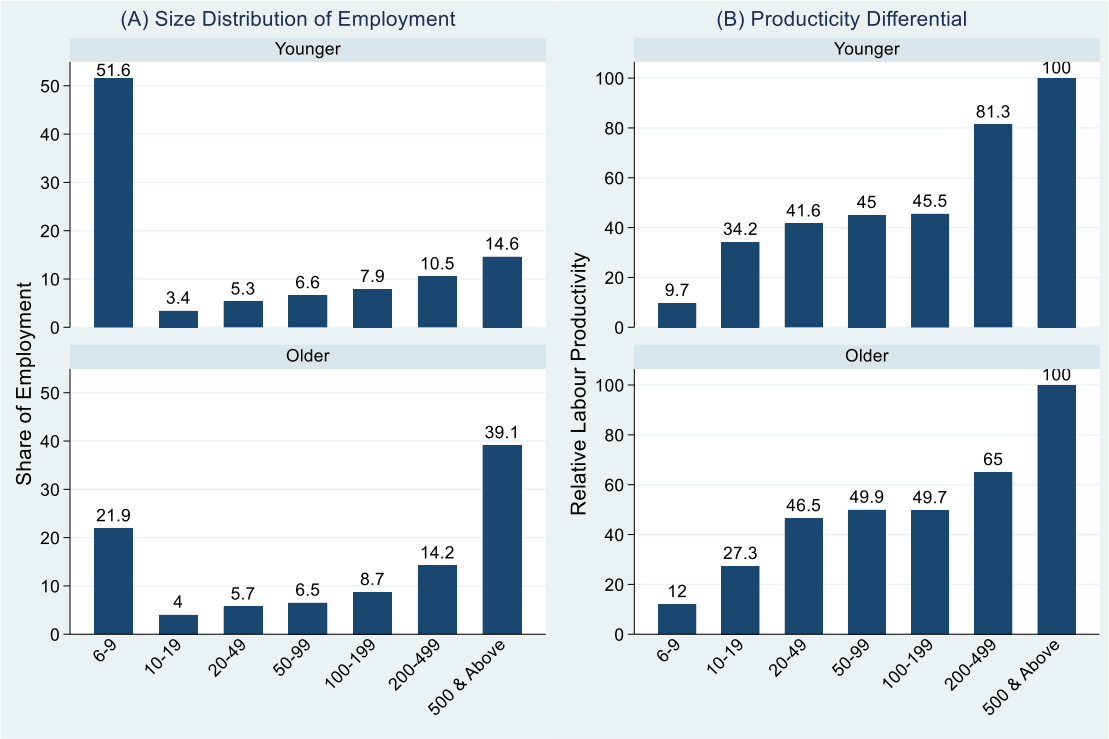
Source: Own estimates.

Focusing on age of the firm, we examine whether there are any significant changes in the pattern of employment and productivity distribution between firms of different age groups.[16] Figure 5.5 plots the size distribution of employment and productivity separately for young and old firms. As discussed in Chapter 4, we classify a firm as 'older', if the age of the firm is above the median age and as 'younger' if the age is

[16] We have calculated the age of a firm as the number of years elapsed since the firm started operations (see Section 4.3.2, Chapter 4).

below or equal to the median age. The size distribution among the older firms indicates the presence of missing middle as we observe a strong bi-modal distribution of employment with a relatively smaller share of employment in the intermediate-size groups (Panel A, Figure 5.5). When it comes to the younger firms, the missing middle is not clearly evident though a strong concentration of employment is found in the small firms employing 6 to 9 workers. According to the estimates, these smaller firms account for about 52 per cent of employment in the younger firms. In terms of productivity differential, a substantial productivity gap between the firms in the 6-9 size category and those in the 500 and above size category is noticed for both the young and old firms.

Figure 5.5: Employment and Productivity Distribution by Age, 2016

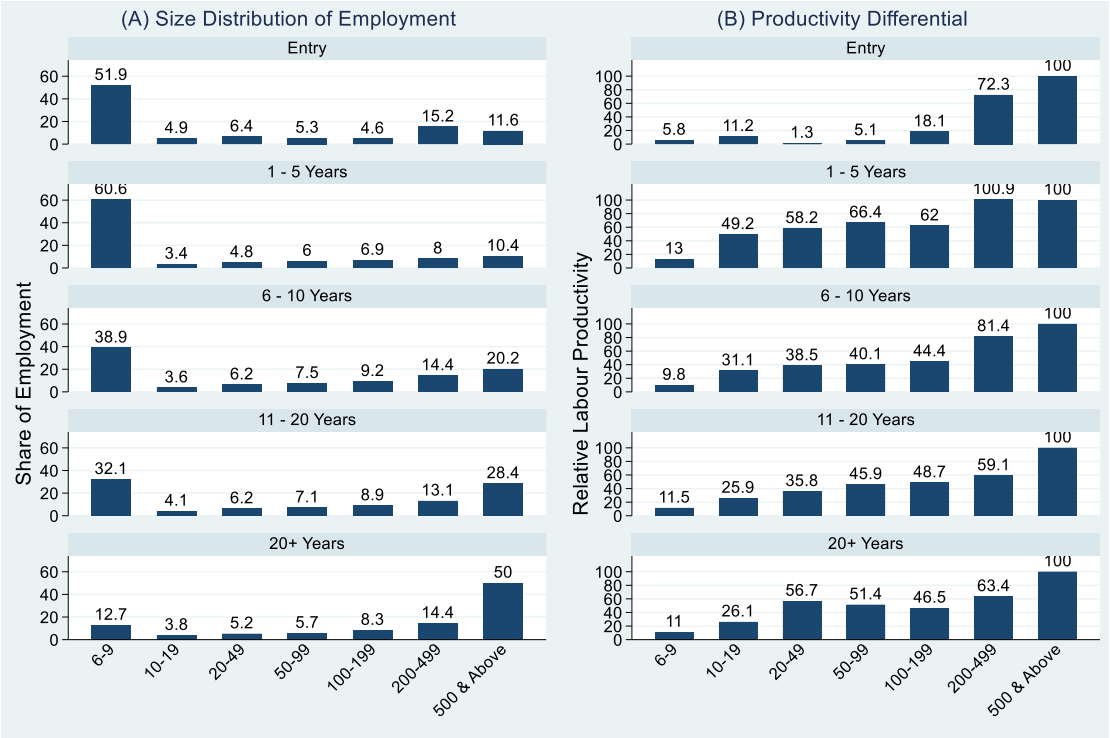


Source: Own estimates.

Considering the significant difference in the size distribution by age, this study also examines the changes in size distribution of employment and relative labour productivity by constructing different age cohorts. We consider five age cohorts of firms, namely, new-born firms, 1-5, 6-10, 11-20, and above 20 years. The missing

middle is clearly evident for firms belonging to 6-10, 11-20, and above 20 years age cohorts endorsing our earlier finding that missing middle is visibly apparent for older firms (Panel A, Figure 5.6.) On the other hand, we notice a large concentration of employment in the small firms employing 6-9 workers. The employment distribution by age cohorts thus reveals that the phenomenon of missing middle emerges as the outcome of the life cycle of manufacturing firms. While the employment in the entry and 1-5 years age cohort of firms is concentrated in the 6-9 size category, employment is distributed more evenly across remaining size categories (Panel A, Figure 5.6). Our analysis of productivity differential across different firm size categories shows existence of significant gap in productivity between small and large firms in all age cohorts.

Figure 5.6: Employment and Productivity Distribution by Age Groups, 2016



Source: Own estimates.

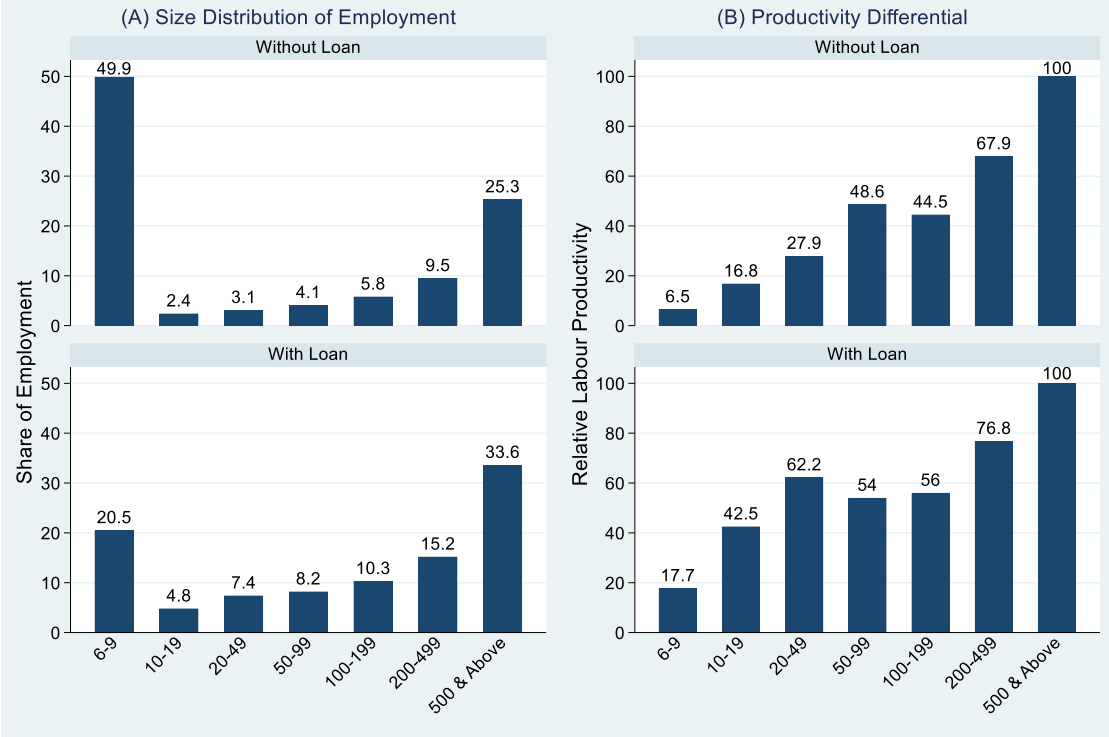
5.3.3. Employment and Productivity Distribution by Firm Constraints

Having examined the employment and productivity distribution by selected firm characteristics, we now examine the differences in firm size distribution by firm constraints. We consider two important constraints faced by the firms in the Indian manufacturing, namely, access to finance and access to electricity. Our objective here is to see whether the distribution of employment and productivity will be different for firms that report these constraints and firms that do not.

We plot the size distribution of employment and productivity in Figure 5.7 separately for firms with loan outstanding and firms without a loan. Figure 5.7 reveals a missing middle in the size distribution of employment for both the categories of firms. However, when we compare the size distribution of employment between firms with outstanding loan and firms without a loan, some striking results emerge. Firstly, we observe a significantly higher share of employment in the 6-9 size category for firms without a loan. About 50 per cent of the employment in 2016 originated from this size category. In comparison, the share of employment in the 6-9 size category was only 21 per cent for category of firms with outstanding loan (Panel A, Figure 5.7). Secondly, the share of mid-size firms in employment among firms with outstanding loan is considerable higher than their share among firms without loan. Thirdly, the 500 and above size category accounts for a greater share in category of firms with outstanding loan as compared to firms without a loan. These results together perhaps suggest that access to external finance aids the transition of small firms to the inter-mediate size category. We take up this issue later in Chapter 6 where we establish the role of access to finance in small firm transitions Similarly, we also find small firms deriving significant gains in productivity if they belong to the category of firms with outstanding loan (Panel B,

Figure 5.7). Interestingly, the pattern of distribution of employment and productivity across the size classes has persisted over time in firms with loan and those without loan (Figure A5.7 and Figure A5.8). In other words, the share of mid-sized firms in employment is higher among firms with outstanding loan as compared to firms without loan.

Figure 5.7: Employment and Productivity Distribution by Access to Finance, 2016

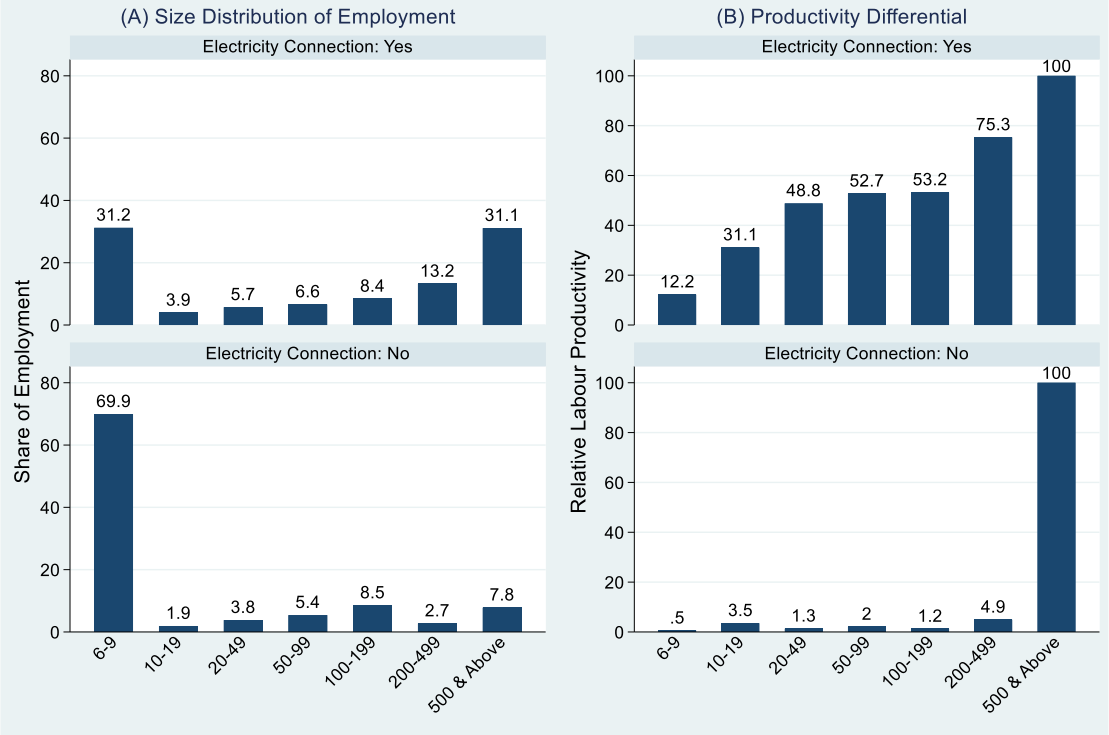


Source: Own estimates.

We now look at the size distribution of employment and labour productivity by firms' access to electricity. Figure 5.8 captures the difference in employment and productivity distribution across various firm size categories for firms with access to electricity and firms without access to electricity. As is the case with access to finance, we find a concentration of employment in the 6-9 size category among firms without access to electricity. About 70 per cent of the workforce in firms without electricity access is found in the 6-9 size category. In the case of firms with access to electricity, we find that the employment distribution mirrors the pattern observed for the aggregate

manufacturing sector. The share in employment by the mid-size firms is substantially higher among the firms with access to electricity than those without electricity access. This perhaps points to the importance of infrastructure in the transition of small firms in Indian manufacturing. We investigate the nexus between infrastructural availability and firm transition later in Chapter 7. The relative productivity distribution shows how important infrastructure is for improving the productivity of firms and for bridging the gap in productivity between the small and the large firms. We find that the gains in productivity are higher for firms with access to electricity as compared to firms without access to electricity. Further, we note significant gap in productivity between small and large firms and the gap is more evident among firms without access to electricity than those with access to electricity. We also examine the changes in employment distribution and productivity differential over time for firms without access to electricity and firms with access to electricity. They are captured in Figures A5.9 and A5.10. These figures do not suggest substantial changes in the employment distribution across size categories.

Figure 5.8: Employment and Productivity Distribution by Access to Electricity, 2016



Source: Own estimates.

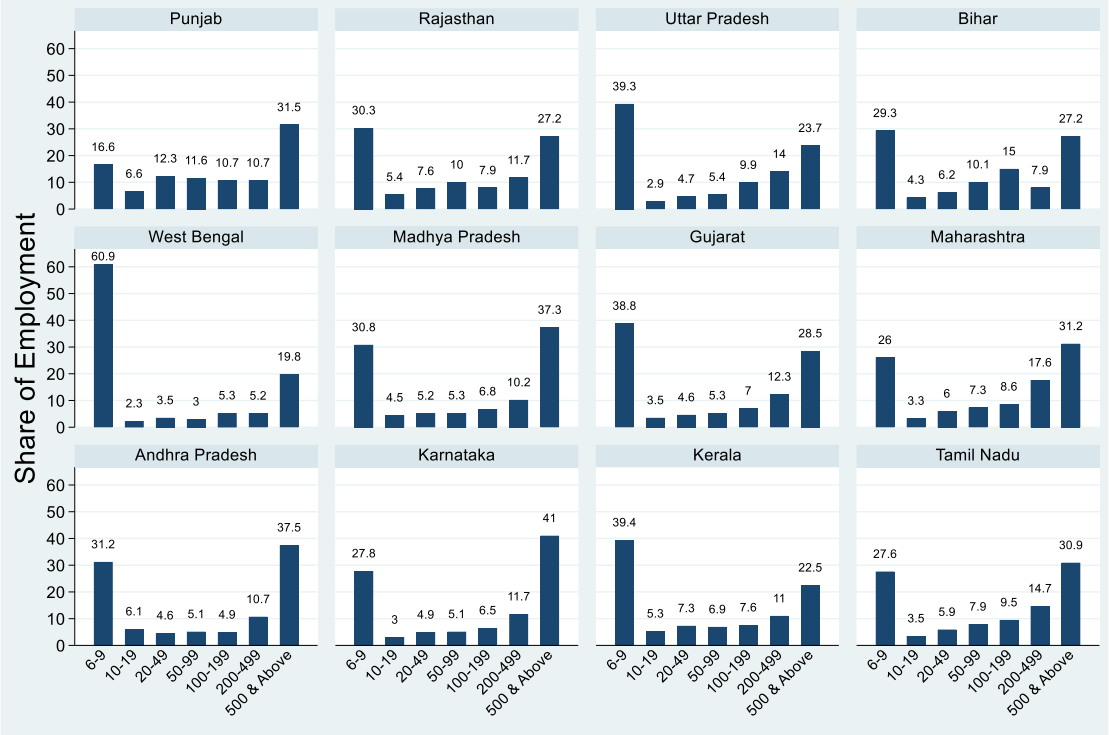
5.3.4. Regional Level Differences

We now explore the regional variations in employment distribution and productivity differentials by size groups. We argue that inter-state disparities in economic growth and development might influence employment patterns and size structures of manufacturing firms. We consider 12 key Indian states to examine the distribution of manufacturing employment by size groups in these states.[17] The employment distribution for 12 states displayed in Figure 5.9 indicates a bi-modal size-structure in employment with a missing middle in all the key Indian states. Unlike in other states, in Punjab, we notice a large concentration of employment at the upper end of the firm

[17] In India, most of the manufacturing activities are concentrated in these 12 key states. In 2016, these 12 states together constituted about 91 per cent of manufacturing firms and 89 per cent of the manufacturing employment in India.

size distribution. In contrast, a significant share of employment is found in the 6-9 size category in West Bengal.

Figure 5.9: State-wise Employment Distribution by Size Groups, 2016



Source: Own estimates.

To capture the changes in employment distribution over time, we also analyse the size distribution of employment in these key states in 2001. We present this in Figure A5.11 in the appendix. When we compare distribution of 2016 with 2001, we find some significant changes over the 15-year period. Firstly, we find a decline in the share of employment in the 6-9 size category. Secondly, a significant surge in the share of larger size groups in employment can be discerned in most of the states. Despite this switch in shares between the small and the large size category, the contribution from inter-mediate size groups remained very low suggesting that the middle is missing in most states during the period under study. More importantly, the shares of inter-mediate size groups have experienced a decline between 2001 and 2016. Despite the rapid growth of the economy, the 6-9 size category accounted for a substantial proportion of

employment in West Bengal, Madhya Pradesh, and Bihar (Figure 5.9). Whereas states like Maharashtra, Punjab, Tamil Nadu, Karnataka, and Gujarat have increased their share of employment in the upper end of the size distribution. In short, the missing middle has been extremely persistent in most states during the period under study, irrespective of their economic size and geographic diversity.

We also examine the relative productivity of different size groups (relative to 500 and above set equal to 100) in these states. Figure 5.10 presents this productivity comparison for the year 2016. A substantial productivity gap between firms in the 6-9 size category and firms in the 500 and above size category is evident in all the states. Unlike at the aggregate level, where productivity increased by almost equal proportion as we moved up the size categories. there is a huge jump in productivity as we move from the 6-9 size category to the larger end-of-size categories. We also find that the productivity difference between firms in the 6-9 size category and firms in the 500 and above size category in the states of Punjab, Kerala, Karnataka, and Tamil Nadu is not as substantial as in the case of Uttar Pradesh, Bihar, and Madhya Pradesh.

5.3.5. Industry Level Differences

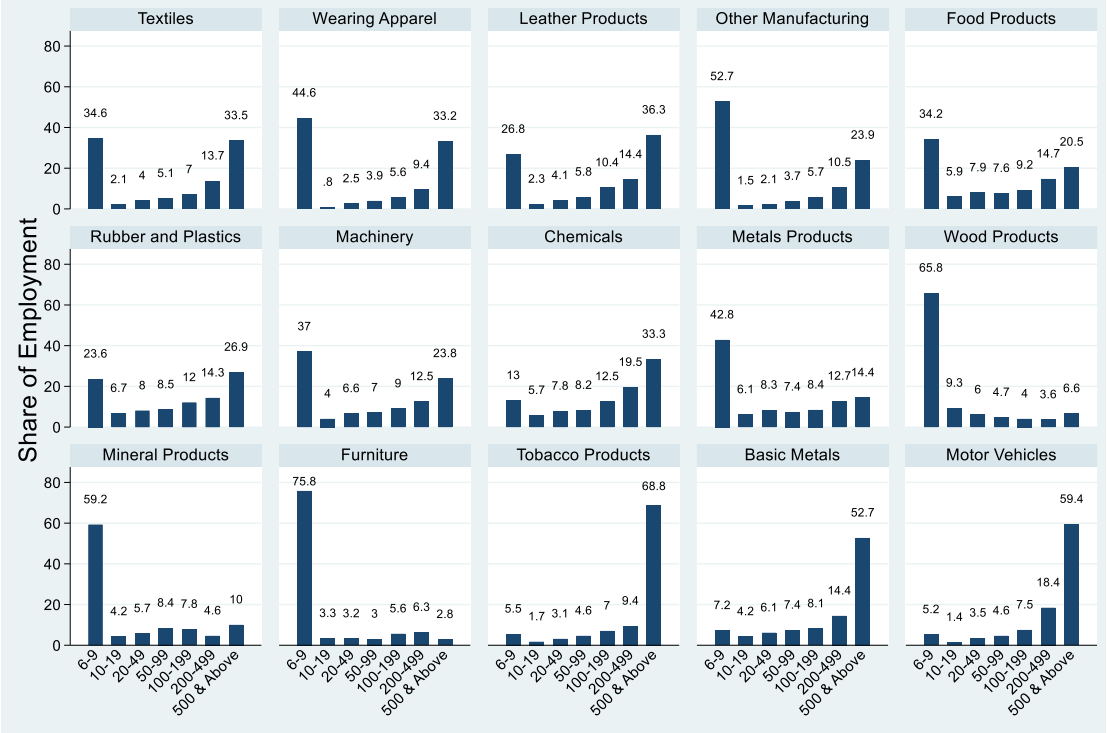
Lastly, we examine the inter-industry differences in firm size distribution in employment and labour productivity. We visually present this in Figure 5.11 for the year 2016. The size structure at the industry level threw up three distinctive patterns of the size distribution of employment. First, the missing middle in firm size distribution is found in large industries, in terms of their share in enterprises and employment, such as textiles, wearing apparel, leather goods, food products, rubber products, plastics, machinery, and machine tools and other manufacturing goods. As we found at the aggregate level, in these industries too, the share of employment is largely concentrated

in the 6-9 size category and 500 and above size category of firms, with a relatively small proportion of employment originating from the intermediate middle size groups.

Figure 5.10: State-wise Productivity Distribution by Size Groups, 2016

Source: Own estimates.

Figure 5.11: Industry-wise Employment Distribution by Size Groups, 2016



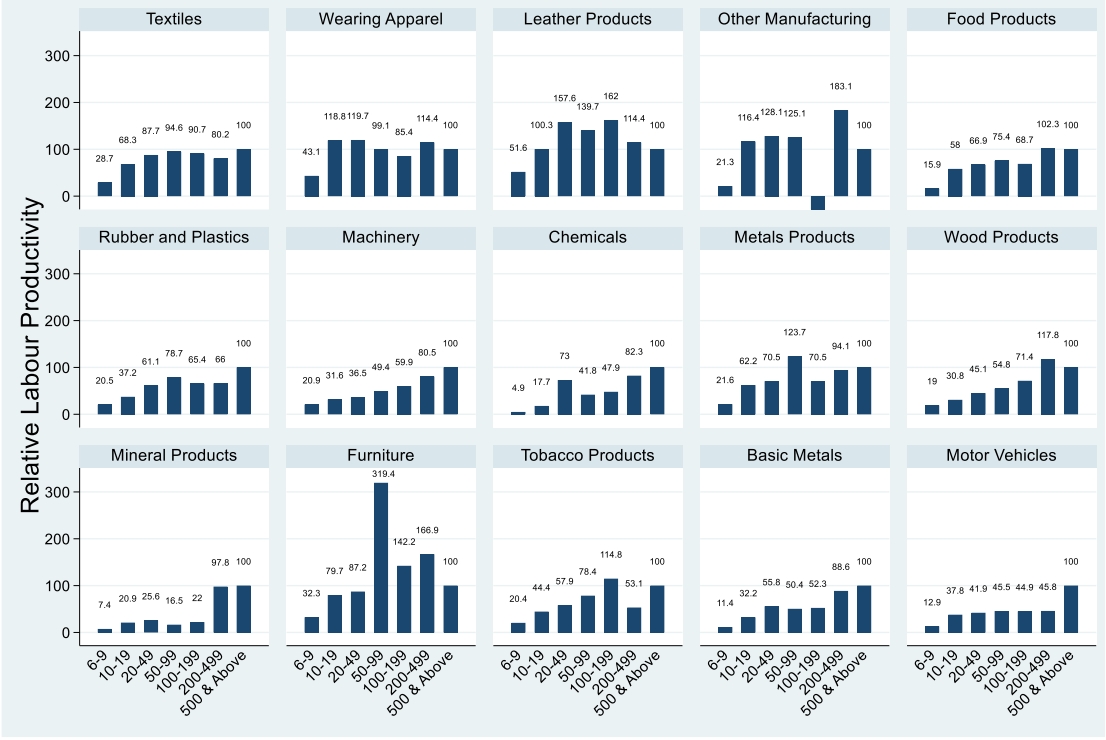
Source: Own estimates.

Second, the size distribution of employment is skewed to the right in industries producing furniture, wood and wood products and mineral products. In these industries, about 2/3rd of the employment is found in the 6-9 size category of firms and the remaining share of employment is distributed evenly across the other size categories (Figure 5.11). Third, the size distribution of employment is left-skewed in industries producing tobacco products, basic metals and motor vehicles. In these industry groups, about 50 per cent of the employment is concentrated in the 500 and above size category in 2016 (Figure 5.11). To capture the changes in employment distribution over time, we also analyse the size distribution of employment in these industries for 2001 and presented this in Figure A5.13. When we compare with the distribution of employment with the estimate of 2001, we noticed a decline in the share of employment in the 6-9 size category while there was a significant improvement in share of employment for firms in the 500 and above size category. Despite the fact, the pattern of size distribution remains unchanged over the period.

The productivity differential by size group presented in Figure 5.12 for the year 2016 shows a substantial gap in labour productivity between firms employing 6 to 9 workers and firms employing 500 and above workers in all the industry groups. The gap is found to be substantially larger for firms in the capital-intensive industries like chemicals, mineral products, basic metals and motor vehicles (Figure 5.12). The productivity differences between firms employing 6 to 9 workers and firms employing 500 and above workers is considerably lower in industries like wearing apparel, leather products, and furniture. However, when we compare the level of productivity with estimates for 2001, we notice a significant improvement of the productivity for firms employing 6 to 9 workers for all industries (Figure A5.14). We also noticed a significant improvement in the level of productivity for mid-sized firms in industries like furniture,

leather products, rubber and plastics, machinery, chemicals, basic metals and metal products.

Figure 5.12: Productivity Differential by Size Groups in Key Industry Groups, 2016



Source: Own estimates.

5.4. Conclusion

This chapter investigates the presence and persistence of missing middle and examines its temporal and spatial variations in Indian manufacturing. We also examined the presence of missing middle by firm-specific characteristics such as location, ownership type, age, labour intensity, access to finance and electricity. To put the size distribution of Indian manufacturing firms into perspective, we confined ourselves to the size distribution within the non-household manufacturing sector. These include informal sector firms that employ 6-9 workers (mostly hired workers) and formal sector firms registered under the Factories Act. We applied sampling weights provided by ASI and NSSO to compute aggregate-level information.

In India, we observe a dualistic structure with the size distribution of firms being bipolar at the two ends of the size groups of firms, consistent with the existing evidence in the literature. In other words, the missing middle problem is a dominating feature of the Indian manufacturing sector even after decades of reforms. We also notice a large gap in labour productivity between small and large firms, and interestingly, this gap has widened over time. From these results, two key insights can be distilled: first, labour productivity is correlated with firm size, implying that the larger the size higher the labour productivity. Second, there is little evidence of the transition of firms from small to medium, and correspondingly, from the medium to large size groups. Such a transition can significantly improve productivity in the Indian manufacturing sector.

While the issue of missing middle has been subjected to frequent contestation, what explains the lack of firm transition is yet to be answered. The persistent presence of the missing middle perhaps indicates that there exist some formidable factors that prevent small firms from growing to medium size, and correspondingly, from medium to large size. The literature has often pointed towards some economic, political and institutional factors that might explain such lack of transition in developing countries. We focus on three such factors that we think might explain the lack of transition of firms in India. They are stringent labour regulations, inadequate access to finance, and infrastructural bottlenecks that Indian firms face. We deal with them in the following Chapters.

CHAPTER 6

IMPACT OF ACCESS TO FINANCE

6.1. Introduction

In this Chapter, we assess the role of access to finance in explaining the lack of transition of firms in Indian manufacturing sector. The presence of large number of small firms in less developed countries along with their lack of growth is very often ascribed to finance constraints they face (Pissarides, 1999; Beck and Demirguc-Kunt, 2006; Ayyagari *et al*., 2008; Bakhtiari *et al*., 2020; Raj and Sasidharan, 2021). The lack of access to finance damages small firms' capacity to invest in fixed assets, and as a result, hiring outside workers becomes infeasible. These firms are then forced to fall back on informal channels of credit. Financial constraints, therefore, act as a major hindrance to firm growth and a key factor contributing to factor distortions, resource misallocation and productivity loss for small firms (Hsieh and Klenow, 2009; Buera and Shin, 2013; Midrigan and Xu, 2014; Moll, 2014). The bulk of the existing research examining the role of financial constraints on firm growth has focused either on large firms or firms in advanced countries. It is important to probe the link between access to finance and small firm growth given the extensive international evidence that the small firms are most likely to face difficulties in accessing finance due to informational asymmetries, absence of business credit histories or insufficient collateral to offer to lenders or other financial market failures (Berger and Udell, 2005; Raj and Sen, 2014). In this Chapter, we address this significant gap in the literature and investigate how important is access to finance in explaining the transition of manufacturing firms.

The reminder of the Chapter is structured as follows. In Section 6.2, we discuss about the variables and the methods employed in the study. The empirical results are discussed in Section 6.3. Robustness tests are discussed in Section 6.4. Section 6.5 presents some concluding remarks.

6.2. Methodology

6.2.1. Construction of Variables

As the main objective of the study is to examine the role of access to finance on firm transition, it is important to explain how we construct our measures of access to finance. Two measures are constructed to proxy access to finance.

First, we use a measure that captures the firm's dependence on external finance (*FIN1*). In line with Rajan and Zingales (1998) and Gupta *et al*. (2008), this measure is constructed using the ratio of outstanding loans to invested capital. **Second**, we use a categorical variable for access to finance (*FIN2*) that takes the value of 1 for firms with outstanding loans and 0 for firms without loans.

Though these measures are not perfect proxies for access to finance, we believe that, by using these two measures, we can ward off the problem of errors in measurement in any one measure. Our measure of access to finance is based on the outstanding loan. It includes all loans outstanding reported in the books of the factory as on the closing day of the financial year. Our data does not permit us to separate informal sources of finance from formal sources for formal sector firms. Available evidence shows that a smaller number of firms in the formal sector rely on informal sources of finance (Nikaido *et al*., 2015). On the other hand, we do have a break-up by sources of finance for informal sector firms. Taking this into consideration, we checked the robustness of our results

by using an alternate measure where we consider only the loans from institutional sources for informal sector firms. Our findings continue to hold for this alternate measure of access to finance too.

Firm-Specific and State-Specific Control Variables

We include a battery of firm-specific and state-specific characteristics as control variables in the estimation. As firm-specific controls, we include the location of the firm (*Location*), ownership (*Ownership*), and capital-labour ratio (*CLR*). *Location* is a binary variable for firms located in urban areas. Our conjecture is that as urban firms enjoy access to better infrastructure and their market is larger, they grow faster than rural firms. We introduce three binary variables to control for the effect of ownership on firm transition. *Proprietary, Partnership,* and *PrivateLtdCom* are the three binary variables representing firm ownership with the *PSUs* as the benchmark category. While *Proprietary* stands for proprietary firms, *Partnership* refers to firms run on a partnership basis and *PrivateLtdCom* represents private limited companies. Our benchmark ownership category, *Other_firms*, are those firms that are owned by the Union Government of India or States/UTs or both together. We also include the co-operative societies, self-help groups, trusts, and handlooms under *Other_firms*. The capital-labour ratio (*CLR*) is the ratio of invested capital to employment. We include *CLR* as an additional control, as more capital-intensive firms are more likely to be growing in size (Rajan and Zingales, 1998).[18] We use the log of value of the ratio in regression estimations. As state-level controls, we introduce variables representing the level of human development (*HDI*), level of urbanisation (*Shurban*), and level of

[18] We estimated an alternate model specification where we replace *CLR* with labour productivity (*LP*), as it is argued that the firms that are more productive are more likely to experience upward transition. The results are found to be qualitatively similar.

infrastructure (*Power*). We present the variables used in the analysis and the sources from which we drew information on them in Table 6.1.

The summary statistics are presented in Table 6.2.[19] In our dataset, an average firm belongs to the size category of 20 to 49 workers. 62 per cent of the firms reported to have had outstanding loans during the study period and the ratio of outstanding loans to invested capital stood at about 28 per cent. Among the firms in our dataset, 38 per cent are proprietary firms, 16 per cent are firms operating on a partnership basis and 27 per cent are private limited companies. The remaining 20 per cent are other firms (*Other_firms*). Urban firms constituted 59 per cent of our sample. Table 6.2 also presents the summary statistics for the state-specific control variables included in our analysis. The average level of human development stood at 0.59. On average, 36 per cent of the population are living in urban areas.

Table 6.1: Variables and Their Construction

Variables	Description	Data Sources
Dependent Variable		
SIZE	*SIZE* is an ordinal variable coded as 1 for firms with 6 to 9 workers; 2 for firms employing 10 to 19 workers; 3 for firms with 20 to 49 workers; 4 for firms with 50 to 99 workers; 5 for firms with 100 to 199 workers; 6 for firms with 200 to 499 workers; and 7 for firms with 500 and Above workers.	NSSO & ASI Datasets
Independent Variable		
FIN1	The ratio of outstanding loans to invested capital (we multiply the ratio value by 100)	NSSO & ASI Datasets
FIN2	Dummy variable for firms with loans	NSSO & ASI Datasets
Firm-Specific Control Variables		
Location	Dummy variable for urban firms	NSSO & ASI Datasets
CLR	The ratio of real invested capital to total employment (logarithmic value is used in the estimation).	NSSO & ASI Datasets

[19] In all our estimations, we use the sample weights supplied by the ASI and NSSO, which is often encouraged for arriving at population averages from the sample data (Solon *et al*., 2013). The table 6.2 reports the summary statistics without weights. The Table A6.1 in the appendix presents the summary statistics with weights.

Proprietary	Dummy variable for proprietary firms	NSSO & ASI Datasets
Partnership	Dummy variable for partnership firms	NSSO & ASI Datasets
PrivateLtdCom	Dummy variable for private limited companies	NSSO & ASI Datasets
Other_firms	*Other_firms* are our benchmark ownership category and coded as 1 if the firms under *Other_firms*. It included those firms that are owned by the Union Government of India or States/UTs or both together. We also include the co-operative societies, self-help groups, trusts, and handlooms under *Other_firms*.	NSSO & ASI Datasets
State-Specific Control Variables		
HDI	Human development index, capturing the level of human capital development in the state.	Global Data Lab (Area) Database
Shurban	Urban share in the total state population	Ministry of Power, Govt. of India
Power	Per-capita availability of electricity in a state.	Ministry of Home Affairs, Govt. of India

Source: Own construction.

Table 6.2: Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variable					
SIZE	196391	3.083	1.893	1	7
Independent Variables					
FIN1	196391	27.557	39.153	0	209.791
FIN2	196391	0.617	0.486	0	1
Firm-Specific Controls					
Urban	196391	0.594	0.491	0	1
CLR	196391	17.121	2.016	-2.676	26.196
Ownership:					
Proprietary	196391	0.375	0.484	0	1
Partnership	196391	0.160	0.367	0	1
PrivateLtdCom	196391	0.268	0.443	0	1
PSUs	196391	0.197	0.398	0	1
State-Specific Controls					
HDI	196391	0.590	0.071	0.436	0.757
Shurban	196391	35.622	15.450	9.641	96.126
Power	196391	6.614	0.672	4.240	7.912

Source: Own estimates.

6.2.2. Estimation Strategy

This study uses an ordered logit model (OLM) to investigate the effect of access to finance on firm transition.[20] The choice of the ordered logit model is ideal because the

[20] With the help of OLM, we expect to understand the likelihood that a firm choose to be in either of the seven size categories in the presence of finance constraint after controlling for the influence of other possible factors. In brief, the model helps us to compute the probabilities of an enterprise falling in these seven size categories. Please refer Gebreeyesus and Mohnen (2013) for an in depth discussion on the application of OLM.

dependent variable is an ordered dummy variable. As explained in Section 3.3.1, Chapter 3, our dependent variable is firm size (*SIZE*), denoted by e, measured using an ordered variable, with seven firm size categories, ordered smallest to highest based on the number of workers in the firms. In order to explore the role of access to finance on transition of firms, we consider the following ordered logit specification:

$$e^*_{i,j,s,t} = \beta_0 + \beta_1 FIN_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,s,t} \qquad (6.1)$$

where subscripts *i*, *j*, *s* and *t* represent firm, industry, state, and time, respectively. *FIN* is our measure of access to finance, and two different proxies of financial access (*FIN1* and *FIN2*) are used. We would expect $\beta_1 > 0$ if access to finance is a crucial factor driving the transition of firms. $Z_{i,j,s,t}$ is a vector of variables standing for firm characteristics included in our model specification to control for the firm-level differences in location, capital intensity, and ownership. $X_{s,t}$ corresponds to the vector of state-specific control variables that include state-level differences in human development, urbanisation, and power infrastructure.

Industry, state, and time fixed effects: The variables, α_j, ε_s and γ_t, account for industry-, state- and time-specific fixed effects, respectively. We include time- and state-fixed effects to account for the influence of unobserved year- and region-specific external finance constraints. Year effects are believed to capture macro-level shocks with possible firm productivity effects. Time-invariant state dummies control for the individual impact on the firm size in addition to the effect exerted by the finance variable. Industry dummies control for the industry-specific external finance requirements that are likely to have an independent impact on firm size over and above that exerted by the finance constraint variable.

Our empirical strategy intends to establish the impact of access to finance on firm transition. However, the soundness of our analysis depends crucially on the exogeneity of variables representing access to finance. One lingering concern is that the association between finance and firm transition may be driven by reserve causality and omitted variable bias. The decision of the firm not to hire outside workers might be driven by factors such as the ability of the entrepreneur, family environment, and other unobserved characteristics. Reverse causality is an issue if firms with better attributes, for instance, larger and older firms, are better able to access financing from banks and other financial institutions (Beck *et al*., 2008). There is clear evidence that banks are confident to lend to firms with high performance and prospects. Hence, in the presence of potential endogeneity, it is difficult to extract causality between access to finance and firm transition. In order to address this endogeneity issue, an instrumental variable approach is employed. This requires identifying appropriate instruments that are strongly correlated with the endogenous regressor (*FIN1* and *FIN2*), but uncorrelated with the outcome variable for reasons beyond their influence on the endogenous regressor (Angrist and Krueger, 2001). We instrument our access to finance variables (*FIN1* and *FIN2*) using the bank branch density per hundred thousand population (*BBD*) at the state level. We have collected this information from the Banking Statistics published by the Reserve Bank of India (RBI).

The rationale for using bank branch density as an instrument is strong and straightforward. The country's central bank comes out with policies aimed at extending banking services to the under-served sections of society.[21] In 2005, the RBI started preparing the list of districts (subdivisions under the states) that are underbanked. It

[21] For an important study that provides a discussion on these policies, please refer Young (2017).

classified those districts whose bank branch per capita exceeds the national average as underbanked. The RBI then devised many policies to promote the setting up of branches of banks in such places. For instance, in 2011, the Indian banks were asked to open not less than $1/4^{th}$ of their total branches in a year in underbanked districts (Chavan, 2020). This renewed branch licencing policy followed a 4:1 norm as opposed to the 1:4 norm followed earlier. Through this policy, banks were instructed to devise plans for financial inclusion and to achieve targets for opening branches, starting small savings and deposit accounts and for providing small-sized overdrafts (Gang *et al.*, 2020). The ten-year period between 2005 and 2015 has witnessed substantial expansion in the availability of banking in India in terms of reaching the unbanked and the under-banked (Young, 2017). The reduction in under-banked districts from 347 in 2005 to 327 in 2015 bears testimony to this expansion (Table 6.3). The number of people served per branch, which was 15.5 thousand in 2005 also declined substantially to 9.5 thousand in 2015 (Table 6.4). We firmly believe that this policy affects firm growth only through its influence on the financial constraints faced by the firms. Our conjecture is that firms located in regions with easier access to banking (indicated by lesser people per bank branch) will enjoy better financial access and, therefore, expansion (instrument relevance). Additionally, we think that the instrument satisfies the essential exclusion criterion for an instrumental variable, as it affects the firm's decision to transit to the next size classes only through the firm's financial constraint.

Table 6.3: Number of Banked and Underbanked Districts – 2005 and 2015.

Districts	Year - 2005	Year - 2015
Banked	190	210
Underbanked	347	327

Notes: 537 districts for both the years; if the population per branch in a district is greater than the all-India average, the district considered as an underbanked district.
Source: Own estimates based on the data from RBI (2005 and 2015).

Table 6.4: Bank Branch Offices from 2000-01 to 2015-16.

Year	Number of Bank Branch Offices	Increment in Bank Branches/Offices	Population per Branch (in Thousand)
2000-01	67532		14.7
2005-06	70324	2792	15.5
2010-11	88203	17879	13.3
2015-16	131494	43291	9.5

Source: Own estimates based on the data from RBI.

The two-stage residual inclusion (2SRI) approach is employed to address the issue of endogeneity (Terza, 2017). We proceed in two stages, following Ivlevs *et al*. (2020). In the first stage, a standard auxiliary regression is estimated where the instrument and all the control variables are included to explain the endogenous regressor (in our case, *FIN1* and *FIN2*). In the second stage, the outcome model with the endogenous regressor, all other covariates and the residual inclusion estimator is estimated. The standard errors in the second stage and the reported marginal effects are arrived at using 500 clustered bootstrap replications.

The unbiased impact of access to finance on firm size is represented by the coefficient on the endogenous regressor in the second stage, while endogeneity bias is represented by the estimated coefficients of the predicted residuals (Ivlevs *et al*., 2020; Gang *et al*., 2020). In our study, we first estimate the model specification where we regress the endogenous finance variable on all covariates used in our previous estimations and the instrument, which is bank branch density per hundred thousand population (*BBD*). The first-stage regression that we estimate takes the following form:

$$FIN_{i,j,s,t} = \beta_0 + \beta_1 Instrument_{s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \gamma_t + u_{i,j,s,t} \qquad (6.2)$$

In the second-stage, the predicted first-stage residuals and the endogenous regressor are included. The second-stage equation takes the form as follows:

$$e^{*}_{i,j,s,t} = \beta_0 + \beta_1 FIN_{i,j,s,t} + \theta u^{est}_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \gamma_t + \mu_{i,j,s,t} \qquad (6.3)$$

where variables are defined as above, u is the error term in the first-stage regression and $u^{est}_{i,j,s,t}$ is predicted residual, and μ is the error term in the second-stage regression.

As stated by Ivlevs *et al*. (2020), the coefficient estimates on the predicted residuals, θ, provides the direct test for the exogeneity of finance variables (Bollen *et al*., 1995). If θ is not statistically different from 0, the null hypothesis that the finance variable is exogenous is not rejected. The statistical significance of the coefficient estimates on the predicted residuals (θ) signifies that the finance variable is endogenous, implying that 2SRI is preferred over the ordered logit model.

6.3. Results

We discuss the main results in this section. Robust standard errors are reported in parentheses throughout unless otherwise noted. The data comprise four repeated cross-sections for 2000-01, 2005-06, 2010-11 and 2015-16, as discussed in Chapter 3.

6.3.1. Baseline Results

The results of the ordered logit regression model specified in equation (6.1) are presented in Table 6.5. Six different specifications are estimated. Columns 1–3 report the estimates for *FIN1* and columns 4–6 for *FIN2*. In column 1, we introduce *FIN1* with time, industry, and state fixed effects. We bring in firm-specific controls in column 2. We then introduce state-specific controls in column 3. We follow the same order of specification for *FIN2* in columns 4–6.

Table 6.5: Ordered Logit Model Estimates (Dependent Variable: *SIZE*)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
FIN1	0.024***	0.018***	0.017***			
	(0.001)	(0.000)	(0.000)			
FIN2				1.933***	1.354***	1.343***
				(0.043)	(0.038)	(0.040)
Firm-Specific Controls						
Location		-0.133***	-0.171***		-0.081**	-0.101***
		(0.030)	(0.030)		(0.032)	(0.032)
CLR		0.154***	0.149***		0.057***	0.057***
		(0.012)	(0.013)		(0.013)	(0.014)
Proprietary		-2.349***	-2.277***		-2.390***	-2.313***
		(0.055)	(0.058)		(0.063)	(0.068)
Partnership		0.127**	0.177***		0.125**	0.174***
		(0.062)	(0.062)		(0.065)	(0.066)
PrivateLtdCom		1.700***	1.709***		1.700***	1.711***
		(0.043)	(0.045)		(0.048)	(0.050)
State-Specific Controls						
HDI			0.878**			0.468
			(0.447)			(0.464)
Shurban			-0.014***			-0.012***
			(0.001)			(0.001)
Power			0.335***			0.315***
			(0.049)			(0.053)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	No	Y	Y	No
N	196391	196391	196391	196391	196391	196391
Log pseudolikelihood	-1786630.4	-1438599.9	-1463386.3	-1771411.3	-1441856.5	-1466670.0
Pseudo R^2	0.1406	0.308	0.2961	0.148	0.306	0.295

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

Our findings suggest that access to external finance plays a positive role in the transition of firms. The coefficients on *FIN1* and *FIN2* are positive and significant at the one per cent level across all six-model specification indicating that with better access to finance, a firm is less likely to remain in the small-size category. The evidence that this offers to us is that increased access to external finance promotes firm expansion and progression to the next size classes. Our finding is in line with the existing evidence for developing countries, which too largely assign a positive role for finance on firm growth (Patrick and Schiavo, 2008; Aterido *et al*., 2011; Bose *et al*., 2019).

Our firm-level control variables yield results in line with our expectations. *PrivateLtdCom* is positively associated with *SIZE* indicating that private limited

companies are more likely to make the transition as compared to our benchmark category of firms that include co-operative societies, limited companies, and trusts among others. This seems to be a possibility as these firms are separate legal entities and enjoy better avenues for borrowing funds. Firms that run on a partnership basis are also more likely to make the transition as compared to the firms in the reference category. On the other hand, the coefficient on *Proprietary* yields a negative coefficient indicating that as compared to the firms in the benchmark category they are less likely to make the transition. As anticipated, the coefficient of *CLR* is positive and significant at the one per cent level suggesting that more capital-intensive firms are more likely to make the progress to immediate size-group vis-a-vis less capital-intensive firms.

The results also forcefully confirm the importance of infrastructure and human capital development in firm transition. *HDI* is positively associated with *SIZE*. It indicates that firms that are located in the states with a higher level of human capital tend to grow in size than firms in the states with a lower level of human capital. Similarly, the variable *Power* also yields a positive and statistically significant coefficient indicating that the availability of quality power is an important dimension of infrastructure positively influencing firm expansion in a state.

As against our expectations, we observe a negative association between *Location* and firm transition. It indicates that firms that are located in an urban location are less likely to make the transition as compared to their counterparts. Possibly, it might be highlighting the effects of market competitiveness, cost of land, higher wages, and higher tax rates in an urban location. Further, the coefficient of *Shurban* is negative and significant, suggesting that firms located in states with a higher share of the urban population are less likely to make the transition. This result echoes the findings of

Phillipson *et al*. (2019) that highlighted the negative role of urban location on firm performance.[22]

The results discussed above do not tell us about the magnitude of impact that access to finance has on firm transition. To understand the size of the effect, we compute the marginal effects for the full model (as in Column 3, Table 6.5). Table 6.6 presents the results for *FIN1* and Table 6.7 for *FIN2*. We obtain clear evidence to show that firms with access to external finance are less likely to be in the 6-9 size category and more likely to be in the larger size categories. Based on the marginal effects for *FIN1*, we find that all else equal, a one per cent increase in access to external finance decreases the probability of a firm being in the 6-9 size category by 0.1 percentage points and increases the probability of a firm in the 10-19 size category by 0.1 percentage points, in the 20-49 size category by 0.03 percentage points, in the 50-99 size category by 0.02 percentage points, in the 100 to 199 and above size category by 0.01 percentage points (Table 6.6). The marginal effects yield a similar pattern of influence of access to finance on firm size for *FIN2* too except that the magnitude of impact is larger (Table 6.7). Our results show that access to finance is more important for firms in the informal sector (represented by firms in the 6-9 size category). To state it differently, as financial access improves, we are likely to find more firms in the part of the manufacturing sector labelled as "formal". The robustness of our results is tested by estimating equation (6.1)

[22] According to them, "rural wage levels are typically lower than the wages in urban areas, partly because of a poorer choice of jobs, and more seasonal or part-time work, resulting in lower cost for labour" (Phillipson *et al.*, 2019). Another reason suggested by the same study is that "rural firms are also more likely to be home-based than urban firms, thus incurring fewer fixed costs related to business premises. The cost of business premises and rents tend to be lower in rural areas, and many small rural firms may access mandatory or discretionary business rate reliefs, also lowering premises-related expenditure" (Phillipson *et al.*, 2019).

using the generalised ordered logit model.[23] Our results concerning key explanatory variables are robust to alternate methods and specifications.[24]

Table 6.6: Marginal Effects for *FIN1*: Ordered Logit Model

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 and Above
FIN1	-0.001***	0.001***	0.0003***	0.0002***	0.0001***	0.0001***	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm-Specific Controls							
Location	0.013***	-0.006***	-0.003***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.012***	0.005***	0.002***	0.001***	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.176***	-0.077***	-0.038***	-0.021***	-0.016***	-0.014***	-0.010***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.014***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
PrivateLtdCom	-0.132***	0.058***	0.028***	0.016***	0.012***	0.010***	0.007***
	(0.003)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.068**	0.030**	0.015**	0.008**	0.006**	0.005**	0.004**
	(0.034)	(0.015)	(0.007)	(0.004)	(0.003)	(0.003)	(0.002)
Shurban	0.001***	-0.001***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.026***	0.011***	0.006***	0.003***	0.002***	0.002***	0.001***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Marginal effects for *FIN1* estimated for the full model as in Column 3, Table 5.5; Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

Table 6.7: Marginal Effects for *FIN2*: Ordered Logit Model

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 and Above
FIN2	-0.104***	0.043***	0.023***	0.013***	0.010***	0.009***	0.005***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Firm-Specific Controls							
Location	0.008***	-0.003***	-0.002***	-0.001***	-0.001***	-0.001***	-0.0004***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.004***	0.002***	0.001***	0.001***	0.0004***	0.0004***	0.0002***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.178***	-0.074***	-0.039***	-0.023***	-0.018***	-0.015***	-0.009***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Partnership	-0.013***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
PrivateLtdCom	-0.132***	0.055***	0.029***	0.017***	0.013***	0.011***	0.007***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.036	0.015	0.008	0.005	0.004	0.003	0.002
	(0.036)	(0.015)	(0.008)	(0.005)	(0.004)	(0.003)	(0.002)
Shurban	0.001***	-0.0004***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.024***	0.010***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Marginal effects for *FIN2* estimated for the full model as in Column 6, Table 6.5; Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

[23] The ordered logit model is based on proportional odds assumption which indicate that association between each pair of outcomes is the same for all variables. To check the validity of this assumption, we compared the OLM estimates with the estimates of the generalised ordered logit model. For the latter, the intercept as well as the coefficients vary by category of the dependent variable.
[24] The results of this robustness test are presented in the appendix Table A6.2.

6.3.2. Instrumental Variable Results

To address the possible concerns regarding the endogeneity of finance variables, we employ the two-stage residual inclusion (2SRI) approach as discussed earlier. Our finance variables (*FIN1* and *FIN2*) are instrumented using bank branch density per hundred thousand population (*BBD*). The 2SRI estimation is performed on the full specification of our model (Column 3 and Column 6, Table 6.5). The 2SRI estimates with two measures of financial access are presented in Table 6.8. For *FIN1*, the coefficient of the predicted residual, θ_i^{est}, is significant at the one per cent level suggesting that the regressor is endogenous. We obtain similar results for *FIN2* as well, as the coefficient of the predicted residual is significant at the one per cent level. Overall, the 2SRI estimation reveals that it is important to control for the endogeneity of finance variables.

The coefficient of *BBD* is positive and significant in the first-stage regressions. This implies that the firms located in regions with high bank branch density strongly predict financial access to firms. The value of the F-test of excluded instruments further establishes the relevance of the instrument used in estimations. The F-value of 301.69 exceeds the commonly accepted threshold value of 10.

We report the marginal effects for the second-stage estimation for full model with two versions of our financial constraints *FIN1* and *FIN2* in Tables 6.9 and 6.10, respectively. The results of this two-stage procedure mimic those obtained from the ordered logit model in tables 6.6 and 6.7. Overall, our findings that the lack of access to finance is an important hindrance to firm transition in Indian manufacturing is further strengthened by the 2SRI estimates. Our results are thus robust to possible endogeneity concerns with finance variables.

Table 6.8: Coefficient Values: 2SRI Estimations (No. of Replications: 500)

Variables	First-Stage (Dependent Variable *FIN1*)	Second-Stage (Dependent Variable *SIZE*)	First-Stage (Dependent Variable *FIN2*)	Second-Stage (Dependent Variable *SIZE*)
FIN1		0.222*** (0.026)		
FIN2				4.015*** (0.280)
XuHAT		-0.205*** (0.026)		-1.181*** (0.125)
Firm-Specific Controls				
Location	-1.489*** (0.469)	0.143*** (0.047)	-0.417*** (0.061)	-0.074** (0.032)
CLR	0.684*** (0.146)	0.012 (0.025)	0.371*** (0.026)	-0.158*** (0.023)
Proprietary	-7.749*** (0.577)	-0.694*** (0.194)	-0.506*** (0.080)	-2.117*** (0.076)
Partnership	6.582*** (0.773)	-1.167*** (0.184)	0.499*** (0.089)	-0.164** (0.076)
PrivateLtdCom	19.275*** (0.625)	-2.227*** (0.503)	1.176*** (0.070)	1.480*** (0.056)
State-Specific Controls				
HDI	12.110** (5.614)	-4.284*** (0.763)	2.612*** (0.821)	0.751* (0.446)
Shurban	-0.143*** (0.015)	0.018*** (0.005)	-0.019*** (0.002)	-0.010*** (0.001)
Power	3.357*** (0.588)	-0.437*** (0.126)	0.351*** (0.083)	0.103* (0.053)
Instrument Variable				
BBD	0.305*** (0.108)		0.034** (0.016)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
F (Test of Excluded Instruments)	301.69			
N	196391	196391	196391	196391
Log pseudolikelihood		-1461443.3	-1727508.2	-1459447.9
R^2/Pseudo R^2	0.1165	0.297	0.1416	0.298

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Own estimates.

Table 6.9: Marginal Effects: 2SRI Estimations (Measure of Access to Finance: *FIN1*) (No. of Replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 and Above
FIN1	-0.017***	0.008***	0.004***	0.002***	0.002***	0.001***	0.001***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
XuHAT	0.016***	-0.007***	-0.003***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm-Specific Controls							
Location	-0.011***	0.005***	0.002***	0.001***	0.001***	0.001***	0.001***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.001	0.000	0.000	0.000	0.000	0.000	0.000
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.058***	-0.028***	-0.011***	-0.005***	-0.003*	-0.004**	-0.007***
	(0.020)	(0.010)	(0.004)	(0.002)	(0.002)	(0.002)	(0.001)
Partnership	0.088***	-0.042***	-0.016***	-0.007***	-0.005***	-0.007***	-0.011***
	(0.005)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.003)
PrivateLtdCom	0.135***	-0.062***	-0.024***	-0.011***	-0.010***	-0.012***	-0.016***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.005)
State-Specific Controls							
HDI	0.331***	-0.145***	-0.071***	-0.039***	-0.030***	-0.026***	-0.019***
	(0.058)	(0.025)	(0.013)	(0.006)	(0.006)	(0.005)	(0.003)
Shurban	-0.001***	0.001***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	0.034***	-0.015***	-0.007***	-0.004***	-0.003***	-0.003***	-0.002***
	(0.009)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Own estimates.

Table 6.10: Marginal Effects: 2SRI Estimations (Measure of Access to Finance: *FIN2*) (No. of Replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 and Above
FIN2	-0.308***	0.125***	0.068***	0.040***	0.032***	0.023***	0.016***
	(0.022)	(0.009)	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)
XuHAT	0.090***	-0.037***	-0.020***	-0.012***	-0.009***	-0.008***	-0.005***
	(0.010)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Firm-Specific Controls							
Location	0.006**	-0.002**	-0.001**	-0.001**	-0.001**	-0.001**	-0.0003**
	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	0.012***	-0.005***	-0.003***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.254***	-0.137***	-0.065***	-0.026***	-0.014***	-0.008***	-0.004***
	(0.011)	(0.006)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	0.028**	-0.012**	-0.008**	-0.004**	-0.002**	-0.001**	-0.001**
	(0.013)	(0.006)	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)
PrivateLtdCom	-0.289***	0.072***	0.084***	0.053***	0.038***	0.027***	0.015***
	(0.012)	(0.003)	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)
State-Specific Controls							
HDI	-0.058*	0.023*	0.013*	0.008*	0.006*	0.005*	0.003*
	(0.034)	(0.014)	(0.008)	(0.004)	(0.003)	(0.003)	(0.002)
Shurban	0.001***	-0.0003***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.00004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.008*	0.003*	0.002*	0.001*	0.001*	0.001*	0.0004*
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Own estimates.

One of the drawbacks of this analysis is that the instrument, *BBD*, is constructed at the state level whereas the RBI branch expansion policy that we discussed earlier was mainly aimed at the district level. The policy the RBI pursued was to increase the number of bank branches in "underbanked" districts, where underbanked was defined as districts with greater than India's nationwide mean population per branch. Hence, the ideal procedure would have been to construct the instrument at the district level and use it in the 2SRI estimations. Though we were able to construct this instrument at the district level, we are not able to use it in our estimations as the identity of the districts is not revealed in the ASI data for the period 2016. However, we performed the 2SRI estimations using the dataset for the period 2001–2011 for which the district identifiers were provided in the ASI data. Our results are virtually unchanged, and the sign, significance, and size of our estimates are still the same.[25]

6.4. Robustness Test

6.4.1. Synthetic Panel Data Method

In this section, we discuss a critical robustness test performed in this Chapter. One of the concerns related to our results is that they are derived from repeated cross-sections using which we are unable to capture the movement of firms over time. In order to address this issue, we supplement our findings with an alternate approach, where we employ a synthetic panel data method that constructs synthetic panels from repeated cross-sections. This approach was originally developed by Dang *et al.* (2014). The basic idea of the approach is to predict the outcome for the periods in which the firm was not surveyed. We employ this method for the recent period, 2011–2016, as some of the

[25] For brevity, we report the results of these estimations in Table A6.3 in the appendix.

time-invariant characteristics are available only for these years. The successful implementation of the method depends crucially on the availability of time-invariant characteristics.

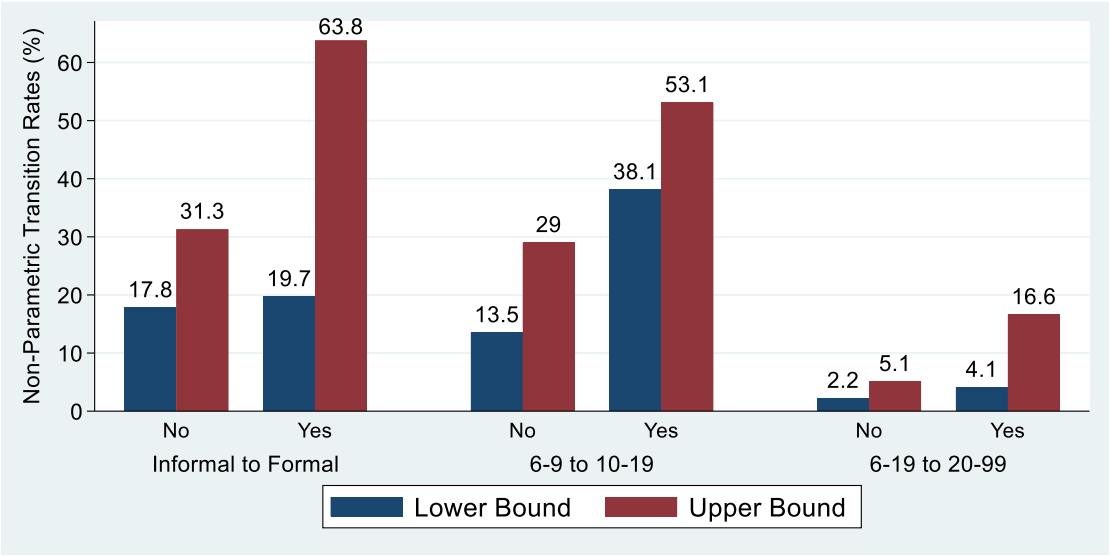
To elaborate on how the synthetic panel method works in practice, let us consider the firm-level dataset of 2011 and that of 2016. This approach involves using the data on firms in the period 2011 as the base year and forecasting their employment levels in 2016 using the imputation methodology. Probabilities are estimated for firms falling into different combinations of firm statuses in the two periods (for example, being an informal sector firm in both periods, or being an informal sector firm in the first period but a formal sector firm in the second period, and so on). The main variable driving the predicted status in each period is the level of employment. For each period, the employment level is predicted using the time-invariant covariates and is decomposed into two parts. The first part is linked to the time-invariant covariates (such as the age of the firm, location of the firm, and gender of the firm owner) and the corresponding estimated coefficients. The second part is related to unobservable firm characteristics and is captured through the error term. The first part of the predicted employment level is computed by applying the coefficients estimated for the 2016 data to the similar observable characteristics in the 2011 data. The second part is constructed based on the estimated correlation coefficient of the error terms between the 2011 and 2016 datasets. Based on the assumption about the distribution of residuals, one would choose between a nonparametric approach (to estimate upper and lower bound estimates for firm transition) and a parametric approach (to compute point estimates of the conditional probability of firm transition). The predicted employment level of 2016 for each firm in 2011 is computed as the sum of the predicted values of the two parts.

In our study, we rely on the nonparametric approach using the bound estimation method, following the procedure in Rongen (2021) and Garcés-Urzainqui *et al*. (2021) and arrive at lower-bound and upper-bound estimates of firm transition. The successful implementation of the approach relies on the availability of time-invariant characteristics in the dataset. In our case, the outcome variable is the level of employment, and the time-invariant characteristics are *Location*, *Proprietary*, *Age*, *Industrial Activity* and *Region*. *Location* is a dummy variable for urban firms. *Proprietary* is a dummy variable for ownership and coded as 1 if the firm is proprietary and 0 otherwise. *Age* is the firm's age in years. Industrial activity is defined at the five digits of the NIC, and Region is the state where the firm is located.

As our objective is to understand the role of finance, we estimate the transition rates separately for firms with access to finance and firms without access to finance. Our transition rates based on the synthetic panel data method confirm our findings from baseline and IV estimations. We present the lower and upper bound transition rates for three firm transitions namely, from informal to formal, 6-9 to 10-19, and 6-19 to 20-99 during 2011–2016, in Figure 6.1.[26] The lower and upper bounds for the transition from informal to the formal sector for firms that have access to finance are 19.7 and 63.8, respectively, and 17.8 and 31.3, respectively, for firms that do not have access to finance (Figure 6.1). The transition rates are higher among small firms than in the larger firms. The results point to the positive role of finance on firm transition, especially for firms in the informal sector (6-9).

[26] The lower bound underestimates the transition and upper bound overestimates the transition, and together these two bounds give us a range of possible rates of transition of firms (Dang *et al*., 2013).

Figure 6.1: Non-Parametric Rates of Firm Transition (%), 2011–2016 (Conditional Probabilities)



Notes: Transitions rates in per cent. 'Yes', represent the firms that have access to finance and 'No' stands for the group of firms that do not have access to finance. Table A6.4 in the appendix presents the share of firms that have access to finance and Table A6.5 presents the full results of the non-parametric rates of firm transition.
Source: Own estimates.

6.4.2. Access to Finance and Informal – Formal Firm Transition

As an additional robustness check, we also examine the role of access to finance in explaining the transition of informal sector firms to the formal sector separately. We ran a logit model where we categorise firms into just two categories, formal and informal. We estimate the following logit model:

$$FORMAL_{i,j,s,t} = \beta_0 + \beta_1 FIN_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,s,t} \quad (6.4)$$

where the dependent variable $FORMAL_{i,j,s,t}$ is a binary variable for formal sector firms *i* of *j* industry in *s* state at time *t*. *FIN* is our measure of access to finance, and we used two alternative measures to proxy access to finance (*FIN1* and *FIN2*). $Z_{i,j,s,t}$ is a vector of firm-specific variables controlling for the firm-level differences in location, capital intensity and ownership. $X_{s,t}$ is a vector of state-specific controls representing the state-

level differences in human capital, urbanisation and infrastructure. The variables α_j, ε_s and γ_t account for industry-, state- and time-specific fixed effects, respectively. The model specifications are estimated as logit regressions.

The results of the logit regression model specified in equation (6.4) are presented in Table 6.11. Our findings suggest that access to external finance plays a positive role in the transition of informal firms to the formal sector. The coefficients of *FIN1* and *FIN2* are positive and significant at the one per cent level across all six models showing that with better access to finance, a firm is less likely to be in the informal sector and more likely to be in the formal sector. This finding suggests that alleviating financial constraints likely to trigger firm transition from informal to formal manufacturing sector in India.

Table 6.11: Results: Logit Regression Estimates (Dependent Variable: *Formal*)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
FIN1	0.035***	0.032***	0.031***			
	(0.001)	(0.001)	(0.001)			
FIN2				2.004***	1.668***	1.631***
				(0.045)	(0.046)	(0.048)
Firm-Specific Controls						
Location		-0.073	-0.123***		-0.021	-0.047
		(0.045)	(0.045)		(0.044)	(0.044)
CLR		0.231***	0.220***		0.106***	0.104***
		(0.016)	(0.017)		(0.017)	(0.017)
Proprietary		-2.901***	-2.782***		-2.907***	-2.781***
		(0.060)	(0.064)		(0.065)	(0.069)
Partnership		-0.204***	-0.142**		-0.212***	-0.159**
		(0.075)	(0.074)		(0.076)	(0.076)
State-Specific Controls						
HDI			-0.540			-0.808
			(0.616)			(0.608)
Shurban			-0.015***			-0.014***
			(0.071)			(0.002)
Power			0.394***			0.390***
			(0.071)			(0.073)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	N	Y	Y	N
N	196391	196391	196391	196391	196391	196391
Log pseudolikelihood	-1044125.8	-757434.32	-785471.7	-1068796.4	-798337.57	-826838.77
Pseudo R^2	0.245	0.452	0.432	0.227	0.423	0.402

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

As we cannot interpret the magnitude of the logit coefficients,[27] we also compute marginal effects for the full model (Columns 3 and 6, Table 6.11) and report them in Table 6.12. For the sake of brevity, we confine the discussion to our key variable. The magnitude of marginal effect suggests that firms with access to external finance are 3.1 per cent more likely to be in the formal sector. The marginal effects yield a similar pattern of influence of access to finance for *FIN2* too, though the magnitude of impact is larger. This evidence seems to signal that alleviation of financial constraints is greatly important for aiding the transition of firms from the informal sector to the formal sector.

Table 6.12: Marginal Effects: Logit Regression

Variables	*FIN1*	*FIN2*
FIN1	0.031***	
	(0.001)	
FIN2		1.631***
		(0.048)
Firm-Specific Controls		
Location	-0.123***	-0.047
	(0.045)	(0.044)
CLR	0.220***	0.104***
	(0.017)	(0.017)
Proprietary	-2.782***	-2.781***
	(0.064)	(0.069)
Partnership	-0.142**	-0.159**
	(0.074)	(0.076)
State-Specific Controls		
HDI	-0.540	-0.808
	(0.616)	(0.608)
Shurban	-0.015***	-0.014***
	(0.002)	(0.002)
Power	0.394***	0.390***
	(0.071)	(0.073)

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

As discussed in the methodology section, the association between access to finance and firm transition may be driven by omitted variable bias and reverse causality. The decision of the firms to remain in the informal sector might have been driven by unobserved factors, and this unobserved component may not even have distributed

[27] The logit regression coefficients cannot be interpreted as normal elasticities as is the case with the OLS.

randomly across firms. We employ a 2SRI method to tide over the possible reverse causality between firm size and access to finance. We use the same instrument for our finance variables, *BBD*, as used inn our earlier estimation. The choice of the instrumental variable is based on the notion that a larger physical distance between the borrower and the lender can harm access to finance indicating that credit access depends on the local density of banking services (Aguirregabiria *et al*., 2019). In regions with higher bank branch density, the firm enjoys more choice of creditors, the local financial market will be less monopolistic, and banks will have less incentive to restrict the supply of credit (Regasa *et al*., 2020).

We perform the estimation on the full specification of our model (Columns 3 and 6 in Table 6.11).[28] The two-stage procedure reveals that it is important to control for the endogeneity of finance variables. The coefficient of *BBD* is positive and significant at the one per cent level in the first-stage regressions (Table A6.6). This implies that the firms located in regions with high bank branch density strongly predict financial access to firms. The value of the F-test of excluded instruments further establishes the relevance of the instrument used in estimations. The F-value of 188.09 exceeds the commonly accepted threshold value of 10 (Table A6.6). The marginal effects of the second-stage reduced-form estimates reported in Table 6.13 mimic, in sign and significance, the ordered logit results discussed in the previous subsection. In other words, the 2SRI estimates reinforce our main finding that lack of access to finance acts as a constraint for the transition of informal sector firms to the formal sector. Our results are thus robust to possible endogeneity concerns associated with our measures of access to finance.

[28] The first and second stage estimates of 2SRI with two measures of financial access are presented in the appendix Table A6.6.

Table 6.13: Marginal Effects: 2SRI Estimation

Variables	*FIN1*	*FIN2*
FIN1	0.280***	
	(0.037)	
FIN2		1.618***
		(0.050)
XuHAT	-0.248***	8.876***
	(0.037)	(0.462)
Firm-Specific Controls		
Location	0.394***	0.763***
	(0.082)	(0.063)
CLR	-0.014	-0.560***
	(0.043)	(0.032)
Proprietary	0.528	-1.223***
	(0.472)	(0.123)
Partnership	-0.314***	-0.513***
	(0.078)	(0.075)
State-Specific Controls		
HDI	-5.909***	-8.067***
	(0.897)	(0.784)
Shurban	0.023***	0.023***
	(0.006)	(0.003)
Power	-0.563***	-0.351***
	(0.183)	(0.076)

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

6.4.3. District Level Analysis

We also perform another robustness test where we create a pseudo panel at the district level from the firm level dataset, and estimate the following model:

$$ShFORMAL_{d,t} = \beta_0 + \beta_1 FIN_{d,t} + \gamma_t + u_{d,t} \quad (6.5)$$

where $ShFORMAL_{d,t}$ is the share of formal sector firms in total firms in district d at time t. *FIN* is our measure of access to finance. Two proxies of access to finance are used: the median average of *FIN1* in the district, and the share of firms with outstanding loans in the district. The variables γ_t account for time-specific fixed effects.

Our results remain unaltered in the final robustness test too, where we test this relationship using a pseudo panel constructed at the district level (Table 6.14). The

positive coefficients of *MedianFIN1* and *ShFIN2* suggest that access to external finance helps in boosting the share of formal sector firms in the districts, thereby confirming our finding of a strong positive role of financial access on firm transition.

Table 6.14: District Level Results (Dependent Variable: *ShFORMAL)*

Variables	Standard Linear Regression		Fixed Effects	
	(1)	(2)	(3)	(4)
MedianFIN1	0.671***		0.625***	
	(0.105)		(0.096)	
ShFIN2		0.612***		0.534***
		(0.035)		(0.050)
Time FE	Y	Y	Y	Y
Constant	37.018***	16.296***	36.509***	18.632***
	(1.096)	(1.567)	(0.746)	(2.024)
N	1509	1509	1506	1506
Number of Districts	523	523	523	523
F	89.51	206.34	164.04	197.52
R^2	0.241	0.378	0.240	0.374

Notes: Random standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

6.5. Conclusion

In this Chapter, we examine how important is financial access in explaining firm transition in the Indian manufacturing sector. We measure financial access using two core explanatory variables: (1) a measure that captures the firm's dependence on external finance; and (2) a categorical variable on whether the firm obtained institutional loans or no loans. We assess the role played by access to finance on firm transition by using various econometric methods that include ordered logit models and generalised ordered logit models with particular attention to endogeneity concerns with our measures of financial access.

Our results yield a crucial role for increased liquidity. Irrespective of the measures of financial access we employ, we obtain strong evidence that access to finance matters a lot in explaining the likelihood of upward progression of firms. We find that an increase in access to external finance decreases the probability of a firm being in the 6-9 size category by 0.1 percentage points and increases the probability of a firm in the 10-19

size category by 0.1 percentage points, in the 20-49 size category by 0.03 percentage points, in the 50-99 size category by 0.02 percentage points, in the 100 to 199 and above size category by 0.01 percentage points. The results are robust to alternate methods and specifications and also to concerns arising from reverse causality—we obtain similar results with our main identification strategy—IV estimation using 2SRI—as when we use an ordered logit estimation method. We also complement our analysis with a critical robustness test using the synthetic panel data method and arrive at similar findings. Overall, our empirical analysis hints at an important role of financial constraints in explaining small firm transitions in Indian manufacturing.

CHAPTER 7

INFRASTRUCTURE MATTERS

7.1. Introduction

In this Chapter, we investigate the role of infrastructure on firm transition in Indian manufacturing. Access to infrastructure is argued to be one of the biggest obstacles to small firm growth in India (Hulten *et al*., 2006; Raj and Sen, 2016b; Mitra *et al*., 2016; Allcott *et al*., 2016). Given that bulk of the small firms are in the informal sector and are mostly located alongside the large formal sector firms (Mukim, 2015), they often have to compete with the latter to get access to the limited infrastructural facilities in place. It is, therefore, argued that improving the infrastructural base is crucial for improving small firm transition in India. One of the channels through which infrastructural bottlenecks affect firm transition is by increasing the production costs. More often than not, the power outages force firms to outsource power supply by installing a power generator or increase dependence on other forms of power supply to smoothly continue their production process, which eventually increases the cost of production. Such outsourcing cost hits the small firms the most.

While there is a large body of literature that seek to establish the causal link between different types of infrastructure provision and economic outcomes[29], we know very little about how infrastructural bottlenecks influence the firm transition in developing countries. There is limited evidence at the firm level about the role of infrastructure in explaining the firm transition in Indian manufacturing. This is especially due to the

[29] Recent studies include Röller and Waverman (2001), Duflo and Pande (2007), Rud (2012), Audretsch *et al*. (2015), Ghani *et al*. (2016), Donaldson (2018), Moller and Zierer (2018), Threw (2020), and Asher and Novosad (2020).

unavailability of data on infrastructure at the firm level. Our empirical investigation at the firm level is a novel approach, where we utilise the access to energy infrastructure as a proxy for infrastructural constraints at the firm level. Following Rud (2012) and Allcott *et al*., (2016), we rely on this measure to study the nexus between infrastructure and firm transition.

The rest of the Chapter is structured as follows. Section 7.2 provides a brief discussion on the infrastructure in India and the policy initiatives taken by the Government of India to tide over the infrastructural bottlenecks. Section 7.3 presents a discussion on empirical strategies employed in this Chapter. The nexus between infrastructure and firm transition are explored in Section 7.4. The robustness tests are discussed in Section 7.5. Section 7.6 presents the concluding remarks.

7.2. Infrastructure in India

Post-reforms India realised that the country's infrastructure stock fell short of its needs, particularly in the areas of transport, power, and telecommunications, without which the country could not reap the benefits of economic liberalisation. For example, the growing demand and supply gap in the availability of power is one of the most critical issues in India's economic development in post-reform India (Kumar, 2012; Rohit and Rangnekar, 2017; Verma *et al*., 2020). By September 2012, total generation capacity stood at about 208,000 megawatts, and 87 per cent of all Indian villages had been provided electricity (Maniar, 2013). Still the power deficit is estimated to be high, with power availability experiencing a shortfall of 4–5 per cent during peak load times in 2022 (Ministry of Power, Government of India). With regards to the road infrastructure, India's paved road network constituted about 45 per cent (1,517,000 km) of the total

road network (3,320,410 km) in 2013-14, which was much less than other developing countries like Brazil and China (Shah *et al*., 2015).

The underperformance of the infrastructure sector in India was a serious concern given the sector's strong forward and backward linkages in the economy. It can be seen from the Table 7.1 that India's infrastructure competitiveness is far less as compared to China and the United States. Increased economic growth and population growth have exerted a massive stress on India's existing infrastructure. According to Shah *et al*. (2015), India is unable to provide access to some basic services to many of its citizens. Inadequate infrastructure is seen as the biggest impediment to doing businesses in India, as well as being the single biggest challenge to India's economic development (Singhala *et al*., 2011). It is estimated that poor infrastructure in India reduces GDP growth by 1 - 2 per cent per annum (Singhala *et al*., 2011). The infrastructural constraints affect small firms and start-ups more than the large firms (Morris and Basant, 2005).

Table 7.1: Infrastructure Competitiveness: India as Compared to China and United States (Rank Out of 144 Countries), 2012-13

Key Indicators	India	China	United States
Quality of Overall Infrastructure	87	69	25
Quality of Transport Infrastructure	68	70	30
Quality of Road	86	54	20
Quality of Railroad	27	22	18
Quality of Port Infrastructure	80	59	19
Quality of Electricity Supply	110	59	33

Source: World Economic Forum (2012-13).

7.2.1. Policy Environment

In order to achieve efficiency in the supply of infrastructural inputs, the Government of India undertook several initiatives to develop and support infrastructure within the country. The most notable among them were the JNNURM and RSVY aimed at

addressing the critical gaps in physical and social infrastructure in urban and rural India, respectively. We evaluate the effect of exogenous variation in infrastructure, aided by these two policy initiatives, on firm transition. We believe that these programmes would have certainly addressed the critical gaps in infrastructure faced by businesses in rural and urban areas, and hence would have aided firm transition.

Jawaharlal Nehru National Urban Renewal Mission (JNNURM)

Post-independence India experienced a rapid expansion of the urban population, which immensely impacted the provision of infrastructure and other civic amenities in urban areas. The urban infrastructure has not been able to keep pace with the rising urban population which has severely affected urban life in India. The rapid pace of urbanisation coupled with deteriorating infrastructure and inadequate facilities to accommodate the urban population has led to the formation of slums in many developing-world cities (UN-DESA, 2014). In 2001, India's urban population was about 286 million (28 per cent of the total population), of which 52.4 million (about 18 per cent) were forced to live in slums. One decade later, in 2011, India's urban population ballooned to 377.2 million (31 per cent of the total population) of which 65.5 million (about 17 per cent)[30] remained in slums. This has led to the escalation of pressure on existing infrastructure and social services. In order to upgrade the social and economic infrastructure in urban areas, the Government of India launched JNNURM for some selected Indian metro-cities/cities/towns in 2005.

JNNURM was a reforms-driven and fast-track programme that planned the development of identified cities with a focus on urban infrastructure/service delivery systems, community participation, and accountability of urban local bodies to citizens.

[30] Both 2001 and 2011 estimates are based on the successive rounds of Census data.

With a provision of Rs. 50,000 crores, JNNURM was the single largest Central Government initiative to support road network, urban transport, water supply, construction and improvement of drains and storm-water drainage systems, sewerage and sanitation, integrated slum development, and various other urban infrastructure. The seven years long programme, which began in 2005, was implemented in 63 cities with a population of over one million, state capitals and cities of religious and tourist importance.

Rashtriya Sam Vikas Yojana (RSVY)

RSVY was launched to address the critical gaps in physical and social infrastructure and to address the problems of lower growth, productivity, and unemployment in rural India (Planning Commission of India, 2003). The programme was one of the first direct initiatives undertaken by the Government of India to identify and support backward districts to remove barriers to economic growth, accelerate the development process, and improve living standards. RSVY was implemented in 132 backward districts.[31] It started as a three-year programme in 2003, with a funding of Rs. 15 crores per year (the total provision was Rs. 45 crores for each selected district) provided to each backward district (Planning Commission, 2003).

Improving infrastructure in regions that lack such facilities is a policy pushed by the Government of India as a multi-goaled win. Has it really delivered? Improvement in transport infrastructure and power generation capacity are often regarded as a measure of success of infrastructural development in underdeveloped regions. Does it translate

[31] Out of 132 districts, 100 backward districts were selected based on an index of backwardness comprising three parameters with equal weights to each: (i) value of output per agricultural worker; (ii) agriculture wage rate; and (iii) percentage of SC/ST population of the districts. Another 32 districts were selected which are affected by the left-wing extremism.

to gains for the small firms, to more productive and efficient firms, and help some of the small firms to transit to larger firms? In brief, how does small firms in the informal sector respond to the enhanced access to infrastructure?

7.3. Variables and Methods

7.3.1. Variables

Our core independent variable is availability of infrastructure to the firm. We focus on a specific economic infrastructure, energy infrastructure. Two measures are used to proxy energy infrastructure. First, we use a binary variable for power constraint (*INF1)* that takes the value 1 for firms that lack access to power and 0 for other firms.[32] Second, we construct a measure that captures the firm's dependence on energy infrastructure (*INF2*). In line with Gupta *et al*. (2008), this measure is constructed using the share of total annual costs of electricity to total output. This variable is likely to approximate the cost of electricity consumption for firms, and indirectly show the extent to which electricity is accessible for firms.

We include a series of firm-specific and state-specific characteristics as control variables. As firm-specific controls, we include location of the firm (*Location*), ownership (*Ownership*), and capital-labour ratio (*CLR*). As state-level controls, we introduce variables representing the level of human development (*HDI*) and the level of urbanisation (*Shurban*).[33]

[32] By definition, the formal sector firms are most likely to have access to power as they are supposed to use power in the production process. Following Abeberese (2017), to construct the infrastructure variables, we focus on the annual electricity cost to categorise firms. If the purchase value of electricity is 0, we consider them as power constrained and code them 1. On the contrary, if the purchase value of electricity is positive, we code them 0.

[33] In Section 6.2.1, Chapter 6, we defined these variables.

In our dataset, about 6 per cent of firms have no electricity connection or faced electricity problems (Table 7.2). While 37 per cent of the firms in our sample are proprietary firms, 16 per cent are operating on a partnership basis and 27 per cent are private limited companies. The remaining 20 per cent are Other firms (*Other_firms*). Urban firms constituted about 60 per cent of our sample. The average level of human development stood at 0.59. On average, 36 per cent of the population are living in urban areas.

Table 7.2: Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variable					
SIZE	201316	3.093	1.890	1	7
Main Independent Variable					
INF1	201316	0.057	0.231	0	1
INF2	201316	-3.512	1.816	-15.564	9.604
Firm-Specific Controls					
Location	201316	0.596	0.491	0	1
CLR	201316	17.094	2.026	-2.676	26.196
Proprietary	201316	0.367	0.482	0	1
Partnership	201316	0.161	0.368	0	1
PrivateLtdCom	201316	0.269	0.443	0	1
Other_firms	201316	0.203	0.402	0	1
State-Specific Controls					
HDI	201316	0.590	0.071	0.436	0.757
Shurban	201316	35.669	15.463	9.641	96.126

Source: Own estimates.

7.3.2. Baseline Model

We employ an ordered logit to model (OLM) to evaluate the impact of infrastructural availability on firm transition. The dependent variable is firm size, denoted by e, measured using an ordered variable, with seven firm size categories, ordered from the smallest to the highest based on the number of workers employed by firms. We estimate the ordered logit model that takes the following generic form:

$$e^{*}_{i,j,s,t} = \beta_0 + \beta_1 INF_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,s,t} \qquad (7.1)$$

where subscripts *i*, *j*, *s* and *t* represent firm, industry, state, and time, respectively. *INF* is our measure of infrastructure, and two alternative proxies (*INF1* and *INF2*) are used. We would expect $\beta_1 < 0$ if lack of infrastructure acts as a bottleneck for firm transition. $Z_{i,j,s,t}$ is a vector of firm-level variables included to control for the firm-level differences in location, capital intensity, and ownership. $X_{s,t}$ represents the vector of region-specific variables accounting for the state-level differences in human development and urbanisation. The variables, α_j, ε_s and γ_t, account for industry-, state- and time-specific fixed effects, respectively. Year effects are believed to capture macro shocks with possible firm productivity effects. Time-invariant state dummies are included to control for the influence of non-observables that affect all firms in the same region. Industry dummies control for the industry-specific shocks that are likely to have an independent impact on firm size over and above that exerted by the infrastructure variables.

7.4. Results

We start with the ordered logit regression results, followed by a discussion of the DiD results.

Baseline Results

Table 7.3 presents the results obtained by estimating equation (7.1). Three different specifications are estimated separately for *INF1* (cols. 1 – 3) and *INF2* (cols. 4 – 6). In col. 1, we introduce *INF1* with time, industry, and state fixed effects. We bring in firm-specific controls in col. 2. We then introduce state-specific controls in col. 3. We follow the same order of specification for *INF2* in cols. 4 – 6.

Our findings indicate that availability of power plays a significant role in explaining the transition of firms in Indian manufacturing. The coefficients of *INF1* and *INF2* are negative and significant at the one per cent level across all the specifications, indicating that firms with limited access to power are less likely to make the transition from small to large size categories. Ensuring reliable and continuous power supply is, therefore, vital for promoting firm transition.

Table 7.3: Results: Ordered Logit Regression

Dependent variable: *SIZE*

Variables	(1)	(2)	(3)	(4)	(5)	(6)
INF1	-1.675***	-1.176***	-1.186***			
	(0.064)	(0.068)	(0.069)			
INF2				-0.077***	-0.070***	-0.069***
				(0.012)	(0.011)	(0.011)
Firm-Specific Controls						
Location		-0.196***	-0.214***		-0.139***	-0.150***
		(0.031)	(0.031)		(0.030)	(0.030)
CLR		0.131***	0.144***		0.149***	0.163***
		(0.012)	(0.013)		(0.012)	(0.013)
Proprietary		-2.245***	-2.149***		-2.268***	-2.166***
		(0.052)	(0.054)		(0.052)	(0.054)
Partnership		0.431***	0.507***		0.428***	0.508***
		(0.065)	(0.065)		(0.066)	(0.066)
PrivateLtdCom		2.017***	2.026***		2.024***	2.036***
		(0.044)	(0.045)		(0.044)	(0.044)
State-Specific Controls						
HDI			1.027**			1.401***
			(0.430)			(0.427)
Shurban			-0.010***			-0.009***
			(0.001)			(0.001)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	N	Y	Y	N
N	201316	201316	201316	201316	201316	201316
Log Pseudolikelihood	-1956099.4	-1542711.5	-1571096.2	-1978868.3	-1549508.8	-1578769.0
Pseudo R2	0.084	0.277	0.264	0.073	0.274	0.261

Notes: Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05.
Source: Own estimates.

Firm-level and regional-level variables are correlated with firm size in the expected ways: private limited companies, partnership firms and more capital-intensive firms are more likely to transit to the next size classes. The likelihood of transition is also higher among firms located in states with a better endowment of human capital. Urban firms are less likely to make the transition as compared to firms located in rural areas. This is

against our expectation of a larger likelihood of transition among the urban firms, as suggested by many studies (for example, Beladi *et al*., 2019; Giner *et al*., 2017). Perhaps it points to the effects of market competitiveness, higher cost of land, higher wages, and higher tax rates in an urban location. This is further strengthened by the coefficient of *Shurban*, which suggest that firms located in states with a higher share of the urban population are less likely to make the transition. But it agrees with the evidence found for the SMEs in the UK for the period 2015-2016. They highlighted the negative role of urban location on firm performance (Phillipson *et al*., 2019).

The estimated coefficients of the ordered logit regressions in Table 7.3 tell us about the qualitative relationship between power availability and firm size. However, for policy purpose, it is equally important to understand the magnitude of its impact on firm transition. Therefore, we compute the marginal effects for the full model specification (as in Column 3 of Table 7.3) and report the results in Tables 7.4 and 7.5 for *INF1* and *INF2*, respectively. Table 7.4 shows that all else equal, a one per cent increase in electricity constraint increases the probability of a firm being in the 6-9 size category by 10 percentage points and decreases the probability of a firm being in the 10-19 size category by 4.2 percentage points, in the 20-49 size category by 2.3 percentage points, in the 50-99 size category by 1.3 percentage points, in the 100-199 size category by 1 percentage points, in the 200-499 size category by 0.8 percentage points, and in the 500 and above size category by 0.5 percentage points (Table 7.4). The marginal effects yield a similar pattern of influence of power availability on firm size for *INF2* too (Table 7.5). We also ran a logit model where we categorise firms into just two categories, formal and informal. Our results with respect to key explanatory variables are robust to

alternate methods and specifications.[34] Overall, our results clearly suggest that inadequate supply of power significantly hampers the transition of firms in Indian manufacturing. Provision of an uninterrupted power supply, therefore, assumes critical importance in improving the growth and productivity of small firms in India.

Table 7.4: Marginal Effects (Measure of Infrastructure: *INF1*)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 and Above
INF1	0.100***	-0.042***	-0.023***	-0.013***	-0.010***	-0.008***	-0.005***
	(0.006)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Firm-Specific Controls							
Location	0.018***	-0.008***	-0.004***	-0.002***	-0.002***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.012***	0.005***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.181***	-0.077***	-0.041***	-0.023***	-0.017***	-0.014***	-0.009***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Partnership	-0.043***	0.018***	0.010***	0.005***	0.004***	0.003***	0.002***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
PrivateLtdCom	-0.170***	0.072***	0.039***	0.022***	0.016***	0.013***	0.008***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.086**	0.037**	0.020**	0.011**	0.008**	0.007**	0.004***
	(0.036)	(0.015)	(0.008)	(0.005)	(0.003)	(0.003)	(0.002)
Shurban	0.001***	-0.0003***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.00004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: Marginal effects for *INF1* estimated for the full model as in column 3 of Table 7.3; Robust standard errors are reported in parentheses; *** p<0.01, **p<0.05.
Source: Own estimates.

Table 7.5: Marginal Effects (Measure of Infrastructure: *INF2*)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
INF2	0.006***	-0.002***	-0.001***	-0.001***	-0.001***	-0.0004***	-0.0003***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm-Specific Controls							
Location	0.013***	-0.005***	-0.003***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.014***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.183***	-0.078***	-0.042***	-0.023***	-0.018***	-0.014***	-0.009***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.043***	0.018***	0.010***	0.005***	0.004***	0.003***	0.002***
	(0.006)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
PrivateLtdCom	-0.172***	0.073***	0.039***	0.022***	0.017***	0.013***	0.008***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.119***	0.050***	0.027***	0.015***	0.011***	0.009***	0.006***
	(0.036)	(0.015)	(0.008)	(0.005)	(0.003)	(0.003)	(0.002)
Shurban	0.001***	-0.0003***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.00004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: Marginal effects for INF2 estimated for the full model as in column 6 of Table 7.3; Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

[34] The results of this robustness tests are presented in the appendix. Tables A7.1 and A7.2 present the results of logit model and the marginal effects of the logit estimates, respectively.

7.5. Robustness Tests

There are challenges to identifying a causal relationship between access to power and firm transition. Two such challenges are non-random placement of energy infrastructure and the potential selection of firms into areas with better provision of energy infrastructure. The energy infrastructure is often developed in areas that are industrialised, where there is large demand for electricity (Baev *et al*., 2017). This could lead to an over or under estimation of the impact of energy infrastructure on firm transition. The next challenge is that firms can often self-select into regions (and industries) with better record of electricity provision, leading to selection bias. To mitigate these concerns and to test the robustness of our results, this study has performed a number of additional tests. We discuss the results of these robustness tests in the following sub-sections.

7.5.1. Difference-in-Differences (DiD) Method

As a first robustness test, we analyse the impact of an exogenous variation of the availability of infrastructure on firm transition using a DiD approach. To do this, we take advantage of two recent government policies, namely, JNNURM and RSVY, introduced in 2005 and 2003, respectively. While the JNNURM was implemented in 63 cities to develop and support urban infrastructure, the RSVY was implemented in 132 districts to fill the critical gaps in physical and social infrastructure in rural India. It has been pointed out that these two initiatives significantly improved the physical and social infrastructure in India (Planning Commission of India, 2010). Using these two policies as the exogenous sources of variation in infrastructure, we examine how inadequate infrastructural facilities affect firm transition. If infrastructure is indeed

important for firm transition, then we would see a surge in firm transition in districts where these policies were implemented.

Using DiD, we implemented this experiment as follows. First, we compare the firms in JNNURM districts, which we call as treated firms[35], with the firms in non-JNNURM districts, which we call as control firms, over the period 2001 to 2011.[36] Secondly, we compare the firms in RSVY districts, which are the treated firms, with the firms in non-RSVY districts, the control firms. We employed the following specification to see how these two exogenous variations influenced firm transition:

$$e^*_{i,j,d,s,t} = \beta_0 + \beta_1 Treated_{i,j,d,s,t} + \beta_2 Time_{i,t} + \beta_3 (Treated * Time)_{i,j,d,s,t} + \sum_{k>1} \beta_k Z_{i,j,d,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + u_{i,j,d,s,t} \quad (7.2)$$

The dependent variable is firm size category, denoted by *e*, which is an ordered categorical variable ranging from 1 to 7 (1= 6-9, 2=10-19, 3=20-49, 4=50-99, 5=100-199, 6=200-499, and 7=500 and above). The subscripts *i*, *j*, *d*, *s*, and *t* stand respectively for a firm, industry, district, state and time. In our case, *t* equals 0 for the pre-treatment period and 1 for the treatment period. *Treated* is a dummy variable for treated firms that takes the value 1 for firms located in treated districts and 0 for firms in other districts. *Time* is a dummy variable that takes the value 1 if *t* equals 1 and 0 otherwise. The variable of interest is the interaction term of the time and treated group indicators, $(Treated * Time)_{i,j,d,s,t}$, which will tell us the difference of within-district differences between the treated and controlled districts.

[35] As discussed earlier, though JNNURM was implemented in cities/towns, due to lack of city identifiers in the dataset, we treat the districts where these cities are located as JNNURM districts.
[36] We performed this estimation for urban firms alone as well. The estimates, which are available from the authors upon request, too confirm the main results,

The results are presented in Tables 7.6 and 7.7. Table 7.6 presents the coefficients and Table 7.7 captures the magnitude of impact of policy changes on firm size. We estimate four different specifications of equation (7.2). Columns 1-2 present the results for JNNURM and columns 3-4 for RSVY. The estimation is restricted to urban firms in col. (1) and to rural firms in col. (3). We return to the full sample in cols (2) and (4). These results can be interpreted as the changes in firm transition after the implementation of JNNURM and RSVY in treated districts compared to control districts, relative to the period prior to the implementation of these schemes. The main finding in Table 7.6 is that the interaction between treated and time dummy variables are positive and significant in all model specifications. The positive coefficient of the interaction term suggests that firms in districts where the schemes are implemented experience a significant positive impact on firm transition as compared to firms in controlled districts. In other words, the difference-in-differences estimates suggest an overall positive impact of infrastructural availability on firm transition. These results confirm the findings from our baseline strategy, and clearly point to the effect of policy interventions on firm transition.

Table 7.6: DiD Results

Dependent variable: *SIZE*

Variables	JNNURM		RSVY	
	Urban Firms	All Firms	Rural Firms	All Firms
	(1)	(2)	(3)	(4)
Treated	0.043***	0.068***	-0.425**	-0.335**
	(0.016)	(0.013)	(0.206)	(0.148)
Time	0.455***	0.401***	0.176**	0.235***
	(0.021)	(0.015)	(0.069)	(0.048)
Treated*Time	0.083***	0.123***	0.398*	0.315**
	(0.027)	(0.021)	(0.212)	(0.160)
Firm-Specific Controls				
Location		-0.117***		0.122***
		(0.011)		(0.035)
CLR	-0.002	-0.039***	0.032*	0.002
	(0.005)	(0.004)	(0.018)	(0.013)
Proprietary	-4.949***	-4.730***	-4.571***	-4.947***
	(0.029)	(0.021)	(0.338)	(0.200)
Partnership	-2.678***	-2.632***	-2.106***	-2.200***
	(0.025)	(0.019)	(0.316)	(0.192)
PrivateLtdCom	-1.576***	-1.487***	-0.318	-0.501***
	(0.023)	(0.017)	(0.255)	(0.163)
State-Specific Controls				
HDI	3.242***	2.816***	2.818***	1.933***
	(0.167)	(0.114)	(0.562)	(0.437)
Shurban	-0.007***	-0.005***	-0.0003	-0.010***
	(0.001)	(0.000)	(0.002)	(0.002)
Industry FE	Y	Y	Y	Y
State FE	N	N	N	N
N	90074	150,424	60252	142218
Log pseudolikelihood	-122950.31	-215153.58	-414317.38	-996319.79
PseudoR^2	0.212	0.197	0.300	0.310

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

Table 7.7: True intervention effect of the treatment on the Treated

Size Groups	JNNURM		RSVY	
	All Firms	Urban Firms	All Firms	Rural Firms
	(1)	(2)	(3)	(4)
6 to 9	-0.015***	-0.010***	-0.020**	-0.026**
	(0.003)	(0.004)	(0.010)	(0.014)
10 to 19	-0.002***	-0.001***	0.008**	0.009**
	(0.000)	(0.000)	(0.004)	(0.005)
20 to 49	0.0003***	0.0002	0.005**	0.006*
	(0.000)	(0.000)	(0.002)	(0.003)
50 to 99	0.001***	0.001**	0.003**	0.004*
	(0.000)	(0.000)	(0.002)	(0.002)
100 to 199	0.003***	0.002***	0.002**	0.003**
	(0.001)	(0.001)	(0.001)	(0.002)
200 to 499	0.006***	0.004***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
500 and Above	0.007***	0.005***	0.001**	0.001**
	(0.001)	(0.001)	(0.000)	(0.001)

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

7.5.2. Night-Time Light Intensity as a Proxy for Infrastructure

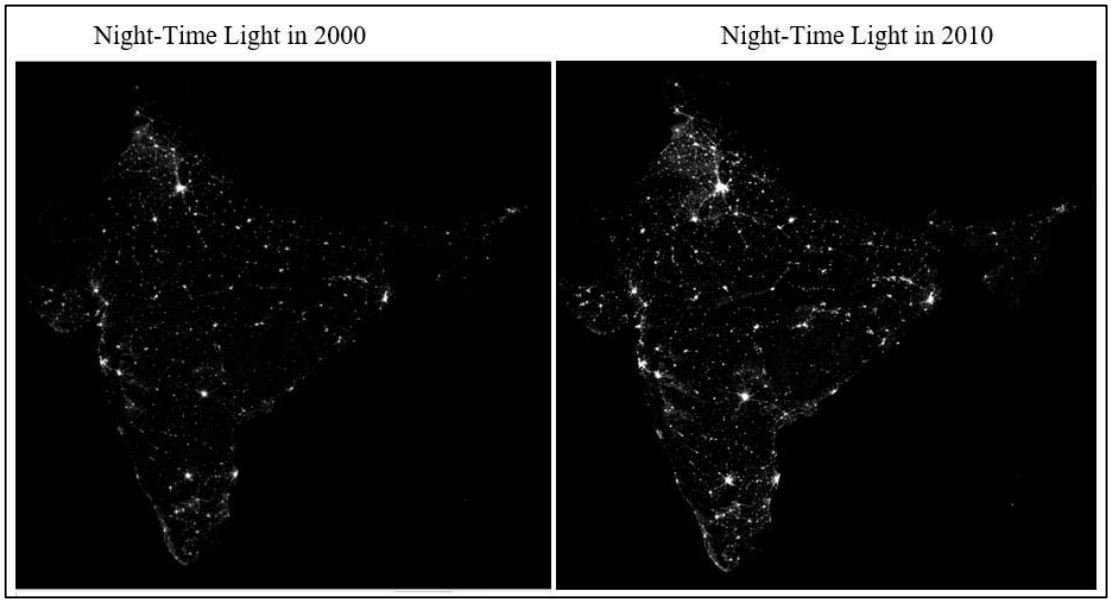
We carry out an additional robustness test to assess the role of infrastructure on firm size using night-time light intensity (*NTLI*) as a proxy for infrastructure, as used by Chaurey and Le (2022) for India and Henderson *et al*. (2012) for sub-Saharan Africa. Night-time light data, following the work of Henderson *et al*. (2012), has been heavily used in the literature as a proxy for economic activity (for example, Basher *et al*., 2022; Goldblatt *et al*., 2019; Beyer *et al*., 2018; Asher and Novosad, 2017).[37] Our approach to using night-time light data is straightforward and based on the logic that it is strongly correlated with various infrastructure provisions, including electricity consumption. For example, Elvidge *et al*. (1997), Shi *et al*. (2015), Addison and Stewart (2015), Mellander *et al*. (2015), Xie *et al*. (2016), and Pickering (2017) find a strong positive correlation of night lights with various infrastructural provisions in many countries, especially in lower-income and developing countries. They also suggest that night-time light data is a better proxy for electricity or energy consumption in regions where data are weak or unavailable (Addison and Stewart, 2015; Jasińsk, 2019). Especially for India, Baskaran *et al*. (2015) show that night-time light emission is an ideal proxy for public-service provisions such as electricity.

We measure *NTLI* using nightlight luminosity, as obtained from the satellite imagery of the earth at night.[38] The recent data on night-time light clearly depicts marked improvement in India's regional dispersion and infrastructural provision from 2000 to 2010 (Figure 7.1).

[37] For more studies on this, please refer Addison and Stewart (2015), Zhou *et al*. (2019), and Gibson *et al*. (2020).

[38] The night-time light is recorded at the 30 arc-second levels which is equivalent to approximately 1 KM^2 at the equator. Satellite images on luminosity at night is collected by the United States Air Force Defense Meteorological Satellite Program (DMSP)'s Operational Linescan System, and then maintained and processed by the National Oceanic and Atmospheric Associations (NOAA).

Figure 7.1: Night-Time Light in India: in 2000 and 2010



Source: Own estimates using QGIS software.

For our empirical analysis, we process the raw Geographic Information System (GIS) digital light composites to obtain mean night-time light radiance for each district from 2001 to 2011. We then normalize the district-level mean night-time light radiance data using an inverse hyperbolic sine transformation as employed by Chaurey and Le (2022) and use it in our ordered logit estimations. The model specification that we estimate take the following form: [39]

$$e^{*}_{i,j,d,s,t} = \beta_0 + \beta_1 NTLI_{i,j,d,t} + \sum_{k>1} \beta_k Z_{i,j,d,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,d,s,t} \quad (7.3)$$

Table 7.8 present the results from this estimation. We find that night-time light intensity is positively associated with firm transition. This finding suggests that the infrastructural provision at the district level is likely to promote dispersed industrialisation and thereby firm expansion and progression from small to the next size categories.

[39] We confine our analysis to the period from 2001 to 2011 as district identifiers is not provided for 2016.

We compute the marginal effects for the full model specification (as in Column 3 of Table 7.8) and present the results in Table 7.9. Marginal effects for *NTLI* suggest that a firm in the district with a higher night-time light intensity reduces its probability to remain in the 6-9 size category by 0.6 per cent, in the 10-19 size category by 0.04 per cent, and increases the probability of it being in the 20-49 size category by 0.4 per cent, in the 50-99 and 100-199 size category by 0.1 per cent and in the 200-499 and 500 and above size categories by 0.2 per cent (Table 7.9). In short, our results indicate that infrastructural availability at the district level is crucial for small firm transition in Indian manufacturing.

Table 7.8: Impact of Night-Time Light Intensity on Firm Transition (Ordered Logit Regression Estimates)

Variables	(1)	(2)	(3)
NTLI	0.037*** (0.008)	0.064*** (0.008)	0.048*** (0.007)
Firm-Specific Controls			
Location		-0.126*** (0.012)	-0.127*** (0.011)
CLR		-0.041*** (0.004)	-0.049*** (0.004)
Proprietary		-4.814*** (0.022)	-4.752*** (0.021)
Partnership		-2.784*** (0.020)	-2.713*** (0.019)
PrivateLtdCom		-1.616*** (0.017)	-1.579*** (0.017)
State-Specific Controls			
HDI			-0.297** (0.124)
Shurban			0.002*** (0.000)
Time FE	Y	Y	Y
Industry FE	Y	Y	Y
State FE	Y	Y	N
N	148761	148761	148761
Log pseudolikelihood	-252194.95	-210209.06	-211911.76
PseudoR^2	0.052	0.209	0.203

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

Table 7.9: Marginal Effects

Size Groups	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
NTLI	-0.006*** (0.001)	-0.0004*** (0.000)	0.004*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

7.6. Conclusion

This chapter investigated the role of infrastructure on firm transition using an ordered logit model. To address the endogeneity issue, we supplemented the main empirical strategy with two alternate approaches. First, we employ DiD, where we analyse the impact of an exogenous variation of the availability of infrastructure on firm transition. We take advantage of two recent government policies, namely JNNURM and RSVY, which were introduced in 2005 and 2003, respectively. In the second approach, we use night-time light intensity as a proxy for infrastructural availability and check the robustness of our findings. The results suggest that infrastructural availability is a vital factor explaining the transition of firms in the Indian manufacturing sector. This finding is upheld by various robustness checks carried out in the study. Therefore, improving the infrastructural availability is important for aiding the transition of firms. The introduction of programmes like JNNURM and RSVY have enhanced the availability of infrastructure and have the potential to aid small firm transition.

CHAPTER 8

ROLE OF LABOUR REGULATIONS

8.1. Introduction

The analysis carried out in Chapters 6 and 7 demonstrated that access to finance and infrastructural availability are vital factors influencing the transition of small firms in Indian manufacturing. Labour legislation is another factor always figured at the top of the list of proximate causes explaining the limited vertical mobility of small enterprises (Goldar and Aggarwal, 2010; Mazumdar and Sarkar, 2013; Ramaswamy, 2013; Chaurey, 2015). In much of the developing world, labour market regulations are a subject of fierce debates. These regulations set the standards for wages, working hours, hiring and firing besides working conditions. Two prominent but fundamentally diverging viewpoints can be discerned with regard to the costs and benefits of these regulations. One view asserts that labour market regulations inhibit employment generation and heighten unemployment rates, which subsequently have an adverse impact on economic growth (Besley and Burgess, 2004; Feldmann, 2009; Balmaceda and Fischer, 2010; Adhvaryu *et al*., 2013; Adascalitei and Morano, 2015). These regulations, they argue, force firms to resort to adjustments in order to circumvent certain pro-worker legislations that raise the cost of labour or alter the balance between flexibility and security (Betcherman, 2015).[40] Scholars belonging to this strand of economic analysis propose reducing or eliminating labour market regulations, so as to enhance the reallocation of workers and competition, which will ultimately result in growth (Almeida and Carneiro, 2012). Although this view has gained considerable

[40] For example, firms can reduce the size of the workforce or replace less skilled workers with more skilled ones in response to high minimum wages. They could even make adjustments in other labour cost components.

value among scholars, it is not universally appreciated (Nickell *et al.*, 2005). Its opponents maintain that labour regulations perform an important redistributive role in a market economy – by redistributing wealth and ensuring bargaining power for workers. Labour laws, according to them, also play a critical role in providing protection to the vulnerable sections of the workforce from adverse market outcomes (Standing and Tokman, 1991). They also act as 'beneficial social or regulatory constraints' that coerce employers to innovate in order to derive benefits out of these constraints and thereby improve the overall efficiency of the economy (Streeck, 2004; Storm and Capaldo, 2018).

A recent and growing body of empirical literature is devoted to understanding the role of labour regulations on small firm transition (Almeida and Carneiro, 2009 and 2012; Hasan and Jandoc, 2010; Aterido *et al.*, 2011; Amirapu and Gechter, 2020; Vallanti and Gianfreda, 2021). Some argue that these regulations raise the effective cost of labour, which prevent firms from growing in size. Others, however, feel these regulations provide an impetus to firms' transition as they make the market employer–friendly by promoting and rewarding entrepreneurship and growth (Fenwick *et al.*, 2007). Although the effects of labour market regulations have been studied extensively in developed countries, studies probing their role in developing countries are limited. Even within developing countries, the bulk of the existing research has focused on large firms. It is equally important to probe the role of regulations on small firms as their impact is also felt on small firms who are reluctant to transit to the registered sector as strict enforcement of the labour laws raises their cost of production. Further, the regulations and their enforcement send a clear signal to the firms as to whom they favour, workers or the employers, which ultimately prompt the firms, especially the small ones, to decide whether to transit from informal to formal status. Hence, one

needs to focus on the entire continuum of firms, from the smallest to the largest firms, to understand the true effects of labour market regulations on firm transition. Additionally, most of the studies have focused exclusively on the *de jure* nature of reforms and ignored the *de facto* measures.[41] When it comes to developing countries, a large gap between *de facto* and *de jure* regulation is observed due to weak enforcement and high evasion (Almeida and Susanli, 2011). Hence, examining the role of both *de facto* and *de jure* labour regulation on firm growth is extremely important.

In this chapter, we investigate the effects of labour market regulations on firm transition in Indian Manufacturing. Some recent studies argued that the labour laws in India are one of the most restrictive in the world and have been a constraint on growth and employment generation (Dougherty, 2009). Some observers also believe that these laws have a negative impact on firm transition in the Indian manufacturing sector, and they regard bunching of firms in the informal sector as an outcome of rigid labour laws (Mazumdar and Sarkar, 2013; Ramaswamy, 2013).

Given the political autonomy of the Indian states, the implementation and enforcement of labour regulations are decentralised and vary across states. We exploit these cross-state differences (both *de jure* and *de facto*) in the implementation of labour laws to construct the measures of labour market flexibility and explore the association between labour regulations and firm transition.

The remainder of the Chapter is structured as follows. We discuss the labour market regulations and its enforcement in India in the next section 8.2. Section 8.3 presents a discussion on the empirical strategies employed in this Chapter. The association

[41] *De jure* and *de facto* measures can also be referred to as regulations on paper and regulations in practice, respectively.

between labour regulation and firm transition is explored in section 8.4. The robustness tests are discussed in section 8.5. Section 8.6 provides the conclusion.

8.2. Labour Market Regulations and its Enforcement in India

In India, industries are subject to a common set of regulatory measures (by the Industries (Regulation and Development) Act of 1951) except the Industrial Dispute Act (IDA) of 1947. Most of these Acts are enacted by the Central Government and apply to all units registered under the Factories Act of 1948 of the Government of India. Firms are bound to register under the Factory Act if they employ 10 or more workers and use power in their operations; and 20 or more workers if they do not use power in their operations (Mazumdar and Sarkar, 2013). Firms registered under the Factories Act will have to abide by a wide set of government regulations that are exclusively applied to the formal sector. Among the set of regulations, the most difficult that the formal sector firms will have to deal with is the employment-protection laws (commonly referred to as Labour Regulations) which are the most restrictive in the world (Kathuria *et al.*, 2013). These regulations consist of rules concerning the condition of service, lay-off, retrenchment and closure of the formal sector firm increasing beyond a threshold size. Which is likely to raise the effective cost of labour adjustment and put pressure on firms to stay below the legal threshold size of 100 workers and restrict transition to the formal sector (Ramaswamy, 2013; Mazumdar and Sarkar, 2013). The administration of IDA is the joint responsibility of both, the central and state governments. Over time, states have introduced various amendments to these labour laws. Till date, 141 such amendments were noticed since the IDA was first introduced. While some of the amendments are considered as pro-workers, some are skewed toward employers, and

some others are neutral. We present two examples below to show how we categorise these amendments:

For example, the state of Rajasthan introduced the following amendment in 2014:

> *"This amendment increases the number of employees from one hundred to three hundred for the provisions relating to lay-off, retrenchment and closure in an industrial establishment (not being an establishment of a seasonal character or in which work is performed only intermittently), given that the state government may reduce the number of employment to one hundred from three hundred to the maintenance of industrial peace or prevention of victimization of workers (Rajasthan Gazette, November-2014)."*

This amendment effectively raises the size threshold from 100 to 300, which is expected to reduce the cost of regulation for firms. Hence, this can be treated as a pro-employer amendment. Another amendment introduced in the state of Assam in 2007 is stated below:

> "*Any person involved in work for the promotion of sales' shall be inserted. This category of employment is not specified in the Central Act (The Assam Gazette, November-2007).*"

As the Central IDA does not apply to persons involved in the promotion of sales, the Act was amended to include this provision. This is an example of a pro-worker amendment.

The impact of labour market regulations on economic outcomes manifests through two channels: (a) relative price effect and (b) expropriation effect. However, both channels

have similar implications on economic outcomes – slowing down the growth of output and employment.[42] The relative price effect comes into the picture when labour regulations raise the cost of employing workers. Pro-worker legislations raise the effective cost of labour adjustments in hiring and firing workers in manufacturing firms. Therefore, it is expected that the firm will desist from employing workers and instead substitute labour for capital, wherever this substitution works. Additionally, the pro-worker regulations are argued to lower the output level following the rise in the marginal cost of production (Besley and Burgess, 2004). These regulations are also expected to affect the decision of small firms to graduate to the formal sector (ibid). In states where there is an escalation in labour costs owing to pro-worker regulations, small firms refrain from registering to become formal-sector firms and decide to remain small. In such states, we will see a very large number of unregistered firms and fewer registered ones. As argued by Mazumdar and Sarkar (2013) as well as Besley and Burgess (2004), the increase in labour costs creates a disincentive for small firms to expand vertically in size, and that results in horizontal expansion with a multiplication of small units in the informal sector rather than growing into the formal sector. The expropriation effect works when labour regulations increase the bargaining power of labourers, which increases the importance of hold-up problems in investment. This will discourage investment, even if the labour and capital are perfect substitutes. This has a similar impact on the level of employment and the decision to register in the formal sector as with the relative price effect.

Whether firms benefit from these regulations is not straightforward and needs to be empirically examined. As the implementation and enforcement intensity varies across

[42] See Besley and Burgess (2004) and Ahsan and Page (2009) for further details.

the states of India, some firms are more likely to be adversely affected than the other firms in the sector. In rigid labour markets, which protect the rights of workers and strictly enforce those rights, firms are likely to show aversion to becoming registered firms as strict enforcement raises the cost of production. On the contrary, in states with a flexible labour market, the possibility of more firms experiencing upward mobility cannot be ruled out. In addition, these amendments are suggestive of the intentions of the states as to whom they favour, workers or employers. In the end, it is such decisions taken by the states that finally prompt firms, especially small ones, to choose whether to transition from informal to formal status.

8.3. Methodology

8.3.1. Labour Regulation Data

Data on labour regulation measures are obtained from various sources. As mentioned earlier, we focus on both *de jure* and *de facto* labour regulations. We utilize the various state-level amendments to the IDA to measure the *de jure* variations in different states. The data on amendments are obtained from the "Besley and Burgess (2004) Data Appendix". Besley and Burgess (2004) provide the data till 1992 and for the remaining period of our analysis, we have updated it using similar coding procedures.

To capture the *de facto* reforms, we relied on the state and time variation in two variables, namely, the share of contract workers and the proportion of workers affected by layoffs, retrenchment, and closures. Data on the share of contract workers is computed from the ASI. Data on the share of workers affected by layoffs, retrenchment and closures is obtained from various issues of statistics on Industrial Disputes, Closures, Retrenchments, and Layoffs in Industries published by the Labour Bureau of India.

8.3.2. Labour Regulation Variables

Our core independent variable is labour regulation. Two measures constructed at the state-level are used to proxy labour regulations.[43] Their construction is as follows:

(a) Cumulative Labour Regulation Index (CLRI)

Cumulative Labour Regulation Index (*CLRI*) measures *de jure* variations at the state-level. We used the commonly employed measure of labour regulation by Besley and Burgess (2004) (hereafter, BB). In their measure, BB capture the bias in the labour laws, whether skewed towards workers or employers, as they exist 'on the books' (Sen *et al.*, 2010). To do this, BB have examined all the state-level amendments to labour laws and classified them into three categories: 'pro-worker' 'pro-employer' and "neutral". We followed a similar procedure as BB and coded an amendment "–1" if 'pro-worker', "+1" if 'pro-employer' and "0" if 'neutral'.[44] We use the BB measure till 1992 and update it till 2015 by employing the same coding strategy as BB. There have been 28 such amendments passed since 1992.[45] Once the codes are assigned, they are cumulated over the entire period to obtain a quantitative picture of the regulatory environment that evolved in a state.[46] A state with a higher cumulative score for *CLRI* is considered a pro-employer labour market. A pro-worker labour market typically enjoys low *CLRI* scores. In our sample, West Bengal emerged as the state having more 'pro-worker' labour market institutions with a cumulative score of "–4" in 2015. On

[43] In our estimations, we use the labour regulation measures lagged by one year.
[44] The codes assigned in this study are different from the ones assigned by BB. They assigned a code "-1" if an amendment is pro-employer, "+1" if pro-worker, and "0" if neutral. In our study, a more flexible market scores high as compared to BB, where a rigid labour market takes a higher score. Therefore, the results would have obviously been the same if we followed BB codes.
[45] We mentioned briefly all these amendments in the Appendix Table A8.11.
[46] Following Besley and Burgess (2004), our index codes the general direction of change if there are multiple amendments in a year. For example, if a state witnessed three pro-worker amendments in a year, we coded it as "-1" rather than "-3". On the other hand, if the amendments in a year constituted one pro-worker and two pro-employer amendments, we coded it as "+1".

the other hand, Tamil Nadu obtained a score of "+2" for *CLRI* as the state has witnessed three pro-employer and one pro-labour legislation in the entire period. We normalised the values of *CLRI* and used them in estimations.

(b) Labour Market Flexibility Index (LMFI)

We also construct a second measure of labour regulation at the state level. The degree of regulation in the labour market crucially hinges on the way these labour laws are implemented and enforced. In other words, state-level amendments to labour laws may not fully capture the extent of regulations in the labour market if there is laxity in enforcement. As stated by Kanbur and Ronconi (2018), state-level differences in the stringency of the labour regulations barely matter, if there is an absence of any enforcement effort since the law simply does not bite. So, we need a measure that encapsulates not only *de jure* laws and regulations, but also their *de facto* implementation and enforcement. Our second measure, *LMFI*, captures both *de jure* and *de facto* changes to labour regulations. The *de facto* differences are measured using two state-level indicators: (a) the share of contract workers in the total workers of a state; and (b) the share of workers affected by layoffs, retrenchment and closures in each state. We followed a three-step approach to construct the *LMFI*. First, we normalised the variables chosen to construct the index. Second, we aggregated the normalised variables into a sub-index representing *de facto* differences by assigning equal weights. Finally, to arrive at the overall index of labour market flexibility, *LMFI*, we took the average of *CLRI* and the sub-index of *de facto* differences. We assign equal weight to both the *de jure* (*CLRI*) and *de facto* indices.[47] A state with a higher *LMFI* is

[47] We have also tried with different weights for *de facto* and *de jure* measures. For instance, we tried with a weighting scheme where the *de facto* measure receives twice the weight as the *de jure* measure. Our results are robust to these alternate weighting schemes.

considered a pro-employer labour market. In other words, a higher score of *LMFI* points to a flexible labour market and a lower score signifies a rigid labour market.

Firm- and State-Specific Control Variables

We include a battery of firm-specific and state-specific characteristics as control variables. As firm-specific controls, we include the location of the firm (*Location*), ownership (*Ownership*), and capital-labour ratio (*CLR*). As state-level controls, we introduce variables representing the level of human development (*HDI*), level of urbanisation (*Shurban*), and level of infrastructure (*Power*).[48]

Industry and Time Fixed Effects

We include time- and industry-fixed effects to account for the unobserved year- and industry-specific shocks. Year effects are believed to capture macro shocks with possible firm productivity effects. Industry dummies control for the industry-specific shocks that are likely to have an independent impact on firm size over and above that exerted by the labour regulation variables.

The summary statistics of the variables used in the analysis are presented in Table 8.1.[49] The construction of the control variables, is presented in Section 6.2.1, Chapter 6. In our dataset, an average firm belongs to the size category of 20 to 49 workers. The mean values of the labour market flexibility index stood at 0.47 when we consider both the *de jure* and *de facto* differences; and it scored about 0.65 when we consider only the *de jure* changes across the states. Among the firms in our dataset, 37 per cent are proprietary firms, 16 per cent are firms operating on a partnership basis and 27 per cent

[48] In Section 6.2.1, Chapter 6, we defined these variables.
[49] Table 8.1 reports the summary statistics without weights.

are private limited companies. The remaining 20 per cent are *Other_firms*. Urban firms constituted 59 per cent of our sample. Table 8.1 also reports the summary statistics for the state-specific control variables. The average level of human development stood at 0.58. The average urban population constituted about 34 per cent of the total population.

Table 8.1: Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variable					
SIZE	189916	3.102	1.894	1	7
Independent Variables					
CLRI	189916	0.649	0.264	0	1
LMFI	189916	0.468	0.174	0.022	0.922
Firm-Specific Controls					
Location	189916	0.591	0.492	0	1
CLR	189916	17.088	2.080	-2.676	28.789
Proprietary	189916	0.367	0.482	0	1
Partnership	189916	0.163	0.369	0	1
PrivateLtdCom	189916	0.268	0.443	0	1
Other_firms	189916	0.202	0.401	0	1
State-Specific Controls					
HDI	189916	0.583	0.068	0.436	0.757
Shurban	189916	34.019	11.052	12.147	58.530
Power	189916	6.609	0.656	4.647	7.718

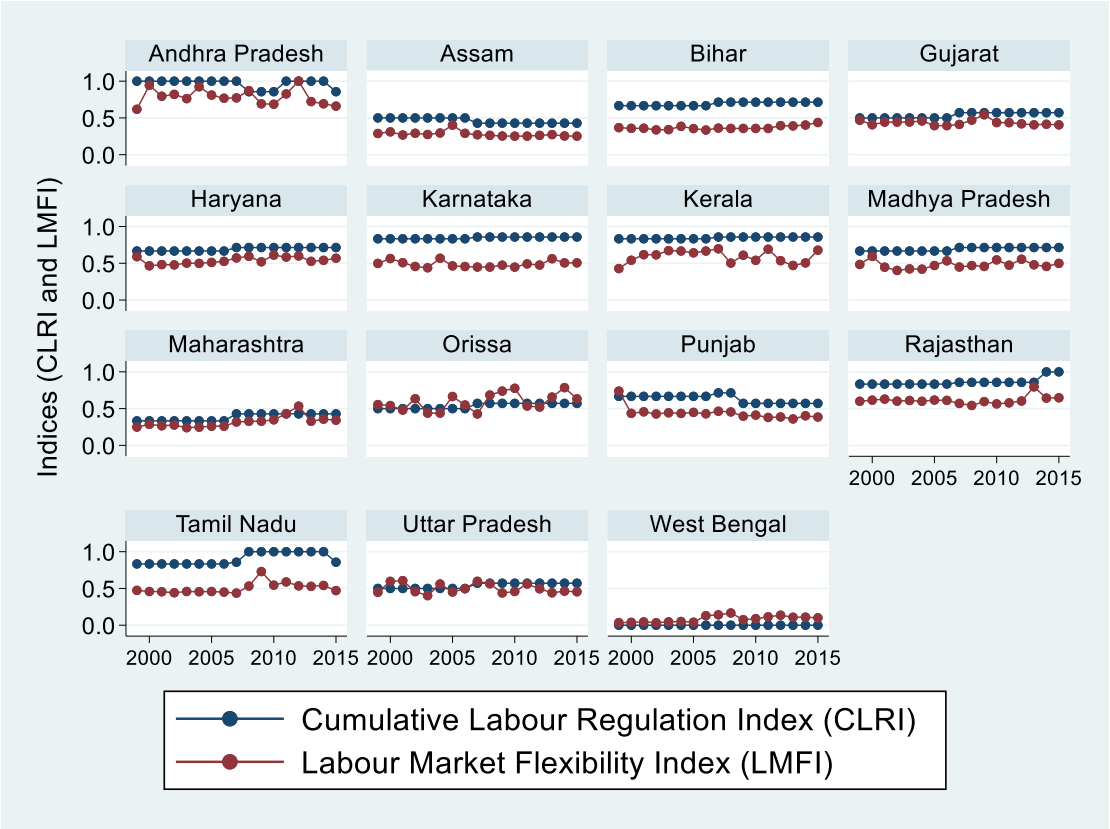
Source: Own estimates.

8.3.3. State-wise Enforcement of Labour Regulations

The implementation and enforcement intensity of labour regulations vary across states. This section briefly presents the labour regulation indices (i.e., *LMFI* and *CLRI*) and captures the state-wise variations. Based on both indices, the labour market is more flexible in the state of Andhra Pradesh, while it is least flexible in West Bengal (Figure 8.1). We observed a sizable difference in the scores of the *CLRI* and the *LMFI* for almost all the states. For example, *CLRI* scores for Bihar, Karnataka and Tamil Nadu remained above 0.6 over the period of our analysis whereas the score of *LMFI* lay between 0.4 and 0.6 (Figure 8.1) in those states. This indicates that the labour market

looks more flexible if only *de jure* reforms (*CLRI*) are considered and less flexible if we consider both the *de jure* and *de facto* reforms. Focusing only on *de jure* reforms, therefore, overstates the flexibility in the labour market-more so in states where there is laxity in enforcement as compared to others-and it is important to account for this limitation. By constructing *LMFI*, we account for this major limitation of studies that relied on only the *de jure* changes in labour regulations (Besley and Burgess, 2004; Gupta *et al*., 2009; Hasan *et al*., 2007; Chaurey, 2015; Hasan *et al*., 2021).

Figure 8.1: State-wise Enforcement of Labour Regulations: 1999-2015



Source: Own estimates.

8.3.4. Empirical Strategy

This study employs an ordered logit model to empirically examine the association between labour regulation and firm transition. As stated earlier, our dependent variable is firm size, denoted by an *e*, measured using an ordered variable, with seven firm size

categories, ordered from smallest to largest based on the number of workers in the firms. To examine the relationship, we consider the following ordered logit specification:

$$e^{*}_{i,j,t,s} = \beta_0 + \beta_1 LR_{t,s} + \sum_{k>1} \beta_k Z_{i,j,t} + \sum \delta_k X_{t,s} + \alpha_j + \gamma_t + u_{i,j,t,s} \qquad (8.1)$$

where subscripts *i*, *j*, *s* and *t* represent firm, industry, state, and time respectively. *LR* is our measure of labour regulation, and we use two different measures of labour regulation (*CLRI* and *LMFI*). We would expect $\beta_1 > 0$ if flexible labour regulation plays a positive role in the transition of firms. $Z_{i,j,t}$ is a vector of variables representing firm characteristics to account for the firm-level differences in location, capital intensity, and ownership. $X_{t,s}$ corresponds to the vector of state-specific control variables that include state-level differences in human development, urbanisation, and power infrastructure. The variables, α_j and γ_t, account for the industry- and time-specific fixed effects, respectively.

Our empirical strategy intends to gauge the effect of labour regulation on firm transition; however, it cannot be denied that the association between labour regulation and firm transition could be driven by reserve causality and omitted variable bias. Changes in labour laws do not take place at random. The alterations to labour laws might likely be an outcome aided by the unpredictability of political and economic events that would dictate the costs and benefits of passing amendments to the labour laws. For instance, states with a larger interest in the manufacturing sector for growth and employment generation may have been initially compelled to pass pro-worker amendments so as to secure workers from future economic shocks. Another possibility is that the anticipation of poor outcomes heightens the chance to introduce reforms that either promote job security or make the resolution of disputes costlier (Ahsan and Page,

2009). These changes would have differently impacted the firm transition. Exploiting the exogenous sources of variation, and instrumenting labour regulation variables would aid in circumventing this concern.

Changes in labour laws mostly occurred after 1977, following a period of emergency, according to Besley and Burgess (2004). The ruling dispensation lost power in the elections held after the Emergency. The Congress party, which enjoyed political power at the state and Central levels, lost its power to other parties in several of the states. The non-congress governments that came to power in these states initiated fresh ideas for establishing industrial relations. The early changes in labour laws in these states can be considered a response to this political shock. In their study, Besley and Burgess (2004) use two measures, namely, the level of unionisation prior to 1977 (*Unionisation),* and the share of land under the non-landlord revenue system in each modern state during British India (*LandTenure*). By these two measures, they captured the initial state of affairs that influenced the political condition in Indian states and its impact on labour regulation subsequently when competition among the political parties intensified. This variable, as they argue, represents the transition in industrial relations aided by the shift in power from congress to non-congress parties in many Indian states. The states where the power shifted in favour of non-congress parties had seen significant changes in labour regulation as compared to the congress-ruled states. We employ these two measures as instruments for our labour regulation variables.

For our measure of *Unionisation*, we follow the method employed by Besley and Burgess (2004). We rely on the union membership rates at the state level computed as the ratio of number of union members in a state to the state population and averaged it over the period 1960 to 1975. We collected this information from the data appendix of

Besley and Burgess (2004). For the *LandTenure* variable, we relied on the data appendix of Banerjee and Iyer (2005), who classified the land revenue system imposed in each district of British India as landlord and non-landlord based. We constructed this measure as the proportion of land that was under the non-landlord system in constituent districts of modern states weighting each by the land area of the districts.

We employed two-stage residual inclusion (2SRI) approach to address the issue of endogeneity (Terza, 2017).[50] We proceed in two stages, following Ivlevs *et al*. (2020). The first stage involves estimating a standard first-stage auxiliary regression where the instruments and all the control variables are regressed on the potentially endogenous regressor (in our case, *CLRI* and *LMFI*). In the second stage, the outcome model with the endogenous regressor, all other covariates and the residual inclusion parameter are estimated. The standard errors in the second stage and the reported marginal effects are arrived at using bootstrapped clustered replications.

8.4. Results

We start with the ordered logit regression results, followed by a discussion of the IV results.

Baseline Results

Table 8.2 provides the basic set of results of this study obtained by estimating equation (8.1). Three different specifications are estimated separately for *CLRI* (Cols. 1-3) and *LMFI* (Cols. 4-6). In Columns 1 and 4, we estimate the basic specification including just the labour regulation variables and time and industry fixed effects. The second specification in columns 2 and 4 includes the set of firm-specific controls discussed

[50] The Section 6.2.2. of Chapter 6 provides a details discussion about 2SRI approach.

earlier. The final specification in columns 3 and 6 also includes state-specific control variables.

Our findings suggest that labour regulation plays an important role in the transition of firms; a state is more likely to see firms making an upward progression if it has a more flexible labour market. The coefficients of *LMFI* and *CLRI* are positive and significant at the one per cent level across all six models indicating that the firms in states with flexible labour markets are more likely to transit from the smaller-size to the larger-size category.

Our firm-level control variables yield results consistent with our expectations. *PrivateLtdCom* is positively related to *SIZE* indicating that private limited companies are more likely to make the transition as compared to the benchmark category of firms that include cooperative societies, limited companies, and trusts among others. This is expected as these firms are separate legal entities and enjoy better avenues for borrowing funds. Firms that run on a partnership basis show a higher probability of making the transition as compared to the firms in the reference category. On the other hand, the coefficient of *Proprietary* yields a negative coefficient indicating that as compared to the firms in the benchmark category they are less likely to make the transition. As anticipated, the *CLR* variable returns a positive and significant coefficient suggesting that the likelihood of transiting to the immediate size-group is higher among more capital-intensive firm vis-a-vis less capital-intensive firm.

Table 8.2: Results: Ordered Logit Regression
(Dependent Variable: *SIZE*)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
CLRI	0.721***	0.987***	0.912***			
	(0.065)	(0.059)	(0.065)			
LMFI				0.911***	1.282***	1.204***
				(0.098)	(0.083)	(0.099)
Firm-Specific Controls						
Location		-0.102***	-0.109***		-0.097***	-0.112***
		(0.031)	(0.031)		(0.031)	(0.031)
CLR		0.158***	0.153***		0.159***	0.151***
		(0.013)	(0.013)		(0.013)	(0.013)
Proprietary		-2.377***	-2.385***		-2.372***	-2.380***
		(0.058)	(0.058)		(0.058)	(0.058)
Partnership		0.264***	0.253***		0.270***	0.257***
		(0.070)	(0.069)		(0.069)	(0.069)
PrivateLtdCom		1.867***	1.871***		1.854***	1.870***
		(0.046)	(0.046)		(0.045)	(0.046)
State-Specific Controls						
HDI			0.194			0.734
			(0.495)			(0.507)
Shurban			-0.008***			-0.002
			(0.003)			(0.003)
Power			0.249***			0.225***
			(0.058)			(0.060)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
N	189913	189913	189913	189913	189913	189913
Log pseudolikelihood	-1959806.7	-1527316.1	-1526255.4	-1962256	-1530535.3	-1528819.9
Pseudo R2	0.056	0.265	0.265	0.055	0.263	0.264

Notes: Robust standard errors are reported in parentheses. *** p<0.01.
Source: Own estimates.

Availability of infrastructure is also a crucial determinant of firm transition, according to our results. The positive coefficient of *Power* suggests that power availability is an important dimension of infrastructure positively influencing firm transition in a state.

Contrary to our expectations, a negative association between *Location* and firm transition is observed. It indicates that urban firms are less likely to make the transition as compared to firms in rural areas. It might be highlighting the effects of market competitiveness, cost of land, higher wages, and higher tax rates in an urban location. Further, the coefficient of *Shurban* is negative and significant suggesting that firms

located in states with a higher share of the urban population are less likely to make the transition. This finding is consistent with that of Phillipson *et al*. (2019), showing a negative role of urban location on firm performance.

Apart from understanding the direction of relationships, it is equally important to understand the economic magnitude of these relationships, which prompts us to extract marginal effects from the estimated ordered logistic models. The marginal effects for the full model (Cols. 3 and 6 in Table 8.2) are presented in Tables 8.3 (for *CLRI*) and 8.4 (for *LMFI*). The estimated marginal effects show that the firms located in a flexible state labour market are less likely to be in the 6-9 size category and more likely to be in the larger size categories. Economically, the magnitude of this impact is large. Marginal effects for *LMFI* suggest that a firm in a state with a flexible labour market reduces its probability of ending up in a 6-9 size category by 10.5 per cent, and increases the probability of it being in the 10-19 size category by 4.5 per cent, in the 20-49 size category by 2.3 per cent, the 50 to 99 size category by 1.3 per cent, the 100 to 199 size category by 1.0 per cent, the 200 to 499 size category by 0.8 per cent and 500 and above size categories by 0.5 per cent (Table 8.4). The marginal effects yield a similar pattern of influence when we consider *CLRI* except that the magnitude of impact is marginally low (Table 8.3). Additionally, we have also used the labour regulation measures developed by Bhattacharjea (2006), Ahsan and Pages (2009) and Roy *et al.* (2020) in our specifications. The results for the key explanatory variables remain the same for these alternative measures too.[51]

[51] The results of these robustness tests are presented in the appendix. The Tables A8.1 and A8.3 present the ordered logit estimation and Tables A8.2 and A8.4 present the marginal effects of the ordered logit model.

Table 8.3: Marginal Effects: *CLRI*

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
CLRI	-0.079***	0.034***	0.018***	0.010***	0.008***	0.006***	0.004***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Firm-Specific Controls							
Location	0.010***	-0.004***	-0.002***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.013***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.339***	-0.191***	-0.084***	-0.032***	-0.017***	-0.010***	-0.005***
	(0.011)	(0.005)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.056***	0.020***	0.018***	0.009***	0.005***	0.003***	0.002***
	(0.015)	(0.005)	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)
PrivateLtdCom	-0.380***	0.020***	0.120***	0.093***	0.069***	0.050***	0.028***
	(0.010)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
State-Specific Controls							
HDI	-0.017	0.007	0.004	0.002	0.002	0.001	0.001
	(0.043)	(0.019)	(0.010)	(0.005)	(0.004)	(0.003)	(0.002)
Shurban	0.001***	-0.0003***	-0.0002***	-0.0001***	-0.0001***	-0.0001***	-0.00004***
	(0.000)	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.022***	0.009***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Robust standard errors are reported in parentheses. *** p<0.01.
Source: Own estimates.

Table 8.4: Marginal Effects: *LMFI*

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
LMFI	-0.105***	0.045***	0.023***	0.013***	0.010***	0.008***	0.005***
	(0.008)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Firm-Specific Controls							
Location	0.010***	-0.004***	-0.002***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.013***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.339***	-0.191***	-0.083***	-0.032***	-0.017***	-0.010***	-0.005***
	(0.011)	(0.005)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.057***	0.021***	0.018***	0.009***	0.005***	0.003***	0.002***
	(0.015)	(0.005)	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)
PrivateLtdCom	-0.381***	0.020***	0.121***	0.093***	0.069***	0.050***	0.028***
	(0.010)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
State-Specific Controls							
HDI	-0.064	0.028	0.014	0.008	0.006	0.005	0.003
	(0.044)	(0.019)	(0.010)	(0.006)	(0.004)	(0.003)	(0.002)
Shurban	0.0002	-0.0001	-0.00004	-0.00003	-0.00002	-0.00002	-0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.020***	0.008***	0.004***	0.002***	0.002***	0.002***	0.001***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Robust standard errors are reported in parentheses. *** p<0.01.
Source: Own estimates.

Instrumental Variable Results

As discussed earlier, we employed the 2SRI method to address the endogeneity concerns between firm transition and labour regulation. The 2SRI estimation is performed on full specifications in Columns 3 and 6 of Table 8.2. Under the 2SRI estimates, the first stage and the second stage reduced form estimates for the full

specification are presented in Table 8.5. The coefficient of the predicted residual is significant when we use *CLRI* indicating that the regressor is endogenous.[52] The value of the F-test of excluded instruments further establishes the relevance of the instruments used in the estimations as it exceeds the commonly accepted threshold value of 10.

The marginal effects of second stage estimation for the full specification (Columns 3 and 6 of Table 8.5) with two version of our labour regulation, *CLRI* and *LMFI*, are presented in Tables 8.6 and 8.7, respectively. The two-stage procedure applied here points to the importance of controlling for the endogeneity of labour regulation variables. However, doing so does not affect the sign or significance of our estimates (Tables 8.6 and 8.7). We find that our 2SRI estimates also support the main results derived from the ordered logit estimations. Our labour regulation variables, *CLRI* and *LMFI*, yield the same sign and significance indicating that labour regulations play a critical role in the transition of firms. The more flexible the labour market in a state is, the more conducive it is for the firms in that state to make the transition. We also implemented the 2SRI procedure separately for each instrument and found the results to be qualitatively similar to the ones reported here.[53]

[52] The coefficient of the predicted residual is insignificant when we use *LMFI* as measures of labour regulation.
[53] The results of these tests are presented in the appendix. Tables A8.5 and A8.7 present the coefficient values of 2SRI estimation and Tables A8.6 and A8.8 report the marginal effects.

Table 8.5: Coefficient values: 2SRI estimations (Instrument: *Unionisation* and *LandTenure*)

(No. of replications: 500)

Variables	First-Stage (Dependent Variable *CLRI*)	Second-Stage (Dependent Variable *SIZE*	First-Stage (Dependent Variable *LMFI*)	Second-Stage (Dependent Variable *SIZE*
CLRI		0.662*** 90.077)		
LMFI				1.100*** (0.130)
XuHAT		0.677*** (0.114)		0.233 (0.182)
Firm-Specific Controls				
Location	-0.015*** (0.004)	-0.115*** (0.029)	-0.008*** (0.002)	-0.113*** (0.029)
CLR	-0.006*** (0.001)	0.151*** (0.012)	-0.003*** (0.001)	0.151*** (0.012)
Proprietary	0.011** (0.005)	-2.381*** (0.057)	0.010*** (0.003)	-2.378*** (0.057)
Partnership	0.017*** (0.005)	0.264*** (0.069)	0.013*** (0.003)	0.260*** (0.069)
PrivateLtdCom	0.026*** (0.005)	1.882*** (0.046)	0.017*** (0.003)	1.872*** (0.046)
State-Specific Controls				
HDI	1.871*** (0.054)	0.386 (0.479)	0.495*** (0.044)	0.725 (0.482)
Shurban	0.022*** (0.000)	-0.10*** (0.003)	0.007*** (0.000)	-0.003 (0.002)
Power	-0.034*** (0.006)	0.327*** (0.059)	0.029*** (0.004)	0.249*** (0.062)
Instrument				
Unionisation	-0.695*** (0.005)		-0.399*** (0.004)	
LandTenure	0.031*** (0.007)		0.058*** (0.006)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
N	189913	189913	189913	189913
Log pseudolikelihood		-1525096.4		-1528761.8
R^2/Pseudo R^2	0.732	0.266	0.689	0.264
F	1043.03***		669.55***	

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

Table 8.6: Marginal Effects of 2SRI Estimations (Instrument: *Unionisation* and *LandTenure*): Measures of Labour Regulation – *CLRI*

(No. of replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
CLRI	-0.057***	0.025***	0.013**	0.007***	0.005***	0.004***	0.003***
	(0.007)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
XuHAT	-0.059***	0.025***	0.013***	0.007***	0.006***	0.005***	0.003***
	(0.010)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Firm-Specific Controls							
Location	0.010***	-0.004***	-0.002***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.013***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.207***	-0.089***	-0.046***	-0.026***	-0.020***	-0.016***	-0.010***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.023***	0.010***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.006)	(0.003)	(0.001)	(0.001)	(0.002)	(0.000)	(0.000)
PrivateLtdCom	-0.163***	0.071***	0.036***	0.021***	0.016***	0.013***	0.008***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.034	0.015	0.007	0.004	0.003	0.003	0.002
	(0.042)	(0.018)	(0.009)	(0.005)	(0.004)	(0.003)	(0.002)
Shurban	0.001***	-0.0004***	-0.0002***	-0.0001	-0.0001***	-0.0001***	-0.00004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.028***	0.012***	0.006***	0.004***	0.003***	0.002***	0.001***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table 8.7: Marginal Effects of 2SRI Estimations (Instrument: *Unionisation* and *LandTenure*): Measures of Labour Regulation – *LMFI*

(No. of replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
LMFI	-0.096***	0.041***	0.021***	0.012***	0.009***	0.007***	0.005***
	(0.011)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
XuHAT	-0.020	0.009	0.004	0.003	0.002	0.002	0.001
	(0.016)	(0.007)	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)
Firm-Specific Controls							
Location	0.010***	-0.004***	-0.002***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
CLR	-0.013***	0.006***	0.003***	0.002***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Proprietary	0.207***	-0.090***	-0.046***	-0.026***	-0.020***	-0.016***	-0.010***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Partnership	-0.023***	0.010***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.006)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
PrivateLtdCom	-0.163***	0.070***	0.036***	0.020***	0.015***	0.013***	0.008***
	(0.004)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
State-Specific Controls							
HDI	-0.063	0.027	0.014	0.008	0.006	0.005	0.003
	(0.042)	(0.018)	(0.009)	(0.005)	(0.004)	(0.003)	(0.002)
Shurban	0.0003	-0.0001	-0.0001	-0.00003	-0.00003	-0.00002	-0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	-0.022***	0.009***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.006)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

8.5. Robustness Tests

8.5.1. Difference-in-Differences (DiD) Method

This section explains the first robustness test carried out in this Chapter. One of the concerns associated with labour regulation measures is that the magnitude of regulatory cost cannot be quantified in numeric terms.[54] A rational entrepreneur however takes these costs into account when they decide to hire and fire workers and follow a forward-looking approach. The size of the workforce in a firm reflects their priorities. If a labour regulation proves to be costly for firms, then they often cut the workforce. Alternatively, in the event of relaxing such regulations, they hire more workers. Hence, it is interesting to see in the event of labour regulations becoming costly for firms, how they readjust their size of the workforce. To address this issue, we complement the main empirical strategy with an alternate approach, difference-in-differences (DiD), where we analyse the impact of an exogenous variation in labour regulations on firm transition. To do this, we take advantage of a recent policy change that was implemented in the state of Rajasthan in the year 2014[55]. Rajasthan increases the size threshold of applicability of Chapter VB of IDA from 100 workers to 300 workers. If labour regulation acts as a constraint, then this policy change might eventually reduce the costs of regulation and trigger the transition of firms.[56] By applying DiD, we capture the impact of this policy change on firm transitions. We compare the firms in Rajasthan

[54] Mazumdar and Sarkar (2008) argued that it is not so much the actual compensation that has to be paid to workers who are laid off, which is important, as the fact that the process of obtaining permission takes a long time and has considerable uncertainty. Similarly, the manager or the firm owner has a great deal of time and attention lost to the factory inspector or government official during the firm's inspection. Secondly, often firm owners/managers pay bribes to labour inspectors responsible for their enforcement, so that they can get away without these regulations (Amirapu and Gechter, 2020).

[55] Rajasthan amended the section 25K of Chapter VB of IDA 1947.

[56] Echoing a similar view, Garicano *et al*. (2016) and Vallanti and Gianfreda (2020) argue that firms are bunching near the threshold size, and if the threshold shifts to a higher level, the cost of the transition for small firms will be reduced eventually.

(heretofore, 'treated') with the firms in other states (heretofore, 'untreated') over the period from 2011 to 2016. We utilize the firm-level data for the years 2011 and 2016. Firms located in Rajasthan are treated and firms in other states (other than Rajasthan) are controlled. We employed the following specification to investigate whether these policy changes affected the firm transition. The dependent variable is firm size category, denoted by *e*, which is an ordered categorical variable ranging from 1 to 7 (1 = 6-9, 2 = 10-19, 3 = 20-49, 4 = 50-99, 5 = 100-199, 6 = 200-499 and 7 = 500 and above). Our empirical specification for performing DiD takes the following form:

$$e^*_{i,j,s,t} = \beta_0 + \beta_1 Treated_{i,j,t} + \beta_2 Time_{i,t} + \beta_3 (Treated * Time)_{i,j,t} + \sum_{k>1} \beta_k Z_{i,j,t,s} + \sum \delta_k X_{t,s} + \alpha_j + \gamma_t + u_{i,j,t,s} \quad (8.2)$$

where i, j, s and t stand respectively for firms, industry, state, and time. In our case, t equals 0 for the pre-treatment and 1 for the post-treatment. $Treated$ is a dummy variable for treated firms that takes the 1 for firms in Rajasthan and 0 for firms in other states. $Time$ is a dummy variable that takes the value 1 if t equals 1 and 0 otherwise. The interaction term ($Treated * Time$) captures the effects of policy changes on $e^*_{i,j,s,t}$.

The results are presented in Table 8.8. The coefficients of interaction terms are positive and at a significant 5 per cent level, which indicates a positive effect of policy change on firm transition. The marginal effects presented in Table 8.9 reveal that the firms located in Rajasthan is likely to lead to a 1.1 per cent decrease in the probability of a firm being in the 6-9 size category, a 0.9 per cent decrease in the probability of a firm being in the 10 to 19 size category, a 0.1 per cent decrease in the probability of a firm being in the 20 to 49 size category, a 0.1 per increase the probability of a firm being in the 50 to 99 size category, a 0.4 per increase the probability of a firm being in the 100 to 199 size category, and a 0.8 per increase the probability of a firm being in the 200

and above size category (Table 8.9). This implies that the firms located in Rajasthan are more likely to make the transition after the policy changes in 2014.

In short, our estimates based on DiD reinforce the finding from the ordered logit and 2SRI estimations. The DiD results show the positive impact of policy change on firm transition. In other words, we notice that firms in Rajasthan are more likely to make the transition as compared to the firms in other states. This suggests that the relaxation of labour laws is likely to promote firm transition in the Indian manufacturing sector.

Table 8.8: DiD Results (Dependent Variable: *SIZE*)

Variables	(1)	(2)
Treated	-0.120*** (0.045)	-0.102** (0.046)
Time	-0.175*** (0.014)	-0.186*** (0.016)
Treated*Time	0.127** (0.057)	0.124** (0.057)
Firm-Specific Controls		
Location	-0.097*** (0.014)	-0.097*** (0.014)
CLR	0.033*** (0.004)	0.033*** (0.004)
Proprietary	-2.036*** (0.020)	-2.034*** (0.020)
Partnership	-0.908*** (0.024)	-0.909*** (0.024)
PrivateLtdCom	0.597*** (0.018)	0.598*** (0.018)
State-Specific Controls		
HDI		0.159 (0.183)
Shurban		0.001 (0.001)
Power		0.012 (0.019)
Industry FE	Y	Y
N	94972	94972
Log pseudolikelihood	-148639.88	-148635.08
Pseudo R2	0.157	0.157

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

Table 8.9: True Intervention Effect of the Treatment

Size Groups	Marginal Effects of Treatment
6 to 9	-0.011** (0.005)
10 to 19	-0.009** (0.004)
20 to 49	-0.001** (0.000)
50 to 99	0.001* (0.000)
100 to 199	0.004** (0.002)
200 to 499	0.008** (0.004)
500 & Above	0.008** (0.004)

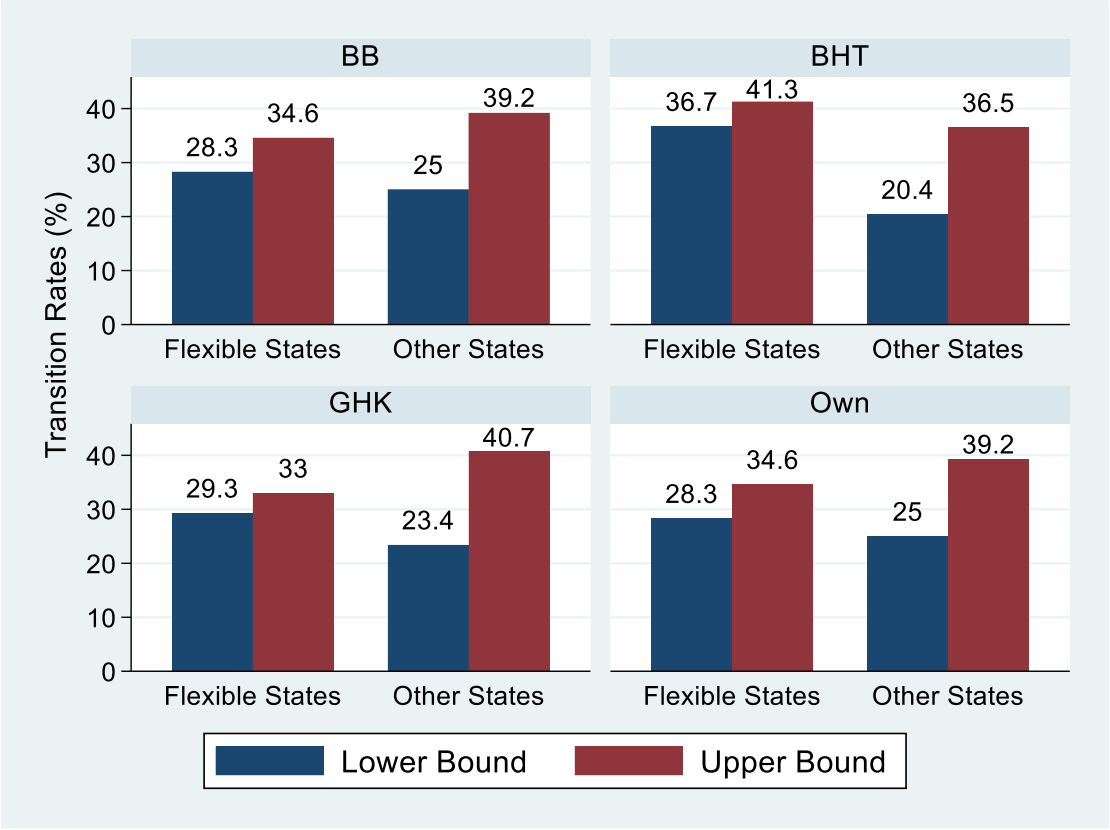
Notes: Robust standard errors are reported in parentheses. ** p<0.05, * p<0.10.
Source: Own estimates.

8.5.2. Firm Transition - Synthetic Panel Approach

We perform another robustness test using the synthetic panel approach. As our baseline results are derived from repeated cross-sections, we are unable to trace the progression of a firm over time. To address this issue, we employ a synthetic panel data method that constructs synthetic panels from repeated cross-sections for the period 2011 and 2016.[57] We follow Dang *et al*. (2014) and employ a bound methodology for constructing synthetic panels.[58] The basic idea of the approach is to predict the outcome for the period in which the firm was not surveyed. One limitation of the method is that the statistical procedures used to construct these synthetic panels can only generate lower and upper bound estimates of the mobility rather than an exact figure. We estimated the transition rates separately for firms located in flexible states and firms located in other states (including both inflexible and neutral states). Besides using our measure to reconcile the major differences in already existing measures, we also used various measures of labour regulations developed by BB, Bhattacharjea (BHT), Gupta, Hassan and Kumar (GHK). Our results are presented in Figure 8.2 which presents the lower and upper bound transition rates of firms from the 6-9 size category to the 10-19 size category.[59] Most studies rely on the lower bound estimates as it gives a conservative picture of mobility (Ferreira *et al.*, 2013). Our lower bound estimates reiterate our main finding that the transition of firms is more likely in states with a more flexible labour market as compared to states where the labour market is less flexible. Barring a few exceptions, our upper-bound estimates too support this finding.

[57] We focus on this period as some of the time-invariant characteristics are available only for these years.
[58] The Section 6.3.1 provides a details discussion on the Synthetic Panel Approach.
[59] The lower bound underestimates the transition and the upper bound overestimates the transition, and together these two bounds give us a range of possible rates of transition of firms (Dang *et al*., 2014).

Figure 8.2: Non-parametric rates of firm transition (%) for firms from 6-9 size category to 10-19 size category, 2011 – 2016
(Conditional Probabilities)



Notes: Transitions rates in per cent. 'Flexible' represents the flexible labour markets and 'Others' represents the inflexible and neutral states. 'BB' represents the classification of labour markets by Besley and Burgess, 'BHT' is the classification of labour markets by Bhattacharjea, GHK represents the classification of labour markets by Gupta, Hassan and Kumar, and 'OWN' is our own classification. Table A8.9 in the appendix presents the labour market regulation across states and Table A8.10 presents the full results of the non-parametric rates of firm transition.
Source: Own estimates.

8.6. Conclusion

This Chapter examines whether or not labour market regulations act as a hurdle to the transition of firms in the Indian manufacturing sector. We captured cross-state variation in labour regulation using two variables: (1) Cumulative Labour Regulation Index (*CLRI*) and (2) Labour Market Flexibility Index (*LMFI*). While the *CLRI* considers only the *de jure* variations in labour regulations, the *LMFI* takes into account both *de jure* and *de facto* differences in the implementation of labour laws. In our investigation, we

observe significant variation across states in the implementation and enforcement of labour laws. Further, we also find that focusing on *de jure* changes alone overstates labour market flexibility in some states more than others. We find that labour market flexibility is positively associated with firm transition. Firms in states with more flexible labour markets are more likely to experience an upward transition. Small firms, the bulk of them in the informal sector, were the ones that most benefited from the reforms in the labour market. The estimated marginal effects showed that the firms located in a flexible state labour market are less likely to be in the 6-9 size category and more likely to be in the larger size categories. The results are robust to concerns arising from reverse causality. When we used IV estimation using 2SRI, or we used DiD, we obtained similar results as to when we used the ordered logit estimation method.

Our findings show that flexible labour laws can expedite firm transition in Indian manufacturing. They contribute to the existing evidence that inflexible labour regulations have been a constraint to firm transition. Such adverse effect of inflexible regulations is particularly pronounced in small firms. In a labour-abundant country like India, transitioning to the formal sector is a route out of poverty for workers relying on small firms. There is a caveat, though: if reforms in labour laws can lessen the relative cost of labour without impacting what workers take home or safety standards, firm transition at a large scale is possible and can contribute considerably to pro-poor growth. These findings have important policy implications for the labour market institution and its reforms in developing countries, particularly in India. These findings possibly point to the adoption of a flexible labour market by introducing employer-friendly labour laws while keeping the labourers' welfare paramount. Labour regulation should also envisage the formalisation of small firms in India.

CHAPTER 9

PRODUCTIVITY AND WAGE IMPLICATIONS

9.1. Introduction

The findings of the previous Chapters show that financial constraints, infrastructure bottlenecks, and rigid labour laws hurt firm transition in Indian manufacturing. It is equally important to see how the lack of firm transitions, especially small firm transitions, influences the performance of the overall manufacturing sector. Hence, in this Chapter, we examine the productivity and wage implications of small firm transitions. We begin by documenting the productivity and wage gap between different firm size categories and show how important small firm transition is in enhancing the productivity and wages in Indian manufacturing. We then examine the role of access to finance, infrastructure, and labour regulations in explaining the productivity and wage gap between small and large firms. We employ Oaxaca and Recentered Influence Function (RIF) decomposition methods to understand the contribution of each of these factors to productivity and wage gap.

The rest of the Chapter is organised as follows. In Section 9.2, we demonstrate how large and persistent the productivity and wage gap are between firms of different size categories. Section 9.3 analyses the productivity and wage implications of small firm transitions. We analyse the role of access to finance, infrastructure, and labour regulations in explaining the productivity and wage gap in Section 9.4. Section 9.5 presents the concluding remarks.

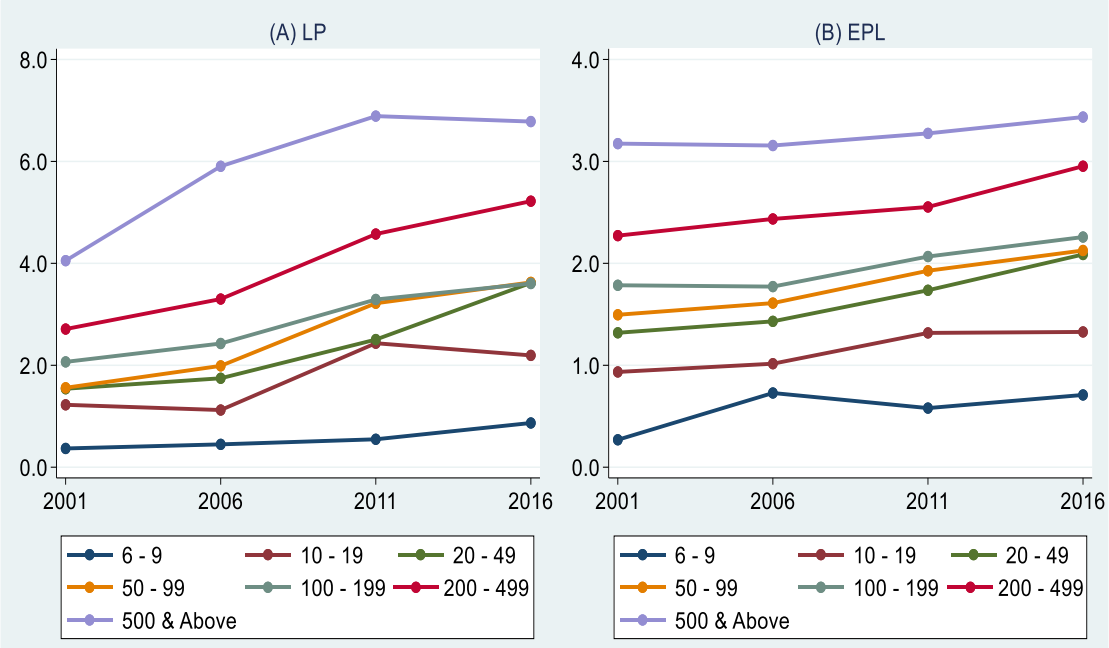
9.2. A Large and Growing Productivity and Wage Gap

There is enough evidence to show a large productivity differential and rising inequality in wages between small and large firms in developing countries (Hsieh and Klenow, 2009; Cirera *et al*., 2020). This has also been linked to the growing inequality in income per capita across countries (Jones, 2016). A large and growing gap in productivity and wages is observed in the Indian manufacturing sector too. Figure 9.1 plots the labour productivity (LP) and emoluments received per labour (EPL) in Indian manufacturing by firm size for the period 2001–2016. It is clearly evident from Figure 9.1 that the workers employed in firms with 500 or more workers are on average more productive and earn more than the workers employed in firms in the 6-9 workers size category. We notice that as firms move from the 6-9 to 10-19 size category, productivity, and wages double. Further, comparing the productivity and earnings of informal sector firms, the firms in the 6-9 size category, with the formal sector firms reveals that the workers employed in the informal sector are at least seven times less productive and are paid five times less than the formal sector workers (Table 9.1 and Figure 9.2). Interestingly, the productivity gap has considerably widened during the period 2001–2016 (Panel A, Figure 9.2). The wage inequality has also widened during the period (Panel A, Figure 9.2). Our results indicate that the lower productivity and wages in the informal sector explain the overall low productivity and wages per worker in the Indian manufacturing sector (Table 9.1). This suggests that transition of informal sector firms to formal sector can perhaps improve the overall productivity and wages in the sector. We examine this next.

As we notice productivity and earnings double for firms in the 6-9 size category when they transit to the 10-19 size category, we revised our estimation by assigning the level

of productivity and earnings of firms in the 10-19 size category for the firms in the 6-9 size category to explore how does the transition influence the overall productivity in the Indian manufacturing. When we do this, interesting results emerge. The estimates for 2016 show that the productivity gap and wage inequality between informal and formal sector firms has declined by about 28 per cent (from 4.9 units to 3.5 units), and 33 per cent (from 2.3 units to 1.5 units), respectively (Table 9.1). The revised estimates also show an improvement in overall productivity by 11 per cent (from 4.1 to 4.6 units in 2016) and in aggregate earnings by 11 per cent in 2016 (from 2.2 to 2.5 units). These findings strengthen our conjecture that the transition of firms from the informal to the formal sector could potentially improve the overall productivity of the manufacturing sector and could be a route out of poverty for the majority of owners and the workers who rely on these firms for their livelihood.

Figure 9.1: Productivity and Wage Differentials Across Firm Size: in 2001–2016



Source: Own estimates.

Table 9.1: Productivity and Wage Differentials Between Informal and Formal Sector Firms: in 2001 – 2016 (in Rs. Lakh)

Year	LP				EPL			
	Informal Sector (6-9)	Formal Sector	Total	Gap	Informal Sector (6-9)	Formal Sector	Total	Gap
2001	0.4	2.7	1.6	**2.3**	0.3	2.4	1.4	**2.1**
2006	0.4	3.9	2.4	**3.4**	0.7	2.4	2.1	**1.7**
2011	0.5	4.9	3.2	**4.4**	0.6	2.7	1.9	**2.1**
2016	0.8	5.8	4.1	**4.9**	0.7	3.0	2.2	**2.3**
Updated Estimates (By assigning the values of 10-19 size category to firms in the 6-9 size category)								
2001	1.3	2.7	2.0	**1.4**	1.0	2.4	1.8	**1.3**
2006	1.2	3.9	2.7	**2.7**	1.1	2.4	1.8	**1.3**
2011	2.4	4.9	3.9	**2.5**	1.5	2.7	2.3	**1.2**
2016	2.2	5.8	4.6	**3.5**	1.5	3.0	2.5	**1.5**

Note: 'Gap' refers to the differences in Productivity and Wages between the formal and informal sectors.
Source: Own estimates.

Figure 9.2: Productivity and Wage Gap between Informal and Formal Firms

Source: Own estimates.

9.3. Impact of Firm Transition on Productivity and Wages

In this section, we formally examine how firm transition influences the level of productivity and wages in Indian manufacturing. To do this, we estimate the following expression:

$$Y_{i,j,s,t} = \beta_0 + \beta_1 SIZE_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,s,t} \qquad (9.1)$$

where the dependent variable ($Y_{i,j,s,t}$) is labour productivity (*LP*) in firms *i* of *j* industry in *s* state at time *t*. We also estimate equation (1) using emoluments received per labour (*EPL*) as the dependent variable. *SIZE* is our measure of firm transition, which is an ordered categorical variable ranging from 1 to 7 (1 = 6-9, 2 = 10-19, 3 = 20-49, 4 = 50-99, 5 = 100-199, 6 = 200-499 and 7 = 500 and above). We assumed the 6-9 size category as our benchmark category (i.e., reference category). $Z_{i,j,s,t}$ is a vector of firm-specific variables controlling for the firm-level differences in location, capital intensity and ownership. $X_{s,t}$ is a vector of state-specific controls representing the state-level differences in human capital, urbanisation and power infrastructure. α_j, ε_s and γ_t stand for industry-, state-, and time-specific fixed effects, respectively.

The OLS results reinforce our main finding that the transition of small firms will improve the productivity and earnings in Indian manufacturing (Table 9.2). The coefficients of all size groups are positive and significant at one per cent level for both the outcome variables, LP and EPL. Interestingly, the magnitude of impact goes up as we move up the size category. These findings suggest how important are small firm transitions in enhancing the level of productivity and earnings in Indian manufacturing.

The firms- and state-specific variables yielded coefficients along expected lines. The coefficient of *Location* is positive and significant at one per cent level, indicating that workers employed in urban firms will have higher productivity and earnings than the workers employed in rural firms. Similarly, *CLR* is positively associated with the LP and EPL, suggesting that the workers employed in more capital-intensive firms are higher productive and earn more as compared to workers employed in less capital-intensive firms. The coefficients of *Proprietary* and *Partnership* are negative and significant for all our estimations, indicating that the workers in proprietary and

partnership firms are less productive and earns lower as compared to workers employed in firms of other ownership category.[60] Table 9.2 also confirms the importance of power infrastructure, human capital development and urbanisation for a higher level of labour productivity and earnings of workers in Indian manufacturing.

Table 9.2: Results – Ordinary Least Square Estimates

Variables	LP			EPL		
	(1)	(2)	(3)	(4)	(5)	(6)
10-19	0.735***	0.487***	0.471***	0.692***	0.484***	0.460***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
20-49	1.018***	0.681***	0.663***	1.030***	0.742***	0.716***
	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
50-99	1.041***	0.717***	0.701***	1.113***	0.817***	0.789***
	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)
100-199	1.111***	0.744***	0.728***	1.190***	0.862***	0.832***
	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)
200-499	1.420***	0.898***	0.885***	1.439***	1.013***	0.992***
	(0.009)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)
500 & Above	1.633***	1.004***	0.988***	1.652***	1.156***	1.138***
	(0.012)	(0.011)	(0.011)	(0.008)	(0.008)	(0.008)
Firm-Specific Controls						
Location		0.126***	0.136***		0.151***	0.173***
		(0.004)	(0.004)		(0.003)	(0.003)
CLR		0.308***	0.317***		0.167***	0.175***
		(0.003)	(0.003)		(0.002)	(0.002)
Proprietary		-0.201***	-0.210***		-0.335***	-0.352***
		(0.007)	(0.007)		(0.006)	(0.006)
Partnership		-0.163***	-0.168***		-0.212***	-0.221***
		(0.007)	(0.007)		(0.005)	(0.005)
PrivateLtdCom		0.021***	0.035***		-0.017***	-0.007
		(0.006)	(0.006)		(0.004)	(0.004)
State-Specific Controls						
HDI			1.041***			1.241***
			(0.058)			(0.044)
Shurban			0.001***			0.003***
			(0.058)			(0.000)
Power			0.016***			0.044***
			(0.005)			(0.004)
Constant	10.235***	5.526***	4.644***	10.058***	7.652***	6.596***
	(0.027)	(0.051)	(0.050)	(0.018)	(0.036)	(0.038)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	N	Y	Y	N
No. of Obs.	195238	195238	195238	196880	196880	196880
F	2673.45***	3811.04***	5691.33***	2643.32***	3530.20***	5032.92***
R^2	0.414	0.587	0.579	0.475	0.579	0.566

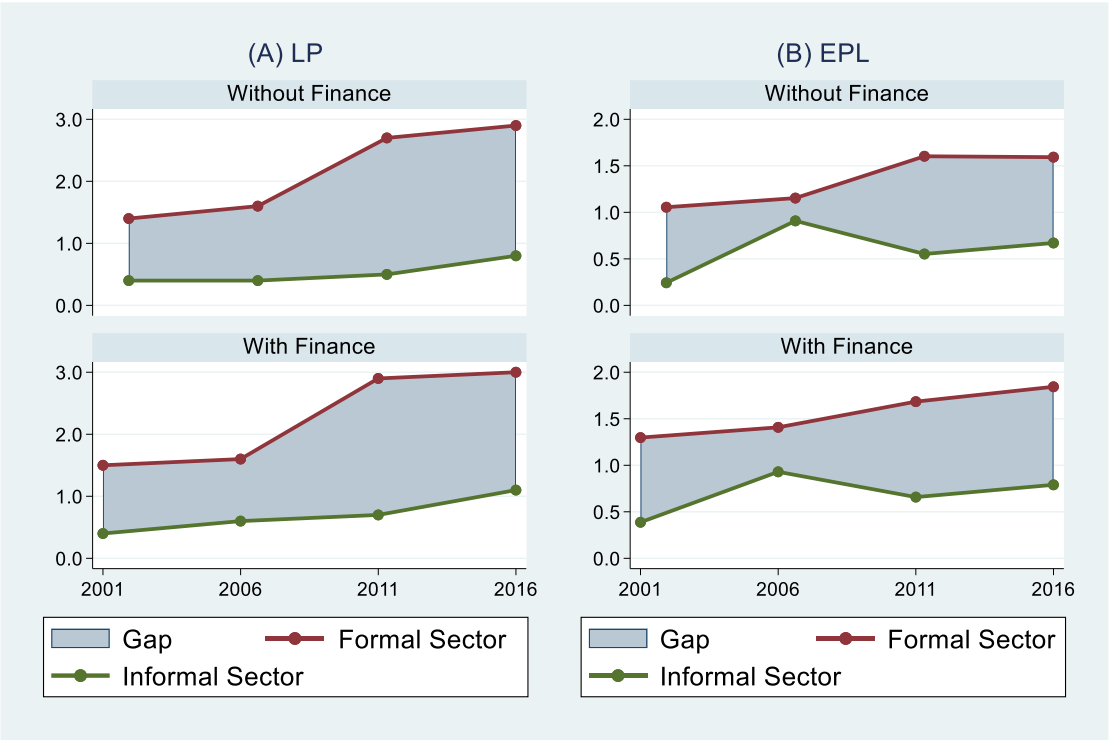
Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

[60] For details, please see in section 6.2.1, Chapter 6, where we defined other types of ownership (*Other_firms*).

9.4. Correlates of Productivity and Wage Gap

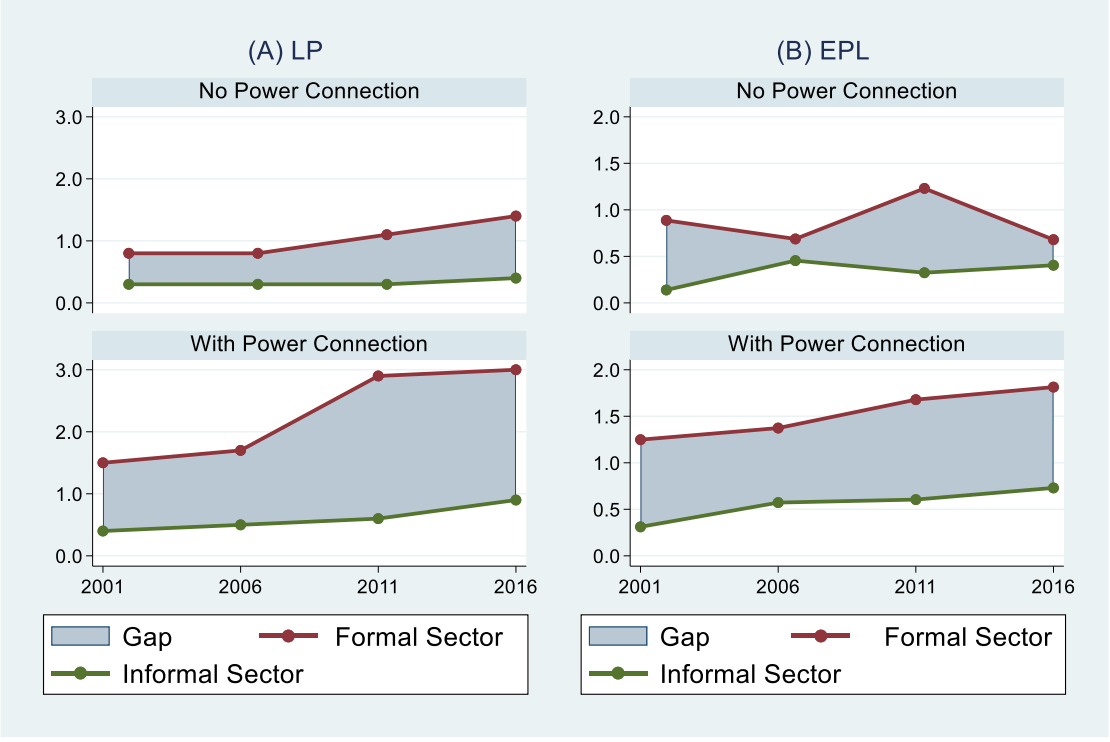
In the previous Chapters, we have already established the significant role of access to finance, power infrastructure and labour regulations in the progression of small firms. Are these factors important drivers of productivity and wage levels in Indian manufacturing? We address this important question in this subsection. We start with a visual exercise. Figures 9.3, 9.4, and 9.5 show the productivity and wage gap between informal and formal sector firms by access to finance, infrastructural availability, and labour regulations, respectively. The visual examination of the productivity and wage gap by finance, infrastructure, and labour regulations unambiguously suggest a large and growing gap in productivity and wages. Notably, the gap is significantly lower for firms with access to finance than firms without access to finance (Figure 9.3). Similarly, productivity and wage inequality are smaller for firms located in states with flexible labour market than firms in other states (Figure 9.5). The disparity in productivity and wages is also evident when we compare the firms by the availability of infrastructure. This comparison shows that the gap is larger for firms with access to power than for firms that lack access to power (Figure 9.4).

Figure 9.3: Productivity and Wage Gap by Access to Finance



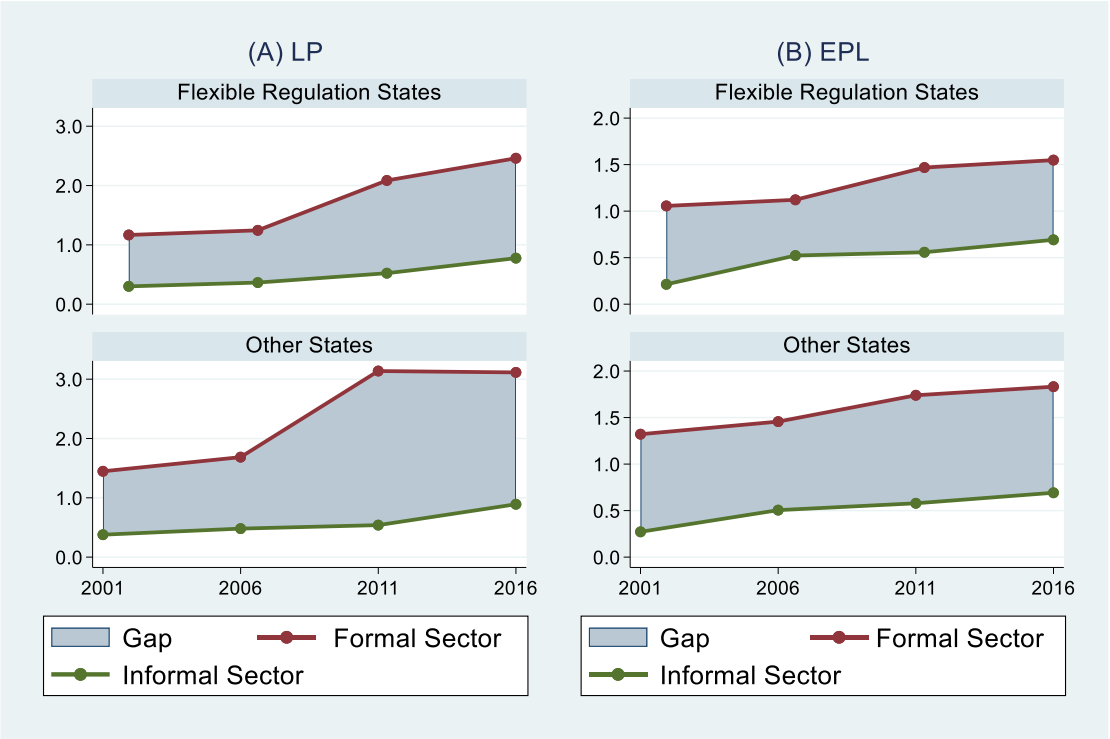
Source: Own estimates.

Figure 9.4: Productivity and Wage Gap by Infrastructure Availability



Source: Own estimates.

Figure 9.5: Productivity and Wage Gap by Labour Regulations



Source: Own estimates.

We now examine whether the observations based on the visual examination survive the scrutiny of regression analysis. To be specific, we assess the role of access to finance, infrastructure and labour regulations in explaining productivity and wages in the Indian manufacturing sector. We employ basic multivariate regression analysis to examine these relationships. The model that we estimate takes the following form:

$$Y_{i,j,s,t} = \beta_0 + \beta_1 Constraints_{i,j,s,t} + \sum_{k>1} \beta_k Z_{i,j,s,t} + \sum \delta_k X_{s,t} + \alpha_j + \varepsilon_s + \gamma_t + u_{i,j,s,t} \quad (9.2)$$

where *Factor* is our main variable of interest. We estimate six different specifications of equation (9.2) using access to finance, infrastructure, and labour regulations as the main explanatory variable. As employed in the preceding chapters, we use *FIN1* and *FIN2* to proxy access to finance, *INF1* and *INF2* to proxy infrastructure availability and *CLRI* and *LMFI* to represent labour regulations. A brief definition of these variables is given in Table 9.3. $Z_{i,j,s,t}$ is a vector of firm-specific variables controlling for the firm-level differences in location, capital intensity and ownership. $X_{s,t}$ is a vector of state-

specific controls representing the state-level differences in human capital, urbanisation and power infrastructure. α_j, ε_s and γ_t stand for industry-, state-, and time-specific fixed effects, respectively We expect a positive role of access to finance, infrastructure and flexible labour markets in improving the productivity and earnings.

Table 9.3: Definition of Variables

Variables	Proxies	Definition	Expected Sign	Expected Result
Access to Finance	*FIN1*	The ratio of the outstanding loan to invested capital	$\beta_1>0$	Access to finance improves productivity and wage
	FIN2	A binary variable for firms that have taken an outstanding loan	$\beta_1>0$	
Infrastructure	*INF1*	A binary variable for firms that do not have access to power	$\beta_1<0$	Lack of Infrastructure reduces productivity and wage
	INF2	The ratio of the expenses on power to the total output	$\beta_1<0$	
Labour Regulation	*CLRI*	*CLRI* captures the variations in the de jure at the state-level	$\beta_1>0$	Flexible labour market improves productivity and wage
	LMFI	*LMFI* measures both the de jure and de facto variations at the state-level	$\beta_1>0$	

Source: Own construction.

Our findings indicate that access to finance, infrastructure and labour regulations play a significant role in explaining the overall low level of productivity and wages in Indian manufacturing. The OLS estimates for productivity and wages are reported in Tables 9.4 and 9.5. The coefficients of finance variables (*FIN1* and *FIN2*) are positive and significant at one per cent level, which implies access to external finance are positively influencing productivity. This suggests that the level of productivity can be improved with increased access to finance from external (formal) sources. As expected, the coefficients of our infrastructure variables (*INF1* and *INF2*) are negative and significant at one per cent level, indicating that the firms with no power connection or inadequate power infrastructure are less productive. This implies that the development of the power infrastructure and its reliable supply to the industrial sector is vital for higher productivity growth in Indian manufacturing. Surprisingly, the coefficients of our labour regulation variables are negative and significant at the one per cent level,

indicating that firms located in states with flexible labour markets are less productive. These results suggest that protective labour regulations are better for higher productivity growth. A similar pattern of influence is observed when we regress access to finance, infrastructure, and labour regulations on wages (Table 9.5). The results are qualitatively similar when all the constraints are simultaneously entered in the equation (9.2) (See Table A9.1 in the appendix). Our results do not vary when we estimate the baseline specification of equation (9.2) for informal and formal sector firms separately. These results are presented in Tables A9.2 and A9.3 in the appendix.

Table 9.4: Correlates of Productivity

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Access to Finance						
FIN1	0.002***					
	(0.000)					
FIN2		0.312***				
		(0.005)				
Infrastructure						
INF1			-0.598***			
			(0.011)			
INF2				-0.116***		
				(0.002)		
Labour Regulation						
CLRI					-0.125***	
					(0.010)	
LMFI						-0.213***
						(0.015)
Firm-Specific Controls						
Location	0.151***	0.156***	0.127***	0.151***	0.164***	0.164***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Proprietary	-0.991***	-0.948***	-0.961***	-0.953***	-1.026***	-1.025***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Partnership	-0.542***	-0552***	-0.514***	-0.520***	-0.556***	-0.557***
	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)
PrivateLtdCom	0.119***	0.097***	0.124***	0.131***	0.109***	0.108***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
State-Specific Controls						
HDI	0.684***	0.710***	0.687***	0.533***	-0.316***	-0.427***
	(0.065)	(0.065)	(0.063)	(0.063)	(0.070)	(0.070)
Shurban	-0.001***	-0.0002	0.002***	0.003***	-0.0003	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	0.141***	0.117***			0.197***	0.210***
	(0.006)	(0.006)			(0.007)	(0.007)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Constant	9.987***	9.971***	10.838***	10.476***	10.285***	10.324***
	(0.038)	(0.038)	(0.031)	(0.031)	(0.041)	(0.041)
No. of Obs.	189329	189329	194350	194350	180192	180192
F	3958.18***	4283.78***	4134.14	4315.77***	3710.44***	3712.89***
R^2	0.390	0.400	0.388	0.400	0.387	0.388

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

Table 9.5: Correlates of Wages

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Access to Finance						
FIN1	0.001*** (0.000)					
FIN2		0.263*** (0.004)				
Infrastructure						
INF1			-0.561*** (0.011)			
INF2				-0.067*** (0.001)		
Labour Regulation						
CLRI					-0.109*** (0.008)	
LMFI						-0.175*** (0.013)
Firm-Specific Controls						
Location	0.158*** (0.004)	0.160*** (0.004)	0.138*** (0.004)	0.160*** (0.003)	0.171*** (0.004)	0.171*** (0.004)
Proprietary	-0.990*** (0.006)	-0.956*** (0.006)	-0.982*** (0.006)	-0.990*** (0.006)	-1.059*** (0.006)	-1.059*** (0.006)
Partnership	-0.503*** (0.006)	-0.513*** (0.006)	-0.497*** (0.006)	-0.504*** (0.006)	-0.548*** (0.006)	-0.548*** (0.006)
PrivateLtdCom	0.065*** (0.005)	0.046*** (0.005)	0.054*** (0.005)	0.060*** (0.005)	0.031*** (0.005)	0.031*** (0.005)
State-Specific Controls						
HDI	1.047*** (0.049)	1.078*** (0.047)	1.067*** (0.046)	1.075*** (0.046)	1.022*** (0.056)	0.940*** (0.056)
Shurban	0.002*** (0.000)	0.002*** (0.000)	0.003*** (0.000)	0.004*** (0.000)	0.001*** (0.000)	0.0003 (0.000)
Power	0.116*** (0.004)	0.094*** (0.004)			0.127*** (0.005)	0.137*** (0.005)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Constant	9.873*** (0.029)	9.852*** (0.029)	10.592*** (0.023)	10.319*** (0.023)	9.985*** (0.032)	10.012*** (0.033)
No. of Obs.	190301	190301	195338	195338	183207	183207
F	3805.24***	3945.01***	4040.41***	4050.17***	3554.15***	3559.21***
R^2	0.422	0.433	0.428	0.427	0.418	0.418

Notes: Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

9.4.1. Decomposing the Productivity and Wage Gap

We also employ Oaxaca and Recentered Influence Function (RIF) decomposition methods to understand the factors that explain the productivity and earnings differentials between formal and informal firms. We employed six sets of covariates in

all the decomposition estimates. They are: (i) Financial Constraints; (ii) Infrastructure; (iii) Labour Regulations; (iv) Firm Characteristics; (v) State Characteristics; and (vi) Industry Characteristics. The gap explained by each of these covariates is the sum of the contribution by each of the variables included in the set. We begin by estimating a model of determinants of (log) labour productivity for informal and formal sector firms as follows[61]:

$$lnLP_{i,k} = \beta_k X'_{i,k} + \varepsilon_{i,k}; i = 1, \ldots., n;\ k = m, n \qquad (9.3)$$

where *i* stands for firms; *k* stands for whether a firm is an informal firm (*m*) or a formal firm (*n*); $lnLP_{i,k}$ is the log of labour productivity; $X_{i,k}$ is a vector of independent regressors; and β is the estimated regression coefficient. The mean difference in labour productivity between the informal and formal sector firms is computed as follows:

$$\Delta ln\overline{LP} = ln\overline{LP}_m - ln\overline{LP}_n = (\hat{\beta}_m \bar{X}'_m) - (\hat{\beta}_n \bar{X}'_n) \qquad (9.4)$$

We decompose the labour productivity gap into the component of the gap attributable to the differences in observable characteristics (composition effects) and the differences in returns to coefficients (structural effects). Though the latter is also attributed to discrimination, it is important to recognize that it also captures all the potential effects of differences in unobserved variables (Jann, 2008). Symbolically,

$$\Delta\overline{lnLP} = \left(\hat{\beta}_m \bar{X}'_m\right) - \left(\hat{\beta}_n \bar{X}'_n\right) = (\bar{X}_m - \bar{X}_n)'\hat{\beta}_m + \bar{X}'_n(\hat{\beta}_m - \hat{\beta}_n) \qquad (9.5)$$

[61] We also perform the same empirical investigation to examine the factors that explaining the widening gap in wages (EPL).

where $\hat{\beta}_k$ is the estimated value of β_k. The first term on the right-hand side of equation (5), $(\bar{X}_m - \bar{X}_n)'\hat{\beta}_m$, represents the composition effects and the second term, $(\bar{X}'_n(\hat{\beta}_m - \hat{\beta}_n)$, captures the structural effects.

Following Gang *et al*. (2022), we perform the RIF decomposition at all deciles of the productivity and wage distribution. To implement this, we rely on the RIF approach developed by Firpo *et al*. (2009 and 2018). This method measures the contribution made by various factors in influencing the productivity and wage gap at different points in the productivity distribution. This decomposition can be implemented for any distributional statistics such as inter-quartile ratio, Gini index and so on (Ahmed and Maitra, 2015). Additionally, the reweighting approach employed by this method allows us to offset the intrinsically parametric character of the basic Oaxaca decomposition (Firpo *et al*., 2009). We also normalise the covariates of the categorical variables to avoid omitting the reference group (Gang *et al*., 2022). The estimation proceeds in two stages. The first stage involves producing a counterfactual distribution using a reweighting procedure to decompose the gap in productivity (and wages) between informal and formal sector firms into 'composition effects' and 'structural effects'. The reweighting function is estimated using logit regression. In the second stage, using the RIF decomposition method, we estimate the contribution of each set of explanatory variables to both the composition and the structural effects. The RIF decomposition method is similar to Oaxaca method except that the outcome variable is replaced by the RIF of the target statistic. We then estimate an OLS regression of the corresponding RIF on observed characteristics for formal sector firms, informal sector firms and the counterfactual. These estimates are used to decompose the difference in distributional parameters between informal and formal sector firms by replacing the log of labour productivity with the corresponding RIF for each observation and using a suitable

counterfactual (Khurana and Mahajan, 2020). The aggregate structural effects obtained through reweighting approach are broken down into a pure structural effects and a reweighting error. Similarly, another decomposition is used to decompose composition effects into a pure composition effects and a specification error. As these regressions are linear, we are able to derive the contribution of each explanatory variable to pure structural effects, reweighting error, pure composition effects and specification error. We are also interested in estimating the detailed composition and structural effects.

9.4.1.1. Decomposition Results

We now discuss the results of the decomposition estimations. First, we discuss the results of the standard Oaxaca decomposition. We then turn to the results of the RIF-Oaxaca decompositions at the mean and the selected deciles. The standard Oaxaca decomposition results are presented in Table 9.6. Besides reporting the coefficient estimates, the table also reports the percentage contribution to the aggregate effects by each set of covariates. As indicated in equations (9.4) and (9.5), a negative coefficient of a covariate suggests that it widens the productivity gap and wage inequality between informal and formal sector firms. Our interest also lies in explaining the percentage of the gap in productivity and wages attributable to the difference in observables and differences in returns to these observables.

The coefficients of composition and structural effects are negative and significant at a one per cent level. Our results further suggest a much more important role for composition effects in explaining the productivity gap. This is clearly evident from the magnitude of the coefficients and their percentage contribution to the gap. Our estimates show that about $3/5^{th}$ of the productivity gap is explained by the differences in observable factors between informal and formal sector firms. In other words, the

productivity gap would have been reduced by 58 per cent if the informal sector firms possessed similar endowments and advantages in characteristics as the formal sector firms. On the other hand, it is the structural effects that play a significant role in explaining the gap in wages. A whopping 72 per cent of the wage gap between informal and formal sector firms is accounted for by the structural effects. This suggests that if the coefficients of the variables determining wages yielded similar returns for informal and formal sector firms, the gap in earnings would have witnessed a drop by 72 per cent.

Table 9.6: Standard Oaxaca Decomposition of Gap in Productivity and Wages

Variables	Productivity				Wages			
	Composition Effects		Structural Effects		Composition Effects		Structural Effects	
	Estimate	Share (In per cent)	Estimate	Share (In per cent)	Estimate	Share (In per cent)	Estimate	Share (In per cent)
Aggregate Effects	-0.673*** (0.005)	57.85	-0.490*** (0.005)	42.15	-0.955*** (0.006)	28.43	-2.404*** (0.008)	71.57
Finance Constraints	0.021*** (0.002)	-3.18	0.192*** (0.005)	-39.06	0.019*** (0.002)	-1.99	0.266*** (0.008)	-11.08
Infrastructure	-0.071*** (0.002)	10.62	-0.255*** (0.011)	51.99	-0.111*** (0.002)	11.65	-0.235*** (0.016)	9.77
Labour Regulations	0.001** (0.001)	-0.19	0.043*** (0.011)	-8.72	0.005*** (0.001)	-0.57	-0.129*** (0.018)	5.37
Firm Characteristics	-0.558*** (0.005)	82.90	-0.841*** (0.091)	171.45	-0.820*** (0.006)	85.86	0.881*** (0.088)	-36.64
State Characteristics	-0.026*** (0.001)	3.92	0.767*** (0.050)	-156.47	-0.024*** (0.001)	2.54	0.478*** (0.067)	-19.89
Industry Characteristics	-0.040*** (0.001)	5.93	-0.022 (0.021)	4.45	-0.024*** (0.002)	2.50	-0.274*** (0.039)	11.39
Constant			-0.374*** (0.078)	76.37			-3.392*** (0.101)	141.08
No. of Obs.			180192			183207		

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Among the set of covariates, firm characteristics and infrastructure contributed the most to the productivity gap and wage inequality via both composition and structural effects. As reported in Table 9.6, about 83 per cent of the productivity gap via composition effects is explained by the differences in the characteristics of firms between informal and formal sectors. The next important factor that contributes to the productivity gap

through composition effects is the differences in access to infrastructure. This factor accounts for about 11 per cent of the gap explained by composition effects. Similarly, firm characteristics and infrastructure play an important role in explaining the productivity gap between informal and formal firms through structural effects. According to our estimates, about 171 per cent of the productivity gap through structural effects can be attributed to the differences in firm characteristics. Our results also highlight the importance of firm characteristics and infrastructure in explaining the wage gap. Their importance is evident for both composition effects and structural effects. While about 86 per cent of the wage differences through composition effects can be attributed to the differences in firm characteristics, about 12 per cent can be attributed to the differences in access to infrastructure.

9.4.1.2. RIF-Oaxaca Decomposition at the Mean

We now discuss the results of the RIF-Oaxaca decomposition of average differences in productivity and wages between informal and formal sector firms. Tables 9.7 and 9.8 present the RIF-decomposition results for productivity and the wage gap, respectively. The counterfactual estimate in the table shows the estimated productivity distribution indicating the labour productivity of informal sector firms if they had similar coefficients as formal sector firms. The pure components, pure composition effects and pure structural effects, are the differences net of specification and reweighting errors. One of the potential concerns related to the basic Oaxaca decomposition is whether the linearity assumption is satisfied, which is crucial for consistent estimation of composition and structural effects (Firpo *et al.*, 2018). Our results show a non-significant specification error suggesting that our model was correctly specified. We

also find a non-significant reweighting error, suggesting that our reweighting factors are consistently estimated.

As observed earlier, the results clearly suggest that the informal sector firms are less productive and pay lesser wages to workers than the formal sector firms. The coefficient of the total composition and structural effects are significant at the one per cent level indicating that they are important in explaining the productivity and wage gap between informal and formal sector firms (Tables 9.7 and 9.8).

The aggregate results of the RIF decomposition show that a substantial share of the gap in productivity and wages is accounted for by the structural effect (Tables 9.7 and 9.8). In terms of share, the differences in the level of observables explain about 34 per cent of the productivity gap, while the differences in returns to the observables explain about 66 per cent of the gap (Table 9.7). Similarly, 38 per cent of the wage gap is explained by the differences in observed characteristics and 62 per cent by differences in returns to the observables (Table 9.8). These findings suggest that if the coefficients of the variables influencing firm productivity and wages yielded similar returns for both informal and formal firms, the gap in productivity and wages between them would have been reduced by 66 and 62 per cent, respectively. On the other hand, the productivity and wage gap would have seen a drop by 34 and 32 per cent, respectively, if the informal firms had similar endowments and characteristics as formal firms.

Along with the aggregate estimates, we also present the disaggregated results in Tables 9.7 and 9.8. We disaggregate the overall effects into different covariate sets. If the coefficient of a covariate yields a negative sign, then it indicates that the covariate widens the gap and if it yields a positive coefficient, then it helps to narrow the gap. Our disaggregated results show that the infrastructure, financial constraints and firm

characteristics contribute significantly to the size of the productivity and wage gap via the pure composition effects (Tables 9.7 and 9.8). Of the contribution of pure composition effect to the productivity gap, differences in infrastructure and differences in access to finance widen the productivity gap by 85 and 83 per cent, respectively. On the other hand, the differences in the firm and industrial characteristics narrow the productivity gap by 54 and 13 per cent, respectively (Table 9.7). Similarly, the differences in access to finance, infrastructure, and firm characteristics between informal and formal sector firms widen the wage gap explained via pure composition effects, by 37, 35, and 39 per cent, respectively. However, we find no significant impact of labour regulations in explaining the gap in productivity and wages through pure composition effects.

Our disaggregated results also show that the differences in infrastructure, firm characteristics and state characteristics contribute significantly to the size of the productivity and wage gap via the pure structural effects (Tables 9.7 and 9.8). Among the covariates, the differences in firm characteristics contributed about 352 per cent to the widening of the productivity gap through structural effects (Table 9.7). Similarly, the differences in firm characteristics and state characteristics contributed about 86 and 79 per cent, respectively, to the widening of the wage gap through pure structural effects (Table 9.8). Similarly, the differences in labour market flexibility contributed about 45 per cent to the widening of wage gap through pure structural effects. Of the contribution to productivity and wage gap through pure structural effects, infrastructural differences narrowed the productivity gap and wage inequality by 231 and 154 per cent respectively (Tables 9.7 and 9.8). On the contrary, we do not find any significant impact of labour regulations in explaining the productivity gap through pure structural effects.

Table 9.7: Decomposing Productivity Gap: RIF Decomposition at the mean

Variables	Overall	Total Composition Effects		Total Structural Effects	
		Pure Composition Effects	Specification Error	Pure Structural Effects	Reweighting Error
Informal Sector Firm	10.032*** (0.031)				
Counterfactual	10.605*** (0.031)				
Formal Sector Firm	11.728*** (0.014)				
Total Difference (Productivity gap)	-1.695*** (0.034)				
Total Composition Effects	-0.572*** (0.044)				
Total Structural Effects	-1.123*** (0.034)				
Corrected Differences		-0.518*** (0.043)	-0.055 (0.052)	-1.134*** (0.032)	0.011 (0.018)
Finance Constraints		-0.428*** (0.019)	0.052** (0.025)	0.232*** (0.017)	0.061*** (0.006)
Infrastructure Constraints		-0.438*** (0.022)	0.071 (0.088)	2.619*** (0.086)	-0.076*** (0.015)
Labour Regulations		0.005 (0.005)	-0.281** (0.128)	-0.066 (0.108)	-0.001 (0.002)
Firm Characteristics		0.278*** (0.031)	0.023 (0.375)	-3.993*** (0.325)	0.006** (0.003)
State Characteristics		-0.002 (0.004)	-2.048*** (0.610)	0.275 (0.521)	0.017*** (0.004)
Industry Characteristics		0.068*** (0.018)	-0.077** (0.032)	0.049* (0.026)	0.003 (0.007)
Constant			2.206*** (0.722)	-0.250 (0.624)	

Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

Table 9.8: Decomposing Wage Gap: RIF Decomposition at the mean

Variables	Overall	Total Composition Effects		Total Structural Effects	
		Pure Composition Effects	Specification Error	Pure Structural Effects	Reweighting error
Informal Sector Firm	10.565*** (0.021)				
Counterfactual	11.136*** (0.016)				
Formal Sector Firm	12.079*** (0.004)				
Total Difference (Wage gap)	-1.514*** (0.021)				
Total Composition Effects	-0.571*** (0.026)				
Total Structural Effects	-0.943*** (0.017)				
Corrected Differences		-0.547*** (0.028)	-0.024 (0.035)	-0.904*** (0.016)	-0.039*** (0.009)
Finance Constraints		-0.203*** (0.013)	0.022 (0.015)	0.163*** (0.009)	0.030*** (0.003)
Infrastructure Constraints		-0.189*** (0.011)	0.187*** (0.054)	1.389*** (0.039)	-0.057*** (0.006)
Labour Regulations		-0.006 (0.004)	-0.022 (0.079)	-0.407*** (0.052)	-0.004*** (0.001)
Firm Characteristics		-0.216*** (0.022)	-0.454** (0.231)	-0.781*** (0.155)	0.006* (0.003)
State Characteristics		-0.009*** (0.003)	-1.941*** (0.375)	-0.717*** (0.251)	0.003* (0.002)
Industry Characteristics		0.076*** (0.014)	-0.010 (0.020)	0.029** (0.013)	-0.016*** (0.004)
Constant			2.195*** (0.442)	-0.579* (0.300)	

Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

9.4.1.3. RIF-Decomposition at Quantiles

To gain further insights into how the productivity and wage gap between informal and formal sector firms evolved along the distribution, we evaluate the gap at every decile of the productivity and wage distribution. The results of this empirical exercise are presented in Tables 9.9 and 9.10, respectively. The results of aggregate decomposition are visually represented in Figure 9.6. At the aggregate level, we notice a steady

increase of mean productivity and wages as we move up the deciles (Tables 9.9 and 9.10). This finding is true for both the informal and formal sector firms. We find that the differences in productivity and wages are negative and significant at one per cent level at each decile. The gap is higher at the bottom and top deciles but narrows at the middle deciles (Tables 9.9 and 9.10). In any case, our findings clearly suggest that the informal sector firms always seem to be disadvantaged, and therefore, the transition of informal sector firms to formal sector is likely to improve the overall productivity and average worker's earnings in the manufacturing sector.

When we disaggregate the productivity gap into composition and structural effects for each decile, as captured in Figure 9.6, we find that both the effects are important in explaining the productivity and wage gap at every decile. Although the structural effects contribute a larger share of the productivity and wage gap, it varies significantly across deciles (Figure 9.6). Its contribution to the productivity gap is highest in the 10^{th} decile and lowest in the 90^{th} decile. When it comes to wage gap, the contribution of structural effects is highest in the 70^{th} decile and lowest in the 10^{th} decile.

What explains the differences in productivity and wages between informal and formal sector firms along the productivity and wage distribution? We now turn to find an answer to this question. For this, we look at the detailed decomposition results. The results for productivity and wage gap are presented in Tables 9.8 and 9.9, respectively. We also visually present the percentage contribution of each covariate in pure composition effects and pure structural effects for productivity and wage gap in Figures 9.7 and 9.8, respectively. As observed at the mean, financial constraints, infrastructure and firm characteristics contribute a major portion of the productivity and wage gap through the pure composition effect at each decile (Tables 9.9 and 9.10). The results

presented in the Tables 9.9 and 9.10 show that these covariates widen the productivity and wage gap via pure composition effects. As the visual exercise in Figure 9.7 shows, in the bottom deciles, infrastructure and financial constraints contribute most to the productivity and wage gap, and we witness a significant decline in their contribution as we move up the deciles. On the contrary, the contribution of firm characteristics increases as we move from the bottom to the top decile of the productivity and wage distribution (Figure 9.7). Of the pure unexplained gap in labour productivity and wages, the differences in returns to firm characteristics contributed the most to widening the gap in the bottom deciles (10 to 70th deciles). At the upper deciles of productivity and wage distribution (80th and 90th deciles), the firm characteristics played a part in narrowing the gap (Figure 9.8). Infrastructure and financial constraints also contributed significantly to narrowing the gap through pure structural effects. However, we do not find any significant role of labour regulations in influencing the productivity and wage gap at all deciles.

Table 9.9: RIF-Decomposition of Productivity Gap by Percentiles

Variables	10 Percentile	20 Percentile	30 Percentile	40 Percentile	50 Percentile	60 Percentile	70 Percentile	80 Percentile	90 Percentile
Overall									
Mean Productivity of Informal Sector (M)	0.329 (0.000)	10.185*** (0.025)	10.690*** (0.013)	10.970*** (0.010)	11.201*** (0.010)	11.433*** (0.010)	11.676*** (0.010)	11.971*** (0.011)	12.396*** (0.015)
Mean Productivity of Formal Sector (N)	10.429*** (0.021)	11.311*** (0.011)	11.713*** (0.008)	11.985*** (0.007)	12.222*** (0.006)	12.465*** (0.007)	12.734*** (0.007)	13.052*** (0.008)	13.528*** (0.010)
Gap in the Productivity (M – N)	-10.099*** (0.021)	-1.125*** (0.027)	-1.022*** (0.015)	-1.014*** (0.012)	-1.021*** (0.012)	-1.031*** (0.012)	-1.059*** (0.012)	-1.081*** (0.014)	-1.132*** (0.018)
Reweighting Decomposition									
Counterfactual (C)	0.370*** (0.000)	10.600*** (0.022)	11.074*** (0.014)	11.406*** (0.013)	11.686*** (0.011)	11.948*** (0.011)	12.206*** (0.011)	12.519*** (0.013)	13.034*** (0.018)
Total Composition Effects (M – C)	-0.040*** (0.000)	-0.415*** (0.034)	-0.383*** (0.019)	-0.436*** (0.017)	-0.485*** (0.015)	-0.515*** (0.014)	-0.530*** (0.015)	-0.548*** (0.017)	-0.638*** (0.024)
Total Structural Effects (C – N)	-10.059*** (0.021)	-0.710*** (0.025)	-0.639*** (0.016)	-0.579*** (0.015)	-0.537*** (0.013)	-0.516*** (0.012)	-0.529*** (0.013)	-0.533*** (0.015)	-0.494*** (0.021)
RIF Aggregate Decomposition									
Pure Composition Effects	0.000 (0.000)	-0.302*** (0.034)	-0.275*** (0.018)	-0.312*** (0.014)	-0.372*** (0.013)	-0.449*** (0.013)	-0.519*** (0.014)	-0.583*** (0.015)	-0.675*** (0.020)
Specification Error	-0.040*** (0.000)	-0.113*** (0.042)	-0.109*** (0.023)	-0.123*** (0.019)	-0.113*** (0.017)	-0.066*** (0.017)	-0.011 (0.018)	0.035* (0.020)	0.037 (0.029)
Pure Structural Effects	-10.059*** (0.021)	-0.692*** (0.023)	-0.639*** (0.015)	-0.591*** (0.013)	-0.555*** (0.012)	-0.532*** (0.011)	-0.542*** (0.011)	-0.546*** (0.014)	-0.501*** (0.020)
Reweighting Error	0.000 (0.000)	-0.018 (0.012)	0.000 (0.008)	0.012 (0.008)	0.019*** (0.007)	0.015** (0.007)	0.013** (0.007)	0.013* (0.008)	0.007 (0.010)
Pure Composition Effects									
Financial Constraints	0.000 (0.000)	-0.268*** (0.015)	-0.146*** (0.008)	-0.128*** (0.006)	-0.129*** (0.006)	-0.143*** (0.006)	-0.145*** (0.006)	-0.136*** (0.007)	-0.121*** (0.009)
Infrastructure	0.000 (0.000)	-0.276*** (0.014)	-0.112*** (0.006)	-0.071*** (0.004)	-0.059*** (0.004)	-0.051*** (0.003)	-0.045*** (0.003)	-0.046*** (0.003)	-0.061*** (0.005)
Labour Regulations	0.000 (0.000)	-0.009** (0.004)	0.000 (0.002)	0.003 (0.002)	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.003)
Firm Characteristics	0.000 (0.000)	0.146*** (0.026)	-0.037*** (0.014)	-0.099*** (0.011)	-0.141*** (0.011)	-0.192*** (0.011)	-0.251*** (0.011)	-0.321*** (0.013)	-0.435*** (0.018)
State Characteristics	0.000 (0.000)	0.006* (0.003)	0.005*** (0.002)	0.003* (0.001)	0.002 (0.001)	0.002* (0.001)	0.002 (0.001)	0.001 (0.002)	-0.001 (0.002)
Industry Characteristics	0.000 (0.000)	0.098*** (0.016)	0.016* (0.008)	-0.020*** (0.006)	-0.046*** (0.006)	-0.066*** (0.006)	-0.081*** (0.006)	-0.083*** (0.007)	-0.059*** (0.009)
Pure Structural Effects									
Financial Constraints	-0.158*** (0.010)	0.102*** (0.012)	0.079*** (0.008)	0.101*** (0.007)	0.099*** (0.006)	0.095*** (0.006)	0.099*** (0.006)	0.112*** (0.008)	0.128*** (0.011)
Infrastructure	-2.325*** (0.070)	1.201*** (0.061)	0.555*** (0.039)	0.487*** (0.035)	0.296*** (0.031)	0.263*** (0.031)	0.226*** (0.032)	0.309*** (0.038)	0.345*** (0.054)
Labour Regulations	-0.101 (0.073)	0.124 (0.077)	0.254*** (0.049)	0.208*** (0.044)	0.090** (0.039)	0.057 (0.038)	0.085** (0.039)	0.073 (0.047)	0.064 (0.067)
Firm Characteristics	-3.509*** (0.217)	-3.140*** (0.232)	-1.593*** (0.148)	-0.613*** (0.133)	-0.555*** (0.117)	-0.445*** (0.115)	-0.367*** (0.117)	0.642*** (0.142)	1.512*** (0.200)
State Characteristics	-0.095 (0.330)	2.029*** (0.373)	0.788*** (0.237)	0.485** (0.213)	0.164 (0.187)	0.073 (0.184)	-0.217 (0.186)	0.048 (0.226)	-0.067 (0.321)
Industry Characteristics	0.009 (0.017)	0.063*** (0.019)	0.057*** (0.012)	0.049*** (0.011)	0.059*** (0.009)	0.072*** (0.009)	0.082*** (0.009)	0.078*** (0.011)	0.114*** (0.016)
Constant	-3.879*** (0.397)	-1.070** (0.446)	-0.779*** (0.283)	-1.308*** (0.255)	-0.708*** (0.224)	-0.647*** (0.220)	-0.450** (0.223)	-1.808*** (0.271)	-2.596*** (0.384)

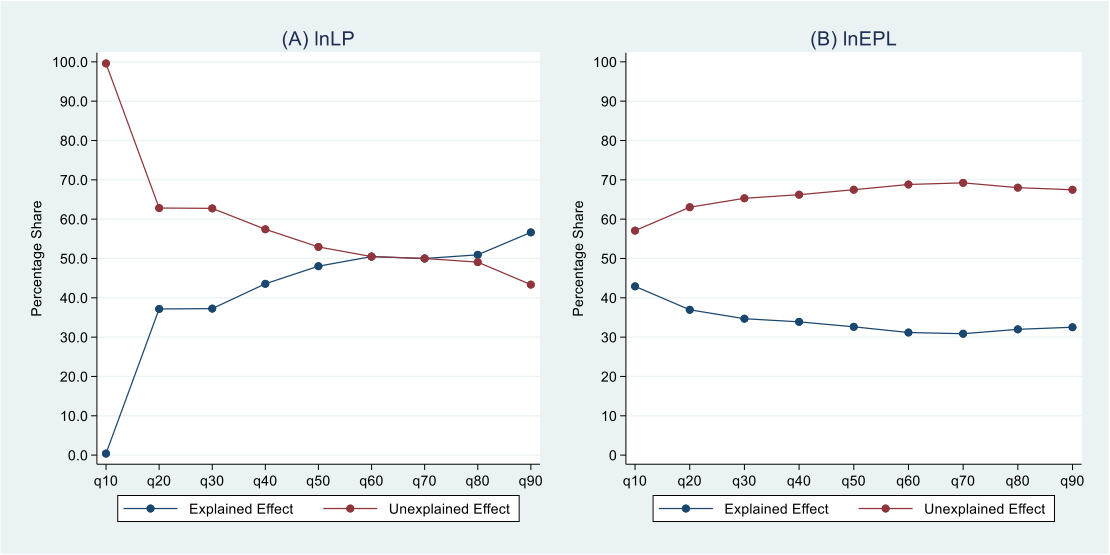
Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

Table 9.10: RIF-Decomposition of Wage Gap by Percentiles

Variables	10 Percentile	20 Percentile	30 Percentile	40 Percentile	50 Percentile	60 Percentile	70 Percentile	80 Percentile	90 Percentile
Overall									
Mean Wage of Informal Sector (M)	9.750*** (0.032)	10.444*** (0.013)	10.757*** (0.010)	10.972*** (0.008)	11.145*** (0.007)	11.303*** (0.006)	11.461*** (0.007)	11.644*** (0.007)	11.916*** (0.009)
Mean Wage of Formal Sector (N)	11.176*** (0.008)	11.547*** (0.005)	11.763*** (0.005)	11.935*** (0.004)	12.087*** (0.004)	12.246*** (0.004)	12.423*** (0.005)	12.632*** (0.005)	12.943*** (0.007)
Gap in the Wage (M – N)	-1.426*** (0.033)	-1.104*** (0.015)	-1.006*** (0.011)	-0.962*** (0.009)	-0.941*** (0.008)	-0.943*** (0.008)	-0.962*** (0.008)	-0.988*** (0.009)	-1.027*** (0.011)
Reweighting Decomposition									
Counterfactual (C)	10.362*** (0.020)	10.852*** (0.011)	11.106*** (0.008)	11.298*** (0.007)	11.452*** (0.006)	11.597*** (0.006)	11.757*** (0.007)	11.959*** (0.008)	12.250*** (0.010)
Total Composition Effects (M – C)	-0.612*** (0.038)	-0.408*** (0.017)	-0.349*** (0.013)	-0.326*** (0.010)	-0.307*** (0.009)	-0.294*** (0.009)	-0.297*** (0.009)	-0.316*** (0.010)	-0.334*** (0.014)
Total Structural Effects (C – N)	-0.814*** (0.021)	-0.696*** (0.012)	-0.657*** (0.009)	-0.637*** (0.008)	-0.635*** (0.008)	-0.649*** (0.008)	-0.666*** (0.008)	-0.672*** (0.009)	-0.693*** (0.012)
RIF Aggregate Decomposition									
Pure Composition Effects	-0.588*** (0.044)	-0.366*** (0.018)	-0.319*** (0.013)	-0.308*** (0.011)	-0.303*** (0.009)	-0.311*** (0.009)	-0.321*** (0.009)	-0.340*** (0.010)	-0.397*** (0.012)
Specification Error	-0.024 (0.053)	-0.042* (0.023)	-0.029* (0.017)	-0.018 (0.013)	-0.003 (0.012)	0.017 (0.011)	0.025** (0.012)	0.025* (0.013)	0.063*** (0.018)
Pure Structural Effects	-0.774*** (0.020)	-0.681*** (0.012)	-0.652*** (0.009)	-0.636*** (0.008)	-0.635*** (0.007)	-0.650*** (0.007)	-0.667*** (0.008)	-0.675*** (0.009)	-0.699*** (0.012)
Reweighting Error	-0.040*** (0.010)	-0.014** (0.006)	-0.005 (0.004)	-0.001 (0.004)	0.000 (0.004)	0.001 (0.003)	0.002 (0.003)	0.002 (0.004)	0.006 (0.004)
Pure Composition Effects									
Financial Constraints	-0.237*** (0.020)	-0.101*** (0.008)	-0.074*** (0.006)	-0.063*** (0.005)	-0.055*** (0.004)	-0.050*** (0.004)	-0.044*** (0.004)	-0.036*** (0.004)	-0.023*** (0.006)
Infrastructure	-0.244*** (0.015)	-0.084*** (0.005)	-0.048*** (0.003)	-0.034*** (0.002)	-0.028*** (0.002)	-0.024*** (0.002)	-0.021*** (0.002)	-0.021*** (0.002)	-0.021*** (0.002)
Labour Regulations	-0.015** (0.006)	-0.006** (0.002)	-0.000 (0.002)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.002* (0.001)	0.001 (0.001)	-0.000 (0.002)
Firm Characteristics	-0.204*** (0.035)	-0.193*** (0.015)	-0.196*** (0.011)	-0.197*** (0.009)	-0.199*** (0.008)	-0.203*** (0.007)	-0.218*** (0.007)	-0.246*** (0.008)	-0.313*** (0.011)
State Characteristics	-0.010** (0.005)	0.002 (0.002)	0.001 (0.002)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	0.004** (0.002)
Industry Characteristics	0.123*** (0.021)	0.016* (0.009)	-0.002 (0.006)	-0.015*** (0.005)	-0.023*** (0.004)	-0.035*** (0.004)	-0.042*** (0.004)	-0.040*** (0.004)	-0.044*** (0.006)
Pure Structural Effects									
Financial Constraints	0.112*** (0.011)	0.067*** (0.006)	0.057*** (0.005)	0.050*** (0.004)	0.050*** (0.004)	0.058*** (0.004)	0.054*** (0.004)	0.057*** (0.005)	0.070*** (0.007)
Infrastructure	0.752*** (0.052)	0.297*** (0.030)	0.205*** (0.023)	0.159*** (0.020)	0.153*** (0.020)	0.140*** (0.020)	0.125*** (0.022)	0.118*** (0.025)	0.112*** (0.034)
Labour Regulations	-0.656*** (0.068)	-0.087** (0.039)	0.012 (0.029)	0.010 (0.025)	0.019 (0.024)	-0.025 (0.024)	-0.049* (0.026)	-0.068** (0.030)	-0.036 (0.041)
Firm Characteristics	-1.393*** (0.204)	-0.757*** (0.116)	-0.705*** (0.087)	-0.612*** (0.076)	-0.700*** (0.072)	-0.886*** (0.073)	-0.903*** (0.079)	-0.776*** (0.091)	-0.778*** (0.124)
State Characteristics	0.568* (0.330)	0.472** (0.186)	0.213 (0.139)	0.081 (0.122)	-0.015 (0.115)	-0.012 (0.116)	-0.331*** (0.126)	0.017 (0.145)	-0.202 (0.197)
Industry Characteristics	0.002 (0.016)	0.022** (0.009)	0.017** (0.007)	0.024*** (0.006)	0.025*** (0.006)	0.023*** (0.006)	0.020*** (0.006)	0.024*** (0.007)	0.019* (0.010)
Constant	-0.158 (0.394)	-0.696*** (0.223)	-0.451*** (0.167)	-0.349** (0.146)	-0.166 (0.138)	0.051 (0.139)	0.416*** (0.150)	-0.047 (0.174)	0.117 (0.236)

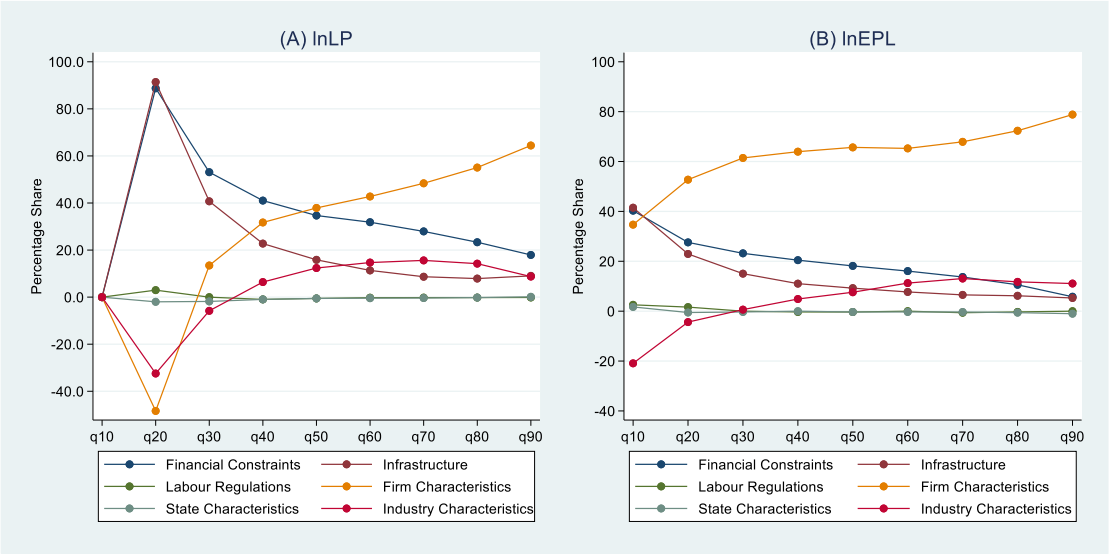
Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

Figure 9.6: Aggregate RIF-Decomposition by Percentiles: Percentage Contribution



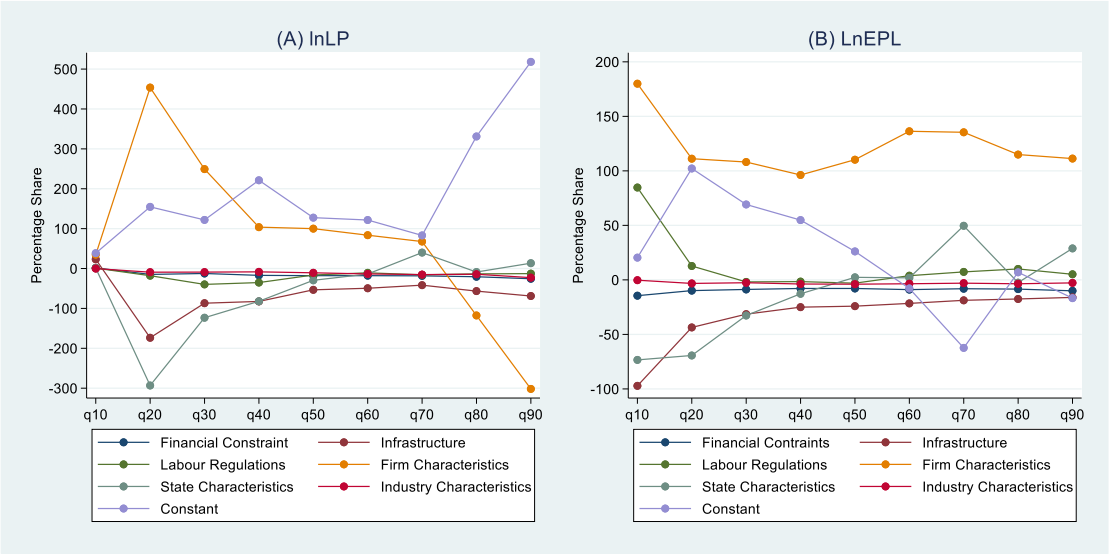
Source: Own estimates.

Figure 9.7: Detailed RIF-Decomposition of Pure Composition Effects by Percentiles: Percentage Contribution



Source: Own estimates.

Figure 9.8: Detailed RIF-Decomposition of Pure Structural Effect by Percentiles: Percentage Contribution



Source: Own estimates.

Finally, we present the percentile ratios (50-10, 90-10, and 90-50), Gini Coefficient and Variance of the RIF-Decomposition of productivity and wage gap in Tables 9.11 and 9.12, respectively. The results from this exercise are qualitatively similar to what we observed at the mean and quantile estimates. We observed large and significant productivity and wage gaps between informal and formal sector firms at the bottom end of the distribution (50-10th percentile ratio). On the other hand, the gap in productivity and wages narrows down as we ascend the distribution ladder, as indicated by the estimates for 90-50th percentile ratio. However, when we look at the disaggregate level, the structural effects are found to be more important in explaining the gap at each percentile ratio. This empirical exercise allows us to examine the role of covariates in percentile ratio, variance and Gini index of productivity and wages. Among the covariates, infrastructure, financial constraints and firm characteristics played significant roles in explaining the productivity gap and wage inequality between informal and formal sector firms.

In a nutshell, our findings based on the decomposition analysis showed considerable importance to both the composition and structural effects in explaining the productivity and wage gap between informal and formal sector firms. Among the individual covariates, financial constraints, infrastructure, and firm characteristics are the most important factors that explain the gap in productivity and earnings.

Table 9.11: RIF-Decomposition for Productivity Gap – Percentile Ratios, Gini Coefficient and Variance

Variables	iqr9010	iqr5010	iqr9050	Cvar	gini	var
	(1)	(2)	(3)	(4)	(5)	(6)
Overall						
Mean Productivity of Informal Sector (M)	12.067***	10.872***	1.195***	0.373***	0.157***	14.025***
	(0.015)	(0.010)	(0.015)	(0.005)	(0.003)	(0.264)
Mean Productivity of Formal Sector (N)	3.099***	1.794***	1.305***	0.232***	0.090***	7.415***
	(0.023)	(0.020)	(0.010)	(0.003)	(0.001)	(0.146)
Gap in the Productivity (M – N)	8.968***	9.078***	-0.110***	0.141***	0.066***	6.610***
	(0.027)	(0.023)	(0.018)	(0.005)	(0.003)	(0.301)
Reweighting Decomposition						
Counterfactual (C)	12.620***	11.272***	1.348***	0.353***	0.148***	14.005***
	(0.018)	(0.011)	(0.018)	(0.005)	(0.002)	(0.281)
Total Composition Effects (M – C)	-0.554***	-0.401***	-0.153***	0.020***	0.009**	0.020
	(0.023)	(0.015)	(0.023)	(0.006)	(0.004)	(0.385)
Total Structural Effects (C – N)	9.521***	9.479***	0.043**	0.121***	0.058***	6.590***
	(0.029)	(0.023)	(0.020)	(0.005)	(0.003)	(0.317)
RIF Aggregate Decomposition						
Pure Composition Effects	-0.675***	-0.372***	-0.303***	0.017***	0.004	-0.207
	(0.020)	(0.013)	(0.020)	(0.006)	(0.004)	(0.360)
Specification Error	0.121***	-0.029*	0.150***	0.004	0.005	0.226
	(0.029)	(0.017)	(0.030)	(0.008)	(0.004)	(0.439)
Pure Structural Effects	9.515***	9.460***	0.055***	0.122***	0.058***	6.642***
	(0.029)	(0.024)	(0.020)	(0.005)	(0.002)	(0.295)
Reweighting Error	0.007	0.019***	-0.012*	-0.001	-0.000	-0.052
	(0.010)	(0.007)	(0.007)	(0.003)	(0.001)	(0.172)
Pure Composition Effects						
Financial Constraints	-0.121***	-0.129***	0.008	0.054***	0.030***	2.872***
	(0.009)	(0.006)	(0.010)	(0.003)	(0.001)	(0.150)
Infrastructure	-0.061***	-0.059***	-0.002	0.063***	0.035***	3.534***
	(0.005)	(0.004)	(0.004)	(0.003)	(0.002)	(0.178)
Labour Regulations	0.001	0.002	-0.000	-0.001	-0.000	-0.042
	(0.003)	(0.002)	(0.003)	(0.001)	(0.000)	(0.048)
Firm Characteristics	-0.435***	-0.141***	-0.293***	-0.085***	-0.050***	-5.581***
	(0.018)	(0.011)	(0.018)	(0.005)	(0.003)	(0.267)
State Characteristics	-0.001	0.002	-0.003	0.001	0.000	0.045
	(0.002)	(0.001)	(0.002)	(0.001)	(0.000)	(0.037)
Industry Characteristics	-0.059***	-0.046***	-0.013	-0.016***	-0.010***	-1.035***
	(0.009)	(0.006)	(0.010)	(0.003)	(0.001)	(0.145)
Pure Structural Effects						
Financial Constraints	0.289***	0.259***	0.030***	-0.022***	-0.013***	-1.341***
	(0.015)	(0.012)	(0.011)	(0.003)	(0.001)	(0.158)
Infrastructure	2.685***	2.651***	0.034	-0.384***	-0.214***	-23.984***
	(0.086)	(0.073)	(0.056)	(0.013)	(0.007)	(0.802)
Labour Regulations	0.166*	0.193**	-0.027	0.020	0.009	1.389
	(0.097)	(0.078)	(0.070)	(0.016)	(0.008)	(0.991)
Firm Characteristics	4.971***	3.049***	1.922***	0.509***	0.365***	40.447***
	(0.289)	(0.234)	(0.208)	(0.049)	(0.025)	(2.973)
State Characteristics	0.029	0.265	-0.236	0.029	0.000	3.116
	(0.451)	(0.361)	(0.334)	(0.079)	(0.040)	(4.753)
Industry Characteristics	0.105***	0.051***	0.054***	0.005	0.003	0.463*
	(0.023)	(0.019)	(0.017)	(0.004)	(0.002)	(0.236)
Constant	1.270**	2.992***	-1.722***	-0.036	-0.092*	-13.448**
	(0.542)	(0.434)	(0.399)	(0.094)	(0.048)	(5.690)

Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

Table 9.12: RIF-Decomposition for Wage Gap – Percentile Ratios, Gini Coefficient and Variance

Variables	iqr9010	iqr5010	iqr9050	cvar	gini	var
	(1)	(2)	(3)	(4)	(5)	(6)
Overall						
Mean Wage of Informal Sector (M)	2.166***	1.395***	0.771***	0.236***	0.084***	6.222***
	(0.032)	(0.030)	(0.009)	(0.004)	(0.002)	(0.198)
Mean Wage of Formal Sector (N)	1.767***	0.911***	0.856***	0.060***	0.033***	0.528***
	(0.010)	(0.007)	(0.006)	(0.000)	(0.000)	(0.008)
Gap in the Wage (M – N)	0.399***	0.485***	-0.086***	0.176***	0.051***	5.693***
	(0.034)	(0.031)	(0.011)	(0.004)	(0.002)	(0.198)
Reweighting Decomposition						
Counterfactual (C)	1.889***	1.090***	0.798***	0.175***	0.061***	3.799***
	(0.021)	(0.019)	(0.010)	(0.004)	(0.001)	(0.161)
Total Composition Effects (M – C)	0.277***	0.305***	-0.028**	0.061***	0.023***	2.423***
	(0.039)	(0.036)	(0.014)	(0.006)	(0.002)	(0.255)
Total Structural Effects (C – N)	0.121***	0.180***	-0.058***	0.115***	0.028***	3.270***
	(0.024)	(0.020)	(0.012)	(0.004)	(0.001)	(0.161)
RIF Aggregate Decomposition						
Pure Composition Effects	0.190***	0.284***	-0.094***	0.049***	0.019***	1.955***
	(0.044)	(0.041)	(0.013)	(0.006)	(0.002)	(0.270)
Specification Error	0.087	0.021	0.066***	0.012	0.004	0.469
	(0.055)	(0.051)	(0.019)	(0.007)	(0.003)	(0.340)
Pure Structural Effects	0.074***	0.139***	-0.064***	0.104***	0.024***	2.812***
	(0.023)	(0.020)	(0.012)	(0.004)	(0.001)	(0.158)
Reweighting Error	0.047***	0.041***	0.006*	0.011***	0.004***	0.458***
	(0.010)	(0.008)	(0.004)	(0.002)	(0.001)	(0.083)
Pure Composition Effects						
Financial Constraints	0.213***	0.182***	0.031***	0.036***	0.015***	1.650***
	(0.020)	(0.019)	(0.006)	(0.003)	(0.001)	(0.122)
Infrastructure	0.223***	0.216***	0.007***	0.036***	0.015***	1.671***
	(0.014)	(0.013)	(0.003)	(0.002)	(0.001)	(0.096)
Labour Regulations	0.015**	0.016***	-0.001	0.001*	0.001*	0.067*
	(0.006)	(0.006)	(0.002)	(0.001)	(0.000)	(0.038)
Firm Characteristics	-0.109***	0.005	-0.114***	-0.004	-0.003	-0.449**
	(0.036)	(0.034)	(0.011)	(0.005)	(0.002)	(0.213)
State Characteristics	0.014***	0.012**	0.003*	0.002***	0.001***	0.115***
	(0.005)	(0.005)	(0.001)	(0.001)	(0.000)	(0.037)
Industry Characteristics	-0.166***	-0.146***	-0.020***	-0.023***	-0.010***	-1.101***
	(0.021)	(0.020)	(0.006)	(0.003)	(0.001)	(0.133)
Pure Structural Effects						
Financial Constraints	-0.044***	-0.064***	0.020***	-0.029***	-0.010***	-1.244***
	(0.013)	(0.011)	(0.007)	(0.002)	(0.001)	(0.086)
Infrastructure	-0.651***	-0.610***	-0.041	-0.358***	-0.115***	-14.965***
	(0.061)	(0.052)	(0.034)	(0.009)	(0.003)	(0.379)
Labour Regulations	0.622***	0.677***	-0.055	0.101***	0.035***	3.924***
	(0.078)	(0.067)	(0.042)	(0.013)	(0.004)	(0.512)
Firm Characteristics	0.597**	0.678***	-0.080	0.052	0.021*	1.912
	(0.233)	(0.201)	(0.126)	(0.038)	(0.012)	(1.537)
State Characteristics	-0.767**	-0.581*	-0.186	0.190***	0.048**	8.942***
	(0.376)	(0.324)	(0.201)	(0.062)	(0.020)	(2.504)
Industry Characteristics	0.018	0.023	-0.005	-0.003	-0.001	-0.153
	(0.019)	(0.016)	(0.010)	(0.003)	(0.001)	(0.125)
Constant	0.299	0.016	0.283	0.150**	0.046*	4.397
	(0.449)	(0.388)	(0.241)	(0.074)	(0.024)	(2.989)

Notes: Standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

9.5. Conclusion

In this chapter, we document the productivity and wage differentials across formal and informal firms in Indian manufacturing. Firstly, we show how important small firm transition is in enhancing the level of productivity and wages in Indian manufacturing. We then examine the role of finance, infrastructure and labour regulations in explaining the productivity and wage gaps between small and large firms. We employ Oaxaca and RIF-Oaxaca decomposition methods to understand the role of each of these factors in explaining the productivity and wage differentials between firms in the informal and formal manufacturing sectors.

We witness a large and growing gap in productivity and wages in Indian manufacturing. It is clearly evident from our analysis that there are significant gains in productivity and wages as the firm transits to larger size categories. Our finding also shows that the firm size is positively and significantly correlated with productivity and wages, implying that the larger the size higher the labour productivity and wages. These findings strengthen our argument that the transition of small firms will improve the productivity and earnings in Indian manufacturing as well as the living standards of workers and entrepreneurs in small firms.

Our findings also hint at a significant role of finance, infrastructure and labour regulations in explaining the overall low level of productivity and wages in Indian manufacturing. The findings of the study suggest that the level of productivity and wage can be improved with increased access to finance from external (formal) sources and better energy infrastructure. Our estimation from the RIF decomposition shows that about 34 per cent of the productivity gap is explained by the differences in observable characteristics, of which the differences in access to finance and infrastructure between

firms in the informal and formal sectors contributed the most. Contrarily, we do not find any significant role of the differences in labour market conditions in explaining the productivity and wage gap.

CHAPTER 10

CONCLUSION

A peculiar feature of the manufacturing sector in India is the presence of missing middle -- presence of a few large firms and many smaller ones with disproportionately few mid-sized firms. This implies that there is limited upward transition of small firms, which is argued to be a dampener to growth. Owing to the large productivity gap between small and large firms, absence of small firm transition can potentially lead to losses in productivity and earnings. Such adverse effects on earnings essentially have negative implications on pro-poor growth as the majority of urban workers are in small firms. Existing literature has highlighted various factors contributing to the lack of transition of firms to the mid-size category. Among the set of factors identified, greater emphasis is accorded to inadequate access to finance, limited access to infrastructure and stringent labour regulations. These studies have largely relied on suggestive evidences, and a serious empirical scrutiny on the possible drivers of small firm transition is still lacking. Hence, the lessons drawn from these explorations might not be adequate enough to arrive at the precise impact of these factors on firm transition, and to suggest suitable policy measures.

In this study, our objective was to complement the thin literature on the absence of mid-sized firms in India. We began with a discussion of the data sources used in the study. We provided a brief introduction to the various data sources on Indian firms, and also deliberated upon the various steps employed to prepare the final dataset for the analysis. We then reviewed the studies on firm growth and the factors influencing it. Using a rich

dataset on formal and informal sector firms, we then examined the levels and trends in informality in manufacturing sector in the aggregate and also by industry, region and different firm characteristics. We also examined the phenomenon of missing middle in Indian manufacturing, and made an attempt to understand its temporal and spatial variations. We then explored the role of finance constraints, lack of access to infrastructure, and stringent labour regulations on the transition of Indian firms. In the end, the study analysed the productivity and wage implications of limited firm transition. The data for our empirical analysis was drawn from two different sources, NSSO surveys and ASI. We combined these two datasets to create a continuum of firms from the smallest to the largest firms in the non-household sector. We empirically tested the objectives using an array of standard econometric methods, both linear and non-linear. Besides ordered logit method and 2SRI, we also employed non-linear decomposition techniques – Oaxaca-Blinder and RIF-decomposition method. Various robustness checks such as Difference-in-Differences (DID) method and synthetic panel approach are employed to test the robustness of our results.

Key Findings

Significant Informality in Indian Manufacturing

In our attempt to gauge the extent and magnitude of informality in Indian manufacturing, we observed a significant presence of informality in the sector. The sector has witnessed a marginal decline in informality between 2001 and 2016, however, the decline is mainly due to the faster growth of the formal sector over that of the informal sector. As such, we did not observe an absolute decline in the contribution of the informal sector to the Indian manufacturing. Endorsing the conjecture that informality is ubiquitous, the presence of a strong informality was also evident across

regions and industries. Our analysis also yielded evidence on the significant variations in informality across the firm characteristics with informality being relatively higher for proprietary firms, rural firms, younger firms, and labour-intensive firms. Further, we find that pervasive informality is associated with weaker economic outcomes. The findings based on visual examination and descriptive analysis suggest that informality is inversely related to growth, productivity, and earnings.

Missing Middle: The Persistent Phenomenon

Consistent with the existing evidence in the literature, our investigation analysing the employment distribution among the Indian firms suggest the presence of a bimodal distribution with a striking missing middle. The bulk of the employment is generated in small and large firms, with relatively less contribution from the intermediate size groups, suggesting that firms that start as small, seldom transform to a medium-sized firm indicating a weak process of upward transition. In addition, we also find that the large firms are nine times more productive than small firms pointing to the wider productivity implications of the missing middle problem. Our temporal examination suggests that the missing middle is a dominating and a consistent phenomenon of the Indian manufacturing sector even after decades of reforms. There is little evidence of the transition of firms from small to medium and correspondingly, from medium to large groups. We find that the missing middle in employment distribution is evident in most of the states and industries, and also does not vary much across firm characteristics. From these results, we discerned two key insights: first, labour productivity is correlated with firm size, implying that the larger the size higher the labour productivity. Second, there is little evidence of the transition of firms from small to medium, and correspondingly, from the medium to large size groups.

Finance Matters for Firm Transition

Our investigation analysing the impact of financial constraints on firm transition yielded a crucial role for increased liquidity. Irrespective of the measures of financial access employed, we obtained strong evidence that access to finance matters a lot in explaining the likelihood of upward progression of firms. We found that an increase in access to external finance decreased the probability of a firm being in the 6-9 size category by 0.1 percentage points and increased the probability of a firm in the 10-19 size category by 0.1 percentage points, in the 20-49 size category by 0.03 percentage points, in the 50-99 size category by 0.02 percentage points, in the 100 to 199 and above size category by 0.01 percentage points. Our attempt to address the possible endogeneity concerns associated with the finance constraint variables using the two-stage residual inclusion (2SRI) approach too endorsed the finance-firm transition nexus found using the baseline model. Another critical robustness test using the synthetic panel data method too hinted at the important role of financial constraints in explaining small firm transitions. Our finding that financial constraints significantly hamper firm growth is robust to alternate methods and specifications and also to concerns arising from reverse causality.

Infrastructure Matters

Realising that there is limited evidence at the firm level on how infrastructural bottlenecks influence firm transition in developing countries, we examined the causal link between infrastructure and transition of firms. Given the data constraints, access to energy infrastructure was used as a proxy for infrastructural constraints at the firm level. Our estimates based on two measures of power availability clearly points to the significant role of energy infrastructure in explaining the transition of firms in India.

Our results clearly indicated that firms with limited access to power are less likely to make the transition from small to large size categories. Estimates suggest that all else equal, a one per cent increase in electricity constraint increased the probability of a firm being in the 6-9 size category by 10 percentage points and decreased the probability of a firm being in the 10-19 size category by 4.2 percentage points, in the 20-49 size category by 2.3 percentage points, in the 50-99 size category by 1.3 percentage points, in the 100-199 size category by 1 percentage points, in the 200-499 size category by 0.8 percentage points, and in the 500 and above size category by 0.5 percentage points. In order to check the robustness of our results, we analysed the impact of an exogenous variation of the availability of infrastructure on firm transition using a DiD approach, where we took advantage of two recent government policies, JNNURM and RSVY. The results showed that firms in districts where the schemes were implemented experienced a significant positive impact on firm transition as compared to firms in controlled districts. An additional robustness test using night-time light intensity as a proxy for infrastructure too suggested the critical role for infrastructure in aiding firm transition.

Labour Market Regulations at Play

As is the case with finance and infrastructure, our results also pointed to the significant role of labour market regulations on firm transition. Unlike most of the existing studies, we focused on both *de jure* and *de facto* changes to capture the changes in labour regulations over time. We found that the exclusive reliance on *de jure* reforms, which is the practice in the literature, overstated the flexibility in the labour market especially in regions where there is laxity in enforcement. Our investigation of the impact of labour market regulations suggested a dampening effect of these regulations on firm

transition. Our econometric analysis suggested that a state is more likely to see firms making an upward progression if it has a more flexible labour market. The estimated marginal effects show that the firms located in a flexible state labour market are less likely to be in the 6-9 size category and more likely to be in the larger size categories. This clearly suggest that small firms, the bulk of them in the informal sector, were the ones that most benefited from the reforms in the labour market. Controlling for the endogeneity of labour regulation variables did not alter our results and reiterated the crucial role of labour regulations on firm transition. Additional robustness tests, DiD and Synthetic panel data approach, too endorsed the main observation that flexible labour laws expedites firm transition in Indian manufacturing.

Large and Growing Gap in Productivity and Wages

The efforts to document the gap in productivity and wages yielded a large and growing gap in productivity and wages between the large and small firms. We observed significant gains in productivity and wages as firms transit to larger size categories. Our visual examination suggested that firm size is significantly correlated with productivity and wages, implying that the larger the size higher the labour productivity and wages. We observed a significant role of finance, infrastructure and labour regulations in explaining the overall low level of productivity and wages in Indian manufacturing. We also examined the factors contributing to the productivity gap and wage inequality in Indian manufacturing by employing non-linear decomposition methods. The findings suggested that the level of productivity and wages can be improved with increased access to finance from external (formal) sources and better energy infrastructure. Our estimates based on the RIF decomposition showed that about 34 per cent of the productivity gap is explained by the differences in observable characteristics, of which

the differences in access to finance and infrastructure between firms in the informal and formal sectors contributed the most.

Policy Suggestions

Our study points to the significant role of access to finance, infrastructure, and labour regulations in explaining the overall low level of productivity and wages in Indian manufacturing. This suggest that the level of productivity and wages can be improved with increased access to finance from external (formal) sources and better power infrastructure and reliable supply to the industrial sector. The inferences drawn from the present study are used to make the following policy recommendations.

One of the policy implications that emerge from our finding is related to the critical role of access to finance on firm transition. The results clearly suggest that the new branch-licensing policy of the Government of India helped in improving the financial access in "under-banked" districts, thereby contributing to the growth of entrepreneurship in the country's manufacturing sector. In addition, commercial bank lending to small firms has substantially reduced even as mandatory commercial bank-lending requirements for small enterprises remain in place in the post-reform period. This shows that the mere presence of bank branches alone may not serve the goal of providing adequate credit to small firms. There has to be a stronger focus from the RBI on increasing the corpus of funds available to term-lending institutions, such as the Small Industries Development Bank of India, to lend to small firms, especially those in the informal sector. Alongside, a greater effort by the lending institutions to provide collateral-free loans is needed to make it easier for these enterprises to borrow from institutional sources. There is a need to devise innovative financing schemes that will help start-ups overcome credit constraints and enable them to commence operations

with sufficient working capital. There is enough evidence to show that setting up businesses using purely internal sources and informal finance restricts their operation and leads to shutdowns. Formulating start-up financing schemes via venture capital or government-backed guarantee schemes, along the lines of the schemes implemented in the Southern African Development Community (SADC) region, is likely to offer success in mitigating the financial constraints that start-up firms face (Fanta *et al*., 2017).

Our finding on the nexus between infrastructure and firm transition clearly points to the importance of ehancing the provision of infrastructural facilities including uninterrupted power supply to improve the growth and productivity of small firms. The introduction of innovative initiatives such as JNNURM and RSVY programmes can substantially enhance the availability of infrastructure in small cities/towns, rural, and backwards regions of the country, which could significantly aid the transition of small firms.

Another crucial finding of this study is that the flexible labour laws can expedite firm transition in Indian manufacturing. This finding contributes to the existing evidence that inflexible labour regulations have been a constraint to firm transition. Such an adverse effect is particularly pronounced in small firms. In a labour-abundant country like India, transitioning to the formal sector is a route out of poverty for workers relying on small firms. There is a caveat, though: if reforms in labour laws can lessen the relative cost of labour without impacting what workers take home or safety standards, firm transition at a large scale is possible and can contribute considerably to pro-poor growth. Our study possibly points to the adoption of a flexible labour market by introducing employer-friendly labour laws while keeping the labourers' welfare

paramount. Labour regulation should also envisage the formalisation of small firms in India.

Limitation and Scope for Future Research

Firstly, the study relies on repeated cross-sectional data on Indian firms to study firm transition. The cross-sectional nature of data does not allow us to track the same firm across the period. Therefore, our usage of the term 'transition' in the study refers to the shift of the preponderance of firms from the smallest to the largest. While some firms themselves may undergo this transition, others may not. This transition may be accomplished by individual firms for whom various constraints on growth are relaxed, or, more likely, by the contraction of small firms and the expansion of mid-size and large firms. This opens a possible avenue for future study. A study using panel data on firms would be more precise to conclude if a particular firm transited to the higher size category or remained in the same size category.

Secondly, the information on labour regulations is available at the state-level and not at the firm-level. This prohibits us from understanding the true impact of the amendments in the labour regulations for individual firms. A more detailed information, for example, what firms perceive of the particular amendment passed and how that would affect firm's decision to hire more workers, would have enabled us to take a more nuanced approach to study the nexus between labour regulations and firm transition.

Further, our analysis on infrastructural needs of the firm is confined to the energy sector. There exists other infrastructure that affects firm growth such as transport, water, internet connection, etc. We do not include them in the present study owing to the non-availability of information on these infrastructural inputs at the firm level. This could be another limitation that can be addressed in future research.

Lastly, one of the constraints often highlighted by the firms is the shortage of skilled labour. This information is difficult to capture using the dataset that we employ in this study. The information on the skilled labour would have added more value to this study. This can again be taken up by studies in future.

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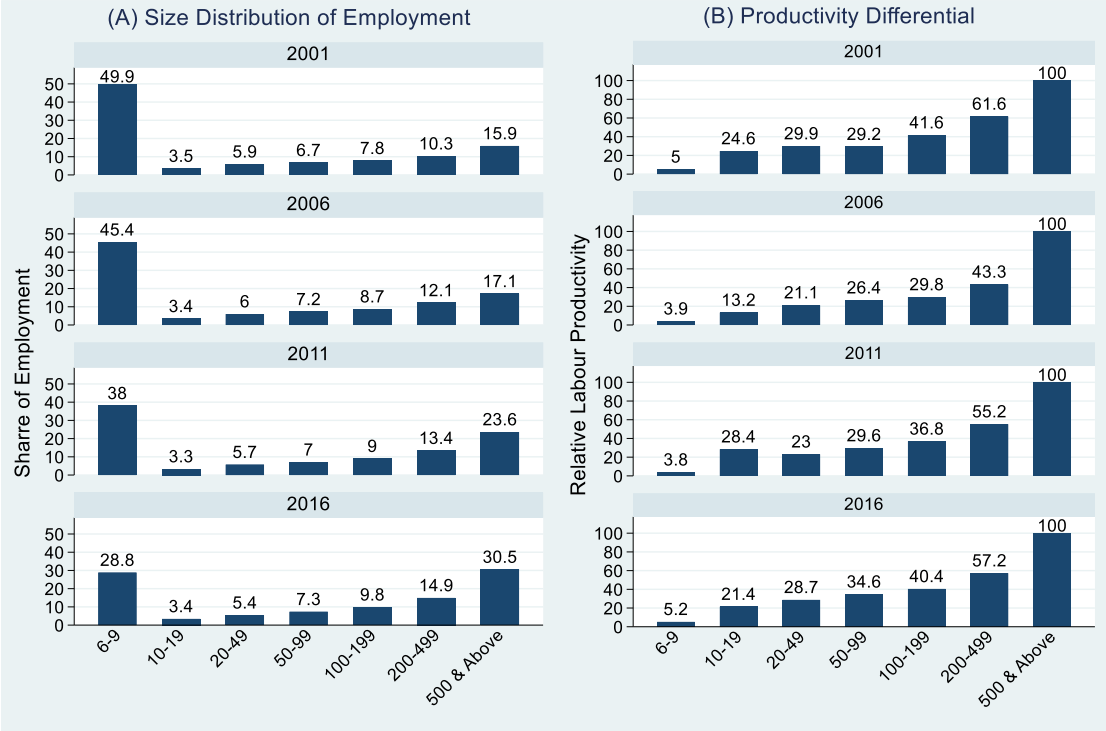
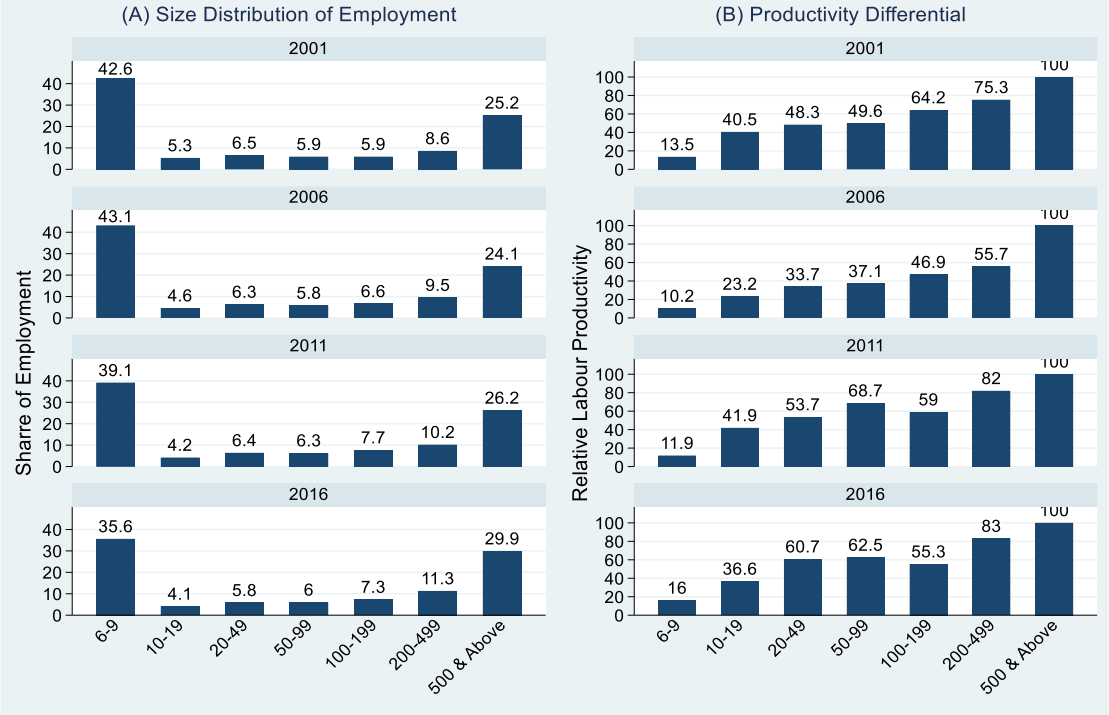
APPENDICES

Figure A5.1: Employment Distribution and Productivity Differential by Size Groups in Rural Location: 2001 to 2016



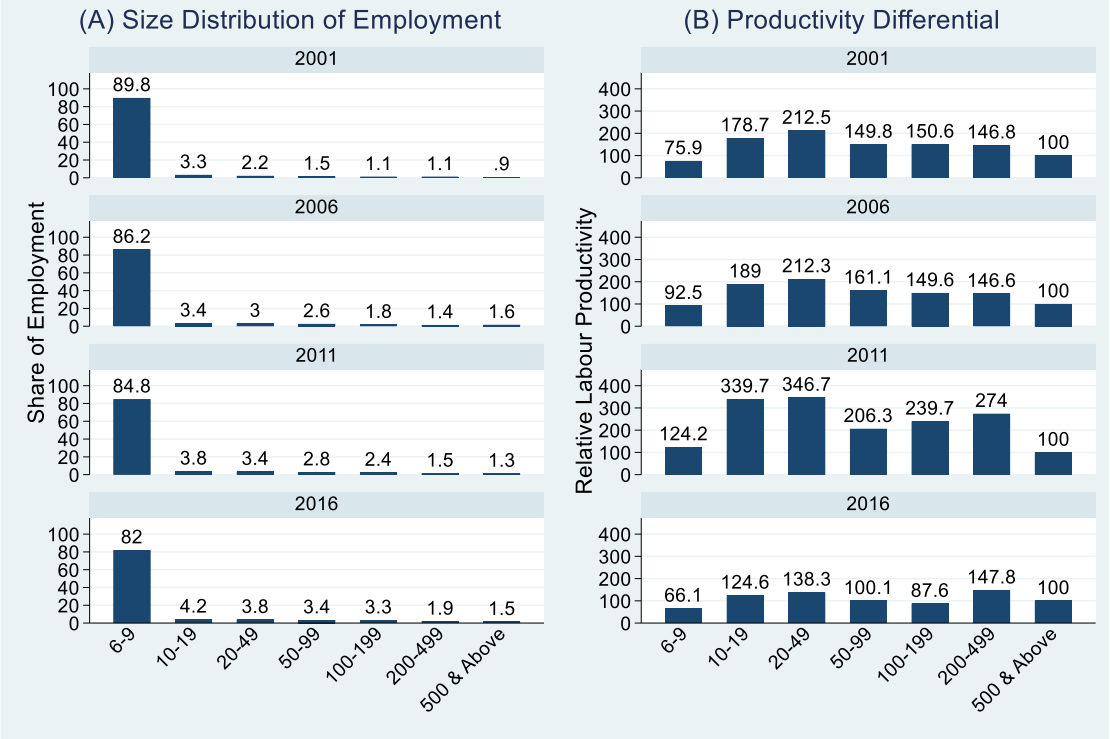
Source: Own estimates.

Figure A5.2: Employment Distribution and Productivity Differential by Size Groups in Urban Location: 2001 to 2016



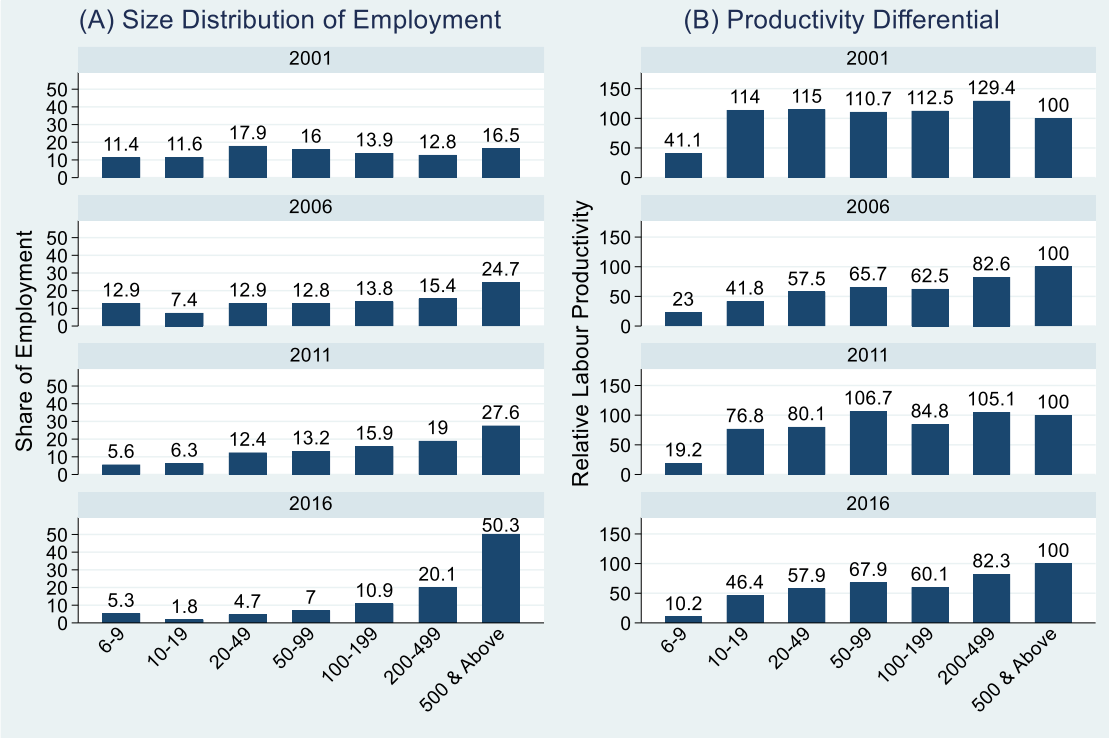
Source: Own estimates.

Figure A5.3: Employment Distribution and Productivity Differential by Size Groups for Proprietary Firms: 2001 to 2016



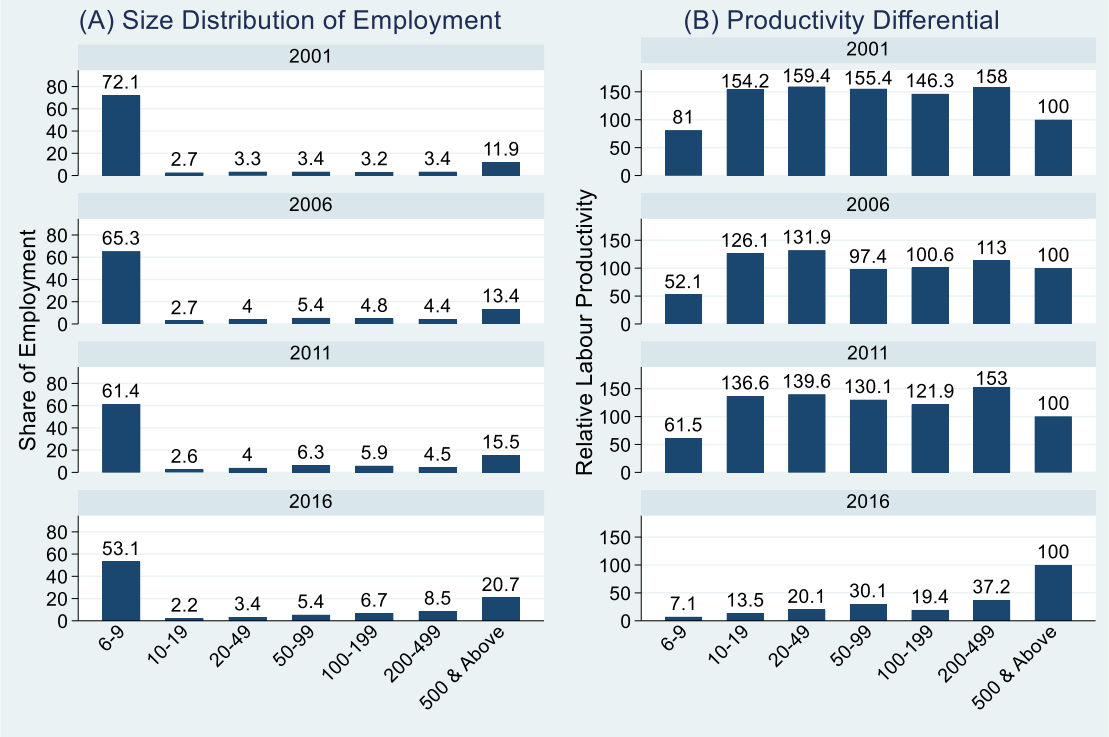
Source: Own estimates.

Figure A5.4: Employment Distribution and Productivity Differential by Size Groups for Partnership Firms: 2001 to 2016



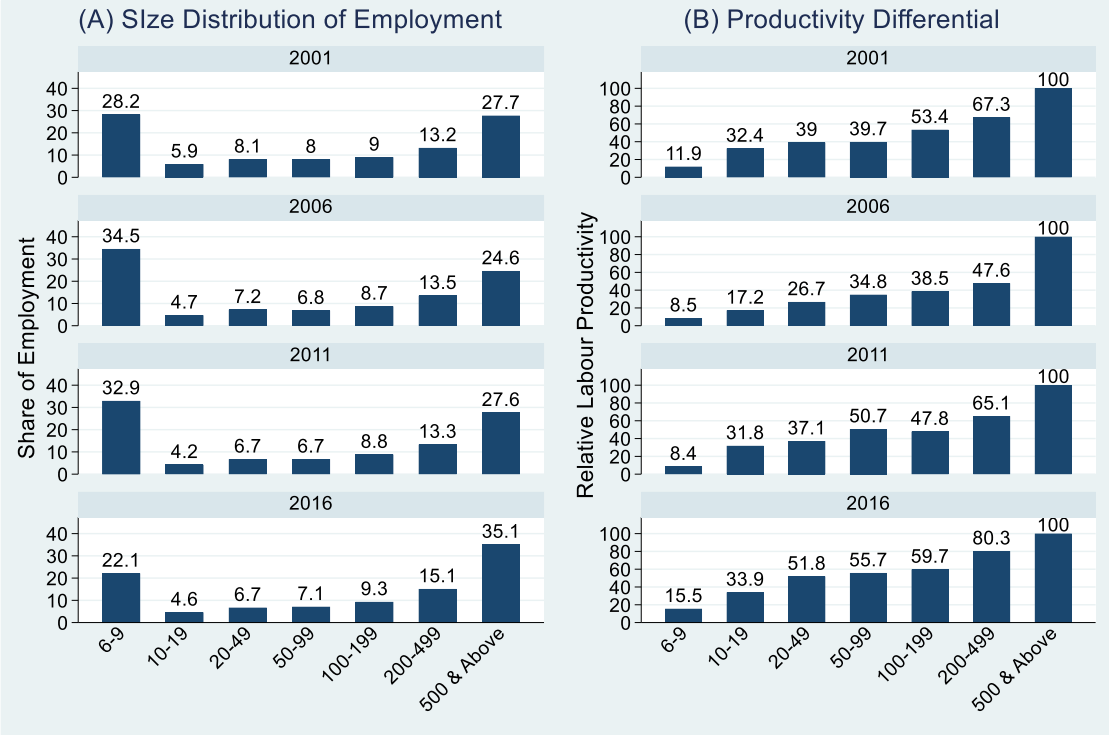
Source: Own estimates.

Figure A5.5: Employment Distribution and Productivity Differential by Size Groups for Labour-Intensive Firms: 2001 to 2016



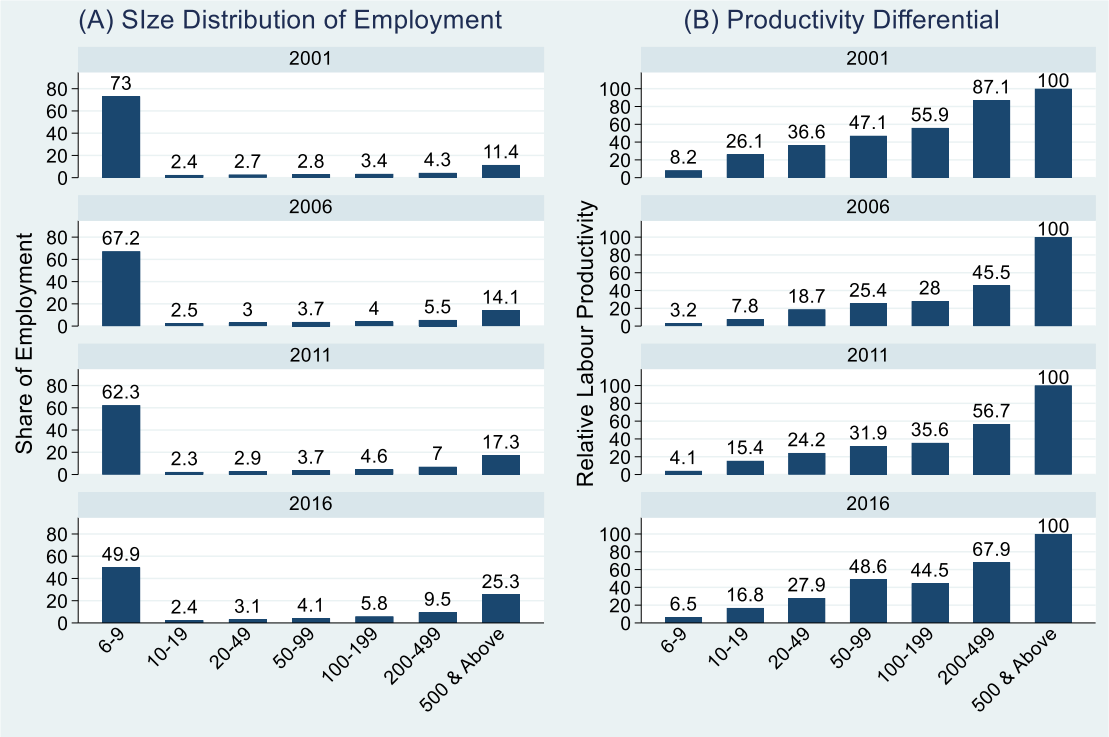
Source: Own estimates.

Figure A5.6: Employment Distribution and Productivity Differential by Size Groups for Capital-Intensive Firms: 2001 to 2016



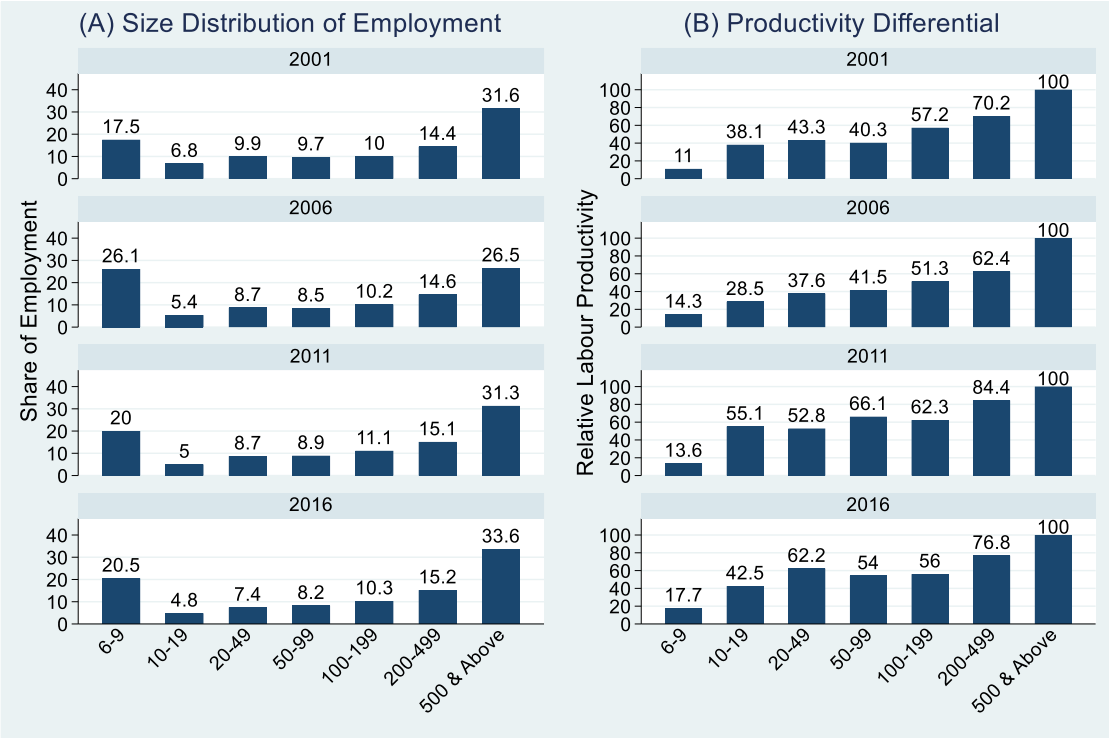
Source: Own estimates.

Figure A5.7: Employment Distribution and Productivity Differential by Size Groups for Firms Without Loan: 2001 to 2016



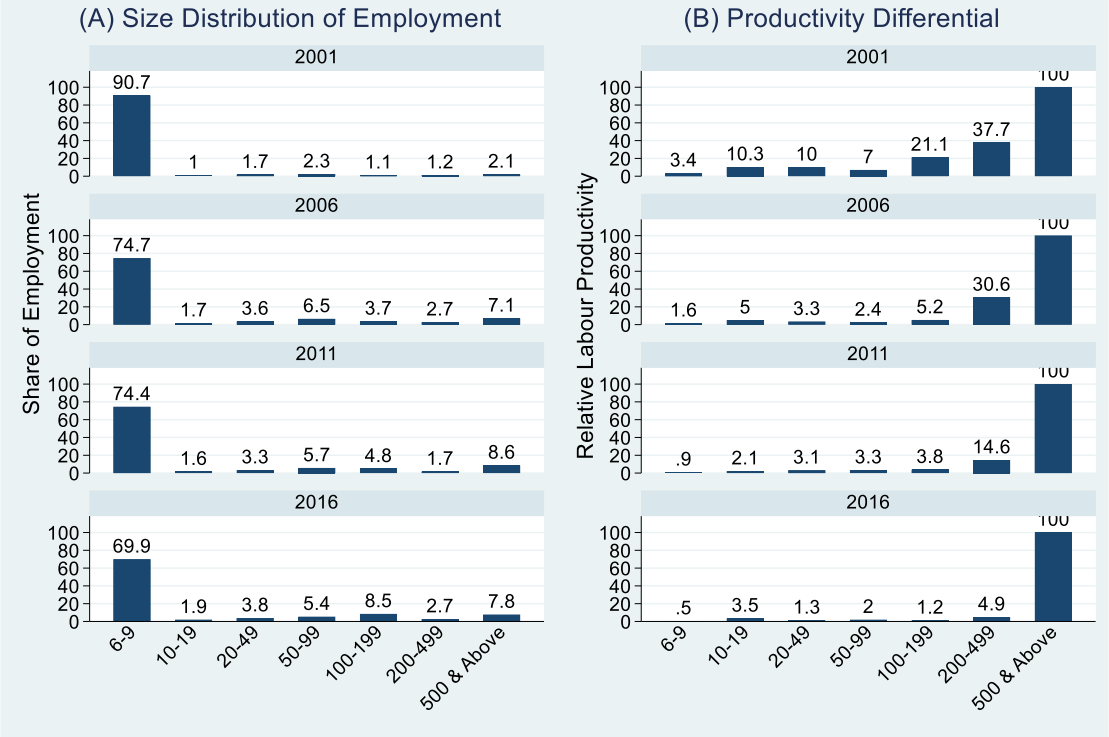
Source: Own estimates.

Figure A5.8: Employment Distribution and Productivity Differential by Size Groups for Firms With Loan: 2001 to 2016



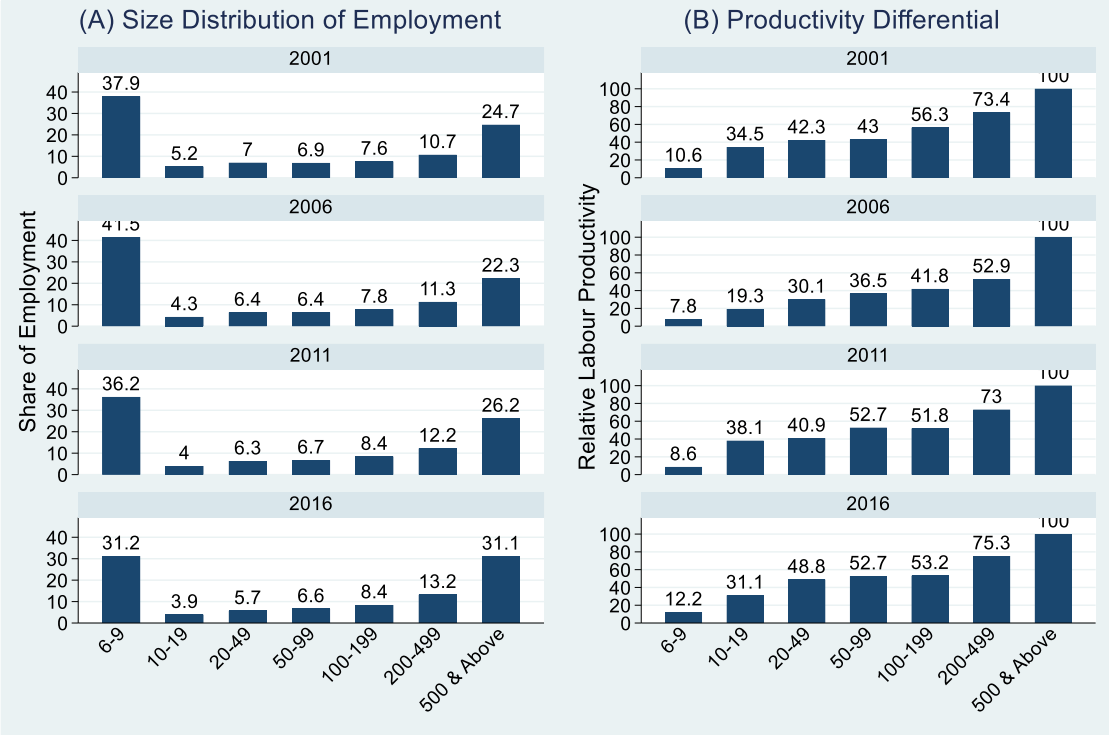
Source: Own estimates.

Figure A5.9: Employment Distribution and Productivity Differential by Size Groups for Firms Without Electricity Connection: 2001 to 2016



Source: Own estimates.

Figure A5.10: Employment Distribution and Productivity Differential by Size Groups for Firms With Electricity Connection: 2001 to 2016

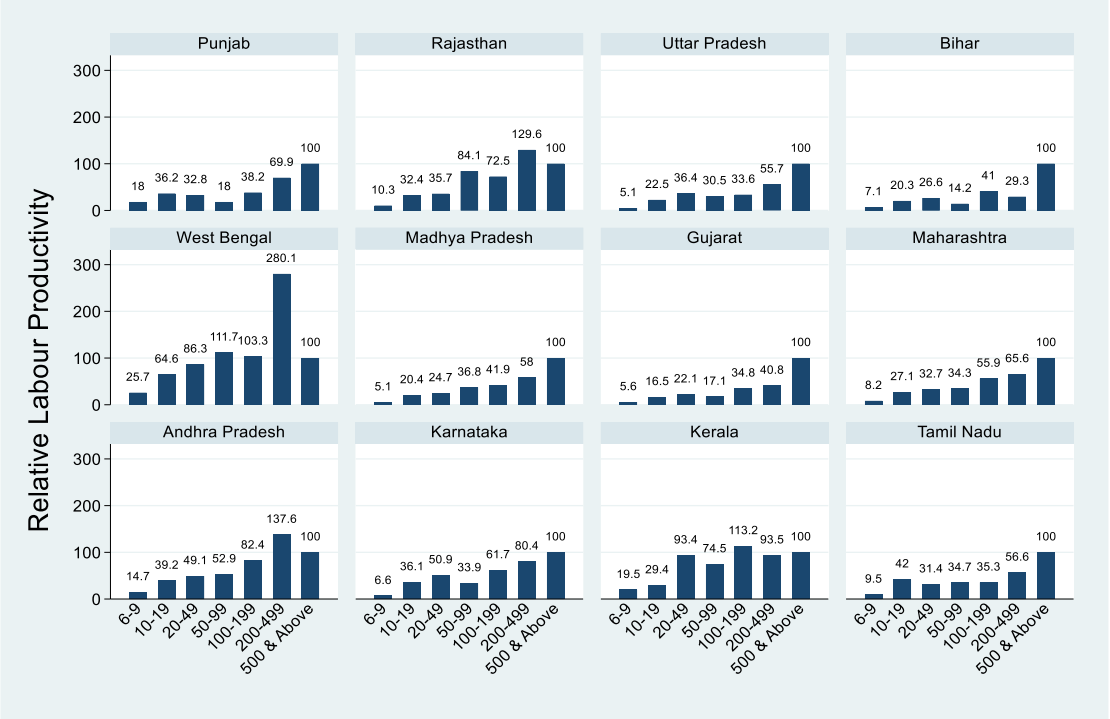


Source: Own estimates.

Figure A5.11: Distribution of Employment by Size Groups in Major Indian States: 2001

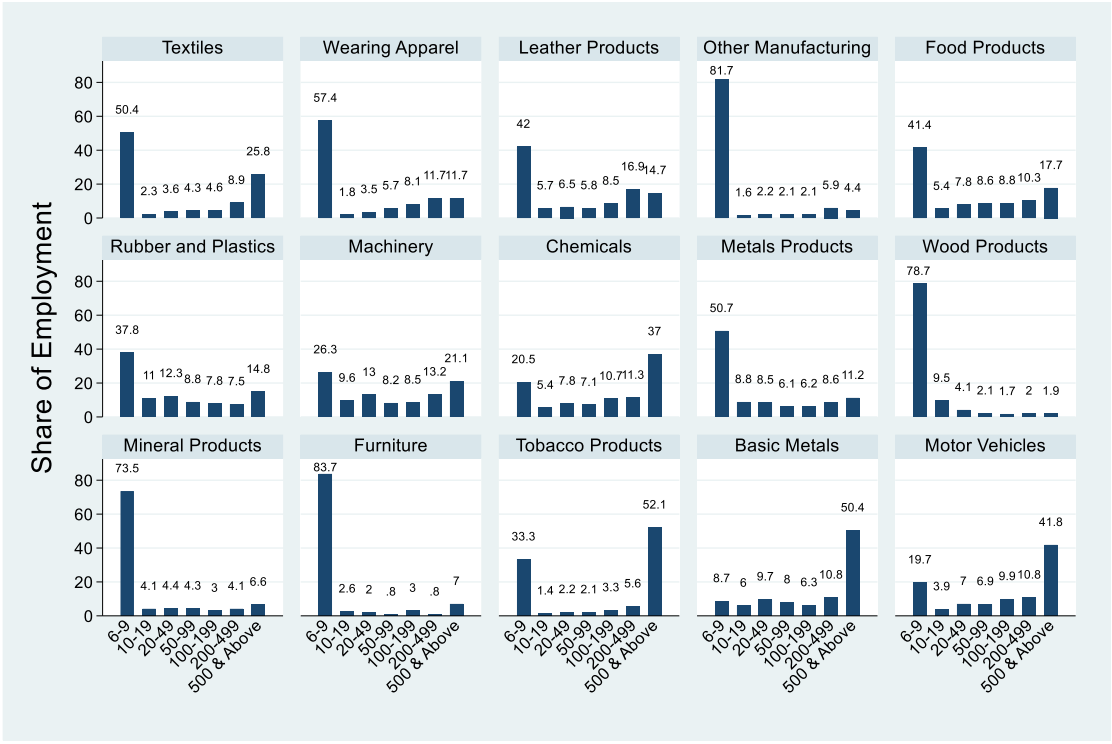
Source: Own estimates.

Figure A5.12: Productivity Differential by Size Groups in Major Indian States: 2001



Source: Own estimates.

Figure A5.13: Size Distribution of Employment in Key Industry Groups: 2001



Source: Own estimates.

Figure A5.14: Productivity Differential by Size Groups in Key Industry Groups: 2001

Source: Own estimates.

Table A6.1: Summary Statistics Estimated Using Sample Weight.

Variable	Observations	Mean	Std. Dev.	Min	Max
Dependent Variable					
SIZE	196391	1.326	0.912	1	7
Independent Variables					
FIN1	196391	10.885	26.231	0	209.791
FIN2	196391	0.342	0.474	0	1
Firm-Specific Controls					
Location	196391	0.640	0.480	0	1
CLR	196391	16.286	1.833	-2.676	26.196
Ownership:					
Proprietary	196391	0.787	0.409	0	1
Partnership	196391	0.076	0.265	0	1
PrivateLtdCom	196391	0.049	0.215	0	1
PSUs	196391	0.088	0.283	0	1
State-Specific Controls					
HDI	196391	0.591	0.068	0.436	0.757
Shurban	196391	37.858	16.859	9.641	96.126
Power	196391	6.645	0.631	4.240	7.912

Source: Own estimates.

Table A6.2: Results: Generalised Ordered Logit Regression Estimates (Dependent Variable: *SIZE*)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499
FIN1	0.036***	0.020***	0.011***	0.008***	0.004***	0.003***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Location	-0.219***	-0.360***	-0.430***	-0.430***	-0.379***	-0.266***
	(0.041)	(0.033)	(0.028)	(0.026)	(0.026)	(0.030)
CLR	0.140***	0.103***	0.082***	0.112***	0.160***	0.196***
	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.014)
Proprietary	-2.180***	-2.685***	-3.044***	-3.444***	-4.059***	-4.688***
	(0.063)	(0.059)	(0.059)	(0.060)	(0.069)	(0.093)
Partnership	0.438***	-0.115**	-0.648***	-1.067***	-1.531***	-2.002***
	(0.068)	(0.050)	(0.046)	(0.046)	(0.050)	(0.063)
PrivateLtdCom	3.268***	1.688***	1.179***	0.899***	0.633***	0.346***
	(0.179)	(0.042)	(0.035)	(0.033)	(0.032)	(0.035)
HDI	-0.308	-0.118	-0.347	-0.402	-1.202***	-1.364***
	(0.440)	(0.411)	(0.367)	(0.347)	(0.350)	(0.384)
Shurban	-0.013***	-0.005***	-0.003***	-0.003***	-0.001	-0.004***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Power	0.306***	0.144**	0.098**	0.065	0.174***	0.249***
	(0.068)	(0.061)	(0.051)	(0.046)	(0.045)	(0.047)
Constant	-4.582***	-3.789***	-3.455***	-4.179***	-5.878***	-7.806***
	(0.470)	(0.388)	(0.341)	(0.314)	(0.304)	(0.325)
N	186654					
Log pseudolikelihood	-82505.444					
Pseudo R^2	0.308					
FIN2	2.553***	1.992***	1.539***	1.329***	1.162***	1.072***
	(0.098)	(0.053)	(0.047)	(0.046)	(0.045)	(0.047)
Location	-0.237***	-0.399***	-0.456***	-0.447***	-0.385***	-0.265***
	(0.058)	(0.044)	(0.036)	(0.033)	(0.032)	(0.034)
CLR	0.039**	-0.003	-0.015	0.024	0.080***	0.120***
	(0.018)	(0.017)	(0.016)	(0.015)	(0.015)	(0.016)
Proprietary	-2.155***	-2.616***	-2.928***	-3.294***	-3.881***	-4.491***
	(0.095)	(0.093)	(0.091)	(0.089)	(0.094)	(0.112)
Partnership	0.374***	-0.310***	-0.825***	-1.220***	-1.660***	-2.111***
	(0.075)	(0.051)	(0.046)	(0.045)	(0.049)	(0.062)
PrivateLtdCom	3.100***	1.376***	0.888***	0.624***	0.371***	0.097***
	(0.172)	(0.043)	(0.035)	(0.033)	(0.032)	(0.034)
HDI	1.523***	1.495***	1.293***	1.165***	0.322	0.172
	(0.453)	(0.487)	(0.421)	(0.389)	(0.382)	(0.409)
Shurban	-0.017***	-0.006***	-0.005***	-0.004***	-0.003**	-0.006***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Power	0.380***	0.158	0.094	0.058	0.167**	0.238***
	(0.133)	(0.110)	(0.087)	(0.077)	(0.071)	(0.070)
Constant	-4.754***	-3.496***	-3.173***	-3.982***	-5.767***	-7.733***
	(0.959)	(0.737)	(0.619)	(0.556)	(0.520)	(0.513)
N	186654					
Log pseudolikelihood	-77421.146					
Pseudo R^2	0.351					

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Own estimates.

Table A6.3: Coefficient Values: 2SRI Estimations Using District-Level Instruments
(No. of Replications: 500)

Variable	First-Stage (Dependent Variable FIN1)	Second-Stage (Dependent Variable SIZE)	First-Stage (Dependent Variable FIN2)	Second-Stage (Dependent Variable SIZE)
FIN1		0.061*** (0.018)		
FIN2				2.996*** (0.066)
XuHAT		-0.055*** (0.018)		-0.824*** (0.027)
Firm-Specific Controls				
Location	1.467** (0.756)	0.037 (0.044)	-0.034** (0.014)	-0.149*** (0.011)
CLR	-1.610*** (0.351)	0.163*** (0.031)	0.380*** (0.005)	-0.276*** (0.006)
Proprietary	-31.077*** (2.666)	-3.145*** (0.544)	-0.304*** (0.020)	-4.623*** (0.021)
Partnership	-9.728*** (2.552)	-1.564*** (0.206)	0.684*** (0.022)	-3.150*** (0.021)
PrivateLtdCom	12.495*** (2.367)	-1.272*** (0.283)	0.913*** (0.023)	-2.081*** (0.021)
District-Specific Controls				
DShurban	-7.748** (3.205)	0.213 (0.197)	0.065 (0.044)	0.403*** (0.038)
ShSCST	4.042 (2.510)	0.746*** (0.183)	-0.288*** (0.058)	0.424*** (0.046)
ShMatPop	2.143 (4.987)	-0.002 (0.272)	-0.191** (0.081)	-0.084 (0.058)
ShVillRoad	-9.641 (6.939)	0.669*** (0.234)	-0.186*** (0.055)	0.246*** (0.045)
ShVillPower	-1.278 (2.474)	0.123 (0.098)	0.307*** (0.031)	-0.224*** (0.026)
ShVillPostTel	10.089** (4.001)	-0.463* (0.274)	-0.188*** (0.051)	-0.179*** (0.038)
ShVillBus	2.548 (2.930)	0.002 (0.154)	-0.020 (0.044)	0.392*** (0.035)
ShVillPSchool	7.426* (4.190)	-0.254 (0.332)	1.181*** (0.069)	-1.011*** (0.062)
Instrument Variables				
BBD	0.357** (0.141)		0.014*** (0.002)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
N	139404	139404	139404	139404
Log pseudolikelihood		-974298.83	-77235.994	-196294.53
R2/Pseudo R2	0.0592	0.3113	0.1606	0.2161
F	127.19			

Notes: (a) *BBD is the* bank branch density per hundred thousand population at the district level; district-specific controls include the share of urban population (*DShurban*), share of Scheduled Caste and Scheduled Tribe population (*ShSCST*), the proportion of individuals with secondary education and above (*ShMatPop*), the proportion of villages with paved approach roads in total villages (*ShVillRoad*), the proportion of electrified villages (*ShVillPower*), the proportion of villages with post and telegraph offices (*ShVillPostTel*), the proportion of villages situated on a bus route (*ShVillBus*), the proportion of villages with at least a primary school (*ShVillPSchool*). Other controls are the same as in our previous estimations; (b) Bootstrapped standard errors are reported in parentheses; and (c) *** p<0.01, ** p<0.05, * p<0.1.
Source: Own estimates.

Table A6.4: Share of Firm Having Access to Finance (in per cent): 2011 & 2016

Year	ASI	NSSO	Total
2010-11	77.3	42.4	64.5
2015-16	73.7	42.3	65.3

Source: Own estimates.

Table A6.5: Non-Parametric Rates of Firm Transition (in per cent), 2011 – 2016 (Conditional Probabilities)

	Formal Sector		10-19		20-99	
Firms with access to finance						
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Informal Sector	19.7	63.8				
6-9			38.1	53.1		
6-19					4.1	16.6
N	29589		6320		18179	
R^2	0.413		0.44		0.369	
Firms without access to finance						
Informal Sector	17.8	31.3				
6-9			13.5	29.0		
6-19					2.2	5.1
N	15584		4948		10245	
R^2	0.392		0.276		0.332	

Notes: Transitions rates in per cent.
Source: Own estimates.

Table A6.6: Coefficient Values: 2SRI Estimations (No. of Replications: 500)

Variables	First-Stage (Dependent Variable FIN1)	Second-Stage (Dependent Variable Formal)	First-Stage (Dependent Variable FIN2)	First-Stage (Dependent Variable Formal)
FIN1		0.280***		
		(0.037)		
FIN2				1.618***
				(0.050)
XuHAT		-0.248***		8.876***
		(0.037)		(0.462)
Firm-Specific Controls				
Locations	-2.037***	0.394***	-0.441***	0.763***
	(0.474)	(0.082)	(0.060)	(0.063)
CLR	0.960***	-0.014	0.385***	-0.560***
	(0.148)	(0.043)	(0.025)	(0.032)
Proprietary	-13.361***	0.528	-0.800***	-1.223***
	(0.546)	(0.472)	(0.070)	(0.123)
Partnership	0.673	-0.314***	0.195**	-0.513***
	(0.742)	(0.078)	(0.078)	(0.075)
State-Specific Controls				
HDI	8.560	-5.909***	2.397***	-8.067***
	(5.716)	(0.897)	(0.820)	(0.784)
Shurban	-0.143***	0.023***	-0.018***	0.023***
	(0.014)	(0.006)	(0.002)	(0.003)
Power	3.448***	-0.563***	0.350***	-0.351***
	(0.582)	(0.182)	(0.082)	(0.076)
Instrument Variable				
BBD	0.313***		0.034**	
	(0.108)		(0.016)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
F (Test of Excluded Instruments)	188.09			
N	196391	196391	196391	196391
Log pseudolikelihood		-783300.47	-1742349.3	-815649.94
R^2/Pseudo R^2	0.098	0.433	0.134	0.410

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.

Table A7.1: Results – Logit Regression (Dependent Variable: *Formal*)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
INF1	-1.708***	-1.297***	-1.297***			
	(0.065)	(0.075)	(0.075)			
INF2				-0.069***	-0.042***	-0.045***
				(0.013)	(0.013)	(0.013)
Firm-specific Controls						
Location		-0.103**	-0.130***		-0.024	-0.043
		(0.042)	(0.040)		(0.040)	(0.039)
CLR		0.156***	0.164***		0.179***	0.187***
		(0.015)	(0.015)		(0.015)	(0.015)
Proprietary		-2.078***	-1.948***		-2.093***	-1.962***
		(0.052)	(0.053)		(0.053)	(0.053)
Partnership		0.740***	0.812***		0.726***	0.795***
		(0.076)	(0.075)		(0.077)	(0.075)
PrivateLtdCom		3.885***	3.853***		3.886***	3.854***
		(0.186)	(0.187)		(0.186)	(0.186)
State-Specific Characteristics						
HDI			0.844			1.504***
			(0.541)			(0.533)
Shurban			-0.013***			-0.012***
			(0.002)			(0.002)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	N	Y	Y	Y
N	201316	201316	201316	201316	201316	201316
Log pseudolikelihood	-1235767.60	-818550.15	-849455.91	-1260040.20	-827589.12	-859402.45
R^2	0.127	0.422	0.400	0.110	0.416	0.393

Notes: Dependent Variable: *Formal* is a dummy variable for formal sector firms; Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05.
Source: Own estimates.

Table A7.2: Marginal Effects (Dependent Variable: *Formal*)

Variables	(1)	(2)
INF1	-0.101***	
	(0.006)	
INF2		-0.004***
		(0.001)
Firm-Specific Controls		
Location	-0.010***	-0.003
	(0.003)	(0.003)
CLR	0.013***	0.015***
	(0.001)	(0.001)
Proprietary	-0.151***	-0.154***
	(0.004)	(0.004)
Partnership	0.063***	0.062***
	(0.006)	(0.006)
PrivateLtdCom	0.299***	0.302***
	(0.014)	(0.014)
State-Specific Controls		
HDI	0.065	0.118***
	(0.042)	(0.042)
Shurban	-0.001***	-0.001***
	(0.000)	(0.000)

Notes: Marginal effects for INF1 and INF2 estimated for the full model as in Columns 3 and 6, respectively; Robust standard errors are reported in parentheses, *** p<0.01.
Source: Own estimates.

Table A8.1: Ordered Logit Results: Dependent Variable – *SIZE*

Variables	(1)	(2)	(3)	(4)	(5)	(6)
CLRI_BHT	0.789***	0.950***	0.915***			
	(0.063)	(0.064)	(0.070)			
LMFI_BHT				0.600***	0.728***	0.871***
				(0.090)	(0.095)	(0.094)
Firm-Specific Controls						
Location		-0.130***	-0.135***		-0.126***	-0.143***
		(0.031)	(0.031)		(0.031)	(0.031)
CLR		0.150***	0.144***		0.156***	0.145***
		(0.013)	(0.013)		(0.013)	(0.013)
Proprietary		-2.369***	-2.382***		-2.335***	-2.364***
		(0.058)	(0.059)		(0.058)	(0.059)
Partnership		0.287***	0.268***		0.314***	0.281***
		(0.070)	(0.070)		(0.069)	(0.069)
PrivateLtdCom		1.865***	1.868***		1.876***	1.879***
		(0.046)	(0.046)		(0.046)	(0.046)
State-Specific Controls						
HDI			0.081			-0.665
			(0.492)			(0.498)
Shurban			-0.0138***			-0.013***
			(0.003)			(0.003)
Power			0.331***			0.494***
			(0.055)			(0.053)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
N	189913	189913	189913	189913	189913	189913
Log pseudolikelihood	-1959881.4	-1529821.3	-1527788	-1965386.5	-1535869.8	-1531696.4
Pseudo R2	0.0562	0.2633	0.2643	0.054	0.2604	0.2624

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
LMFI_BHT: Labour Market Flexibility Index after considered criticism by Bhattacharjea
CLRI_BHT: Cumulative Labour Regulation Index after considering criticism by Bhattacharjea
Source: Own estimates.

Table A8.2: Marginal Effects - Measures of Labour Regulation: *CLRI_BHT* and *LMFI_BHT*

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
CLRI_BHT	-0.080***	0.034***	0.018***	0.010***	0.008***	0.006***	0.004***
	(0.006)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
LMFI_BHT	-0.076***	0.033***	0.017***	0.010***	0.007***	0.006***	0.004***
	(0.008)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table A8.3: Ordered Logit Results: Dependent Variable – SIZE

Variables	(1)	(2)	(3)	(4)	(5)	(6)
CLRI_Dispute	0.718***	1.046***	1.087***			
	(0.060)	(0.062)	(0.071)			
CLRI_LMA				0.690***	0.763***	0.724***
				(0.051)	(0.051)	(0.052)
Firm-Specific Controls						
Location		-0.110***	-0.102***		-0.110***	-0.128***
		(0.031)	(0.031)		(0.031)	(0.031)
CLR		0.156***	0.154***		0.151***	0.142***
		(0.013)	(0.013)		(0.012)	(0.013)
Proprietary		-2.385***	-2.395***		-2.352***	-2.369***
		(0.059)	(0.059)		(0.059)	(0.059)
Partnership		0.269***	0.252***		0.276***	0.255***
		(0.070)	(0.069)		(0.070)	(0.069)
PrivateLtdCom		1.865***	1.862***		1.881***	1.889***
		(0.046)	(0.046)		(0.046)	(0.046)
State-Specific Controls						
HDI			0.474			-0.116
			(0.499)			(0.502)
Shurban			-0.016***			-0.008***
			(0.003)			(0.003)
Power			0.258***			0.363***
			(0.057)			(0.054)
Time FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
N	189913	189913	189913	189913	189913	189913
Log pseudolikelihood	-1960695.7	-1527340.1	-1525277.7	-1959359.5	-1530585.4	-1528111.5
Pseudo R2	0.0558	0.2645	0.2655	0.0564	0.2629	0.2641

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
CLRI_Dispute: Labour Market Flexibility Index: Labour Dispute Resolution (Normalised Values)
CLRI_LMA: Cumulative Labour Regulation Index: Labour Market Adjustment (Normalised Values)
Source: Own estimates.

Table A8.4: Marginal Effects- Measures of Labour Regulation: *CLRI_Dispute* and *CLRI_LMA*

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
CLRI_Dispute	-0.094***	0.041***	0.021***	0.012***	0.009***	0.007***	0.005***
	(0.006)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
CLRI_LMA	-0.063***	0.027***	0.014***	0.008***	0.006***	0.005***	0.003***
	(0.005)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table A8.5: Coefficient Values: 2SRI Estimations (Instrument: *Unionisation*) (No. of replications: 500)

Variables	First-Stage (Dependent Variable *CLRI*)	Second-Stage (Dependent Variable *SIZE*)	First-Stage (Dependent Variable *LMFI*)	Second-Stage (Dependent Variable *SIZE*)
CLRI		0.664***		
		(0.074)		
LMFI				1.111***
				(0.125)
XuHAT		0.677***		0.208***
		(0.106)		(0.172)
Firm-Specific Controls				
Location	-0.015***	-0.115***	-0.008***	-0.113***
	(0.004)	(0.030)	(0.002)	(0.029)
CLR	-0.006***	0.152***	-0.003***	0.151***
	(0.0010	(0.012)	(0.001)	(0.012)
Proprietary	0.012**	-2.381***	0.012***	-2.379***
	(0.005)	(0.055)	(0.003)	(0.055)
Partnership	0.018***	0.265***	0.014***	0.260***
	(0.005)	(0.067)	(0.003)	(0.067)
PrivateLtdCom	0.027***	1.882***	0.018***	1.872***
	(0.005)	(0.048)	(0.003)	(0.048)
State-Specific Controls				
HDI	2.014***	0.387	0.766***	0.727
	(0.034)	(0.461)	(0.030)	(0.467)
Shurban	0.022***	-0.010***	0.008***	-0.003
	(0.000)	(0.003)	(0.000)	(0.003)
Power	-0.031***	0.327***	0.036***	0.247***
	(0.006)	(0.058)	(0.004)	(0.062)
Instrument				
Unionisation	-0.705***		-0.417***	
	(0.004)		(0.004)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
N	189913	189913	189913	189913
Log pseudolikelihood		-1525096.3		-1528772.9
R2/Pseudo R2	0.7318	0.2656	0.6857	0.2638
F	1042.17		608.51	

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table A8.6: Marginal Effects: 2SRI Estimations (Instrument: *Unionisation*) (No. of replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
Measure of Labour Regulation: *CLRI*							
CLRI	-0.058***	0.025***	0.013***	0.007***	0.005***	0.004***	0.003***
	(0.006)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
XuHAT	-0.059***	0.025***	0.013***	0.007***	0.006***	0.005***	0.003***
	(0.009)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Measure of Labour Regulation: *LMFI*							
LMFI	-0.097***	0.042***	0.021***	0.012***	0.009***	0.007***	0.005***
	(0.011)	(0.005)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
XuHAT	-0.018	0.008	0.004	0.002	0.002	0.001	0.001
	(0.015)	(0.006)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)

Notes: Bootstrapped standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table A8.7: Coefficient Values: 2SRI Estimations (Instrument: *LandTenure)*
(No. of replications: 500)

Variables	First-Stage (Dependent Variable *CLRI*)	Second-Stage (Dependent Variable *SIZE*	First-Stage (Dependent Variable *LMFI*)	Second-Stage (Dependent Variable *SIZE*
CLRI		0.677***		
		(0.163)		
LMFI				0.914***
				(0.243)
XuHAT		0.258		0.324
		(0.179)		(0.270)
Firm-Specific Controls				
Location	-0.033***	-0.119***	-0.019***	-0.119***
	(0.006)	(0.030)	(0.004)	(0.030)
CLR	-0.009***	0.151***	-0.005***	0.150***
	(0.002)	(0.012)	(0.001)	(0.012)
Proprietary	0.011	-2.379***	0.010*	-2.375***
	(0.009)	(0.056)	(0.005)	(0.056)
Partnership	0.041***	0.266***	0.027***	0.267***
	(0.010)	(0.070)	(0.006)	(0.070)
PrivateLtdCom	0.030***	1.880***	0.019***	1.877***
	(0.008)	(0.047)	(0.005)	(0.046)
State-Specific Controls				
HDI	-1.408***	0.268	-1.389***	0.661
	(0.079)	(0.480)	(0.058)	(0.475)
Shurban	-0.003***	-0.009***	-0.007***	-0.005
	(0.000)	(0.003)	(0.000)	(0.003)
Power	0.171***	0.311***	0.147***	0.287***
	(0.009)	(0.064)	(0.006)	(0.069)
Instrument				
LandTenure	0.438***		0.292***	
	(0.013)		(0.009)	
Time FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
N	189913	189913	189913	189913
Log pseudolikelihood		-1526173.8		-1528764.9
R^2/Pseudo R^2	0.321	0.265	0.360	0.264
F	112.35***		115.19***	

Notes: Bootstrapped standard errors are reported in parentheses: *** p<0.01, ** p<0.05.
Source: Own estimates.

Table A8.8: Marginal Effects: 2SRI Estimations (Instrument: *LandTenure*)
(No. of replications: 500)

Variables	6 to 9	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 & Above
Measure of Labour Regulation: *CLRI*							
CLRI	-0.059***	0.025***	0.013***	0.007***	0.006***	0.005***	0.003***
	(0.014)	(0.006)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)
XuHAT	-0.022	0.010	0.005	0.003	0.002	0.002	0.001
	(0.015)	(0.007)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)
Measure of Labour Regulation: *LMFI*							
LMFI	-0.080***	0.034***	0.018***	0.010***	0.008***	0.006***	0.004***
	(0.021)	(0.009)	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)
XuHAT	-0.028	0.012	0.006	0.004	0.003	0.002	0.001
	(0.023)	(0.010)	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)

Notes: Bootstrapped standard errors are reported in parentheses: *** p<0.01.
Source: Own estimates.

Table A8.9: Labour Market Regulation Across States

States	BB	BHT	GHK	Own
Andhra Pradesh	1	0	1	1
Assam	0	0	0	-1
Bihar	0	0	0	0
Gujarat	-1	0	0	-1
Haryana	0	0	0	0
Karnataka	1	1	1	1
Kerala	1	0	0	1
Madhya Pradesh	0	0	0	0
Maharashtra	-1	-1	-1	-1
Orissa	-1	-1	-1	-1
Punjab	0	0	0	-1
Rajasthan	1	0	1	1
Tamil Nadu	1	1	1	1
Uttar Pradesh	0	1	1	-1
West Bengal	-1	-1	-1	-1

Notes: Here "1" stands for Flexible Labour Markets, "-1" stands for Inflexible Labour Markets and "0" stands for Neutral Labour Markets.

Table A8.10: Non-Parametric Rates of Firm Transition (in per cent), 2011 – 2016 (Conditional Probabilities)

Transition Groups	BB		BHT		GHK		OWN	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
For Flexible States								
6-9 to 10-19	28.3	34.6	36.7	41.3	29.3	33.0	28.3	34.6
N	4480		3686		5206		4480	
R^2	0.350		0.365		0.350		0.350	
For Other States								
6-9 to 10-19	25.0	39.2	20.4	36.5	23.4	40.7	25.0	39.2
N	6982		7776		6256		6982	
R^2	0.410		0.378		0.390		0.410	

Notes: Transition rates (in per cent)
Source: Own estimates.

Table A8.11: Amendments to the Central IDA from 1992 to 2015

State	Year	Section	Description	Overall Code
Andhra Pradesh	2008	2s	Any Person involved in Sales Promotion is included in the definition of workers. This category of employment not specified in the Central Act.	-1 (Pro-Worker)
Andhra Pradesh	2011	2n	Included the units of services of 100% Export Oriented and units located in Export Processing Zones/Special Economic Zones in the First Schedule, the period so specified shall not, in the first instance, exceed three years but may, by a like notification, be extended, from time to time, by any period not exceeding three years, at any one time, if in the opinion of the appropriate Government, public emergency or public interest requires, such extension. Public utilities are more limited in having strikes and lockouts and the government has greater power to refer industrial disputes in public utilities service to the appropriate court.	1 (Pro-Employer)
Andhra Pradesh	2015	2A	Allows the Labour Court or the Conciliation Officer, deemed to be an industrial dispute if such dispute is not raised in conciliation proceeding within a period of three years from the date of such disputes, provided that the applicant workman satisfied the court or Conciliation Officer that he had sufficient cause for not raising the dispute within the period of three years. This provision not mentioned in the central Act.	-1 (Pro-Worker)
Andhra Pradesh	2015	25K	The rules for lay-off, retrenchment and closure may according to the desertion of the state government be applied to industrial establishments, which employ less than 300 but not less than 100 workers. Under the central act, these rules only apply to establishments, which employ more than 300 workers.	-1 (Pro-Worker)
Assam	2007	2s	Any Person involved in work for the promotion of sales shall be inserted. This category of employment not specified in the Central Act.	-1 (Pro-Worker)
Gujarat	2004	Chapter-VD	Insertion of new Chapter V-D: Special provisions relating to lay-off, retrenchment and closure shall apply to an industrial establishment set up in the Special Economic Zone declared as such by the Government of India. This provision not listed under the central act.	-1 (Pro-Worker)
Gujarat	2004	2k	Does not include the termination of the service of a workman in accordance with the provisions of chapter V-D.	1 (Pro-Worker)
Gujarat	2004	2oo	The definition of retrenchment does not include the termination of the service of a workman in an industrial establishment situate in the Special Economic Zone declared as such by the Government of India.	1 (Pro-Employer)
Gujarat	2004	2qa	The definition of is included as: Termination means discontinuation by the employer of the service of a workman in an industrial establishment situate in the Special Economic Zone declared as such by the Government of India for any reason whatsoever, otherwise than as a punishment inflicted by way of disciplinary action, but does not include- (a) voluntary retirement of the workman; or (b) retirement of the workman on reaching the age of superannuation or the contract of employment between the employer and the workman concerned contains a stipulation in that behalf; or (c) termination of the service of the workman as a result of the non-renewal of the contract of employment between the employer and the workman concerned on its expiry or of such contract being terminated under a stipulation in that behalf contained therein; or (d) termination of the service of a workman on the ground of continued ill-heath.	-1 (Pro-Worker)
Punjab	2009	2s	Any Person involved in work for the promotion of sales shall be inserted. This category of employment not specified in the Central Act.	-1 (Pro-Worker)
Rajasthan	2014	2g	The exiting sub-clause (iii) of clause (g) shall be deleted. "(iii) where the owner of any industry in the course of or for the purpose of conducting the industry contracts with any	1 (Pro-Employer)

			person for the execution by or under the contractor of the whole or any part of any work which is ordinarily a part of the industry, the owner of the industry."	
Rajasthan	2014	2s	The definition of worker in the context of an industrial dispute does not include workers who have contracted with employers for the execution of work as part of the industry.	1 (Pro-Employer)
Rajasthan	2014	2A	An industrial disputes shall not be deemed to be an industrial dispute if such the dispute is not raised in conciliation proceeding with a period of three years from the disputes, provided that the state government may consider to extend the said period of three years when the applicant workman satisfies the authority that he had sufficient cause for not raising the dispute within the period of three years.	1 (Pro-Employer)
Rajasthan	2014	9D	Percentage of membership increases to thirty per cent from the fifteen per cent of the total number of workman employed in unit of an industry may apply in the prescribed form to the Register for registration as a Representative Union.	1 (Pro-Employer)
Rajasthan	2014	25K	It increases the number of employment from one hundred to three hundred for the provisions relating to lay-off, retrenchment and closure in an industrial establishment (not being an establishment of a seasonal character or in which work is performed only intermittently), given that the state government may reduce the number of employment to one hundred from three hundred to maintenance of industrial peace or prevention of victimization of workers.	1 (Pro-Employer)
Rajasthan	2014	25N	Employer need not to pay to the employee in lieu for three months notification of retrenchment. The provisions for retrenchment have been granted on compensation of an amount equivalent to three months average pay at the time of retrenchment.	0 (Neutral)
Rajasthan	2014	25O	The provisions for closing down an undertaking has been granted on the compensation of an amount equivalent to the three months average-pay of the worker, at the time of closure.	-1 (Pro-Worker)
Tamil Nadu	2008	11B	A Labour Court or Tribunal is granted the power of a Civil Court to execute its award or any settlement as a decree of a Civil Court.	1 (Pro-Employer)
Tamil Nadu	2015	2	Any Person involved in Sales Promotion is included in the definition of workers. This category of employment not specified in the Central Act.	-1 (Pro-Worker)
Uttar Pradesh	1991	6	This provision allows the parties reasonable opportunity of being heard, remit the award for reconsideration of the adjudicating authority.	1 (Pro-Employer)
Uttar Pradesh	2000	4E	It allows state government to constitute a committee for conciliation and the describes the eligible member's' of committee.	0 (Neutral)
West Bengal	2007	2	Subsection (aaa) renumbered as (aaaa); a new section namely (aaa) inserted. It provides the definition of 'Authorised Officer'.	0 (Neutral)
West Bengal	2007	2	Subsection (oo) renumbered as (ooo); a new section namely (oo) inserted. It provides the definition of 'Recovery Officer'.	0 (Neutral)
West Bengal	2007	29	It increases the penalty for breach of settlement or award, and the penalty is mentioned as imprisonment for a period, which is not less than six months and with a fine, which may extend to fifty thousand rupees, and where the breach is a continuing one, with a further fine of five hundred rupees.	-1 (Pro-Worker)
West Bengal	2007	33D	The recovery of money from the employer in respect of which the appropriate government under section 2 is the state government.	-1 (Pro-Worker)
West Bengal	2007	33E	It is mentioned the about the recovery Officer to whom certificate is to be forwarded by the authorised officer for recovery of the due payment of employee.	0 (Neutral)

Notes: We followed the coding pattern of Besley and Burgess (2004). We obtained the coding text of amendments from various issues of States' Official Gazette.

Table A9.1: Correlates of Productivity and Wage

Variables	lnLP	lnEPL
	(1)	(2)
FIN1	-0.000000001	0.000000001
	(0.000)	(0.000)
FIN2	0.394***	0.602***
	(0.027)	(0.038)
INF1	-0.271***	-0.418***
	(0.054)	(0.077)
INF2	-0.013	-0.007
	(0.010)	(0.012)
CLRI	-0.031	-0.429***
	(0.120)	(0.158)
LMFI	-0.330	0.198
	(0.206)	(0.263)
Firm-Specific Controls		
Location	0.528***	0.381***
	(0.029)	(0.036)
Proprietary	-0.506***	-1.218***
	(0.032)	(0.048)
Partnership	0.009	-0.170***
	(0.032)	(0.053)
PrivateLtdCom	0.766	1.371***
	(0.028)	(0.046)
State-Specific Controls		
HDI	1.674***	2.235***
	(0.228)	(0.328)
Shurban	0.003***	0.009***
	(0.001)	(0.002)
Constant	8.985***	11.040***
	(0.147)	(0.209)
Time FE	Y	Y
Industry FE	Y	Y
No. of Obs.	180189	183206
F	607.46***	711.04
R^2	0.451	0.418

Notes: Robust standard errors are reported in parentheses; *** p<0.01.
Source: Own estimates.

Table A9.2: Correlates of Productivity, Separately for Informal and Formal Firms

Variables	Informal Sector Firms						Formal Sector Firms					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FIN1	0.001***						0.0002**					
	(0.000)						(0.000)					
FIN2		0.224***						0.181***				
		(0.008)						(0.007)				
INF1			-0.411***						-0.591***			
			(0.013)						(0.018)			
INF2				-0.051***						-0.140***		
				(0.002)						(0.002)		
CLRI					-0.077***						-0.264***	
					(0.014)						(0.012)	
LMFI						-0.207***						-0.328***
						(0.021)						(0.019)
Firm-Specific Controls												
Location	0.399***	0.415***	0.349***	0.393***	0.404***	0.402***	0.075***	0.071***	0.059***	0.064***	0.078***	0.080***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Proprietary	-0.248***	-0.231***	-0.237***	-0.250***	-0.246***	-0.242***	-0.860***	-0.856***	-0.827***	-0.816***	-0.840***	-0.845***
	(0.013)	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Partnership	-0.017	-0.019	-0.004	-0.003	-0.021	-0.019	-0.649***	-0.655***	-0.621***	-0.617***	-0.634***	-0.638***
	(0.020)	(0.019)	(0.019)	(0.019)	(0.021)	(0.021)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
PrivateLtdCom	0.804***	0.768***	0.768***	0.774***	0.916***	0.917***	0.002	-0.011	0.003	0.013*	0.006	0.006
	(0.063)	(0.063)	(0.063)	(0.063)	(0.072)	(0.071)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
State-Specific Controls												
HDI	2.708***	2.515***	2.734***	2.727***	2.254***	2.052***	-0.190**	-0.069	-0.057	-0.384***	-1.308***	-1.414***
	(0.107)	(0.107)	(0.100)	(0.100)	(0.117)	(0.118)	(0.078)	(0.078)	(0.076)	(0.075)	(0.082)	(0.083)
Shurban	-0.001***	-0.001*	-0.000	0.000	-0.003***	-0.004***	0.000	0.000	0.003***	0.004***	0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	0.068***	0.053***			0.151***	0.173***	0.172***	0.152***			0.203***	0.215***
	(0.008)	(0.008)			(0.011)	(0.011)	(0.007)	(0.007)			(0.008)	(0.008)
Constant	8.166***	8.268***	8.637***	8.410***	7.981***	8.043***	10.620***	10.551***	11.494***	11.087***	11.093***	11.116***
	(0.059)	(0.059)	(0.051)	(0.051)	(0.066)	(0.065)	(0.045)	(0.045)	(0.036)	(0.036)	(0.048)	(0.048)
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	48053	48053	48364	48364	43909	43909	141276	141276	145986	145986	136283	136283
F	517.61***	535.68***	560.50***	549.82***	451.94***	453.15***	1829.47***	1945.75***	1976.38***	2106.83***	1750.13***	1741.58***
R-squared	0.265	0.276	0.284	0.274	0.259	0.261	0.284	0.288	0.281	0.304	0.283	0.282

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own estimates.

Table A9.3: Correlates of Wage, Separately for Informal and Formal Firms

Variables	Informal Sector Firms						Formal Sector Firms					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FIN1	0.001***						-0.0002***					
	(0.000)						(0.000)					
FIN2		0.362***						0.069***				
		(0.011)						(0.004)				
INF1			-0.519***						-0.366***			
			(0.018)						(0.012)			
INF2				-0.001						-0.058***		
				(0.003)						(0.001)		
CLRI					-0.200***						-0.209***	
					(0.018)						(0.008)	
LMFI						-0.337***						-0.238***
						(0.028)						(0.012)
Firm-Specific Controls												
Location	0.308***	0.341***	0.251***	0.304***	0.302***	0.304***	0.136***	0.133***	0.127***	0.132***	0.141***	0.143***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Proprietary	-0.266***	-0.232***	-0.252***	-0.271***	-0.349***	-0.348***	-0.828***	-0.828***	-0.827***	-0.828***	-0.846***	-0.851***
	(0.018)	(0.017)	(0.017)	(0.017)	(0.019)	(0.019)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Partnership	0.055**	0.056**	0.073***	0.056**	-0.027	-0.027	-0.606***	-0.609***	-0.604***	-0.605***	-0.618***	-0.621***
	(0.026)	(0.025)	(0.026)	(0.026)	(0.027)	(0.027)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)
PrivateLtdCom	1.367***	1.311***	1.327***	1.345***	1.482***	1.486***	-0.021***	-0.027***	-0.036***	-0.032***	-0.035***	-0.034***
	(0.091)	(0.087)	(0.090)	(0.091)	(0.102)	(0.102)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
State-Specific Controls												
HDI	2.383***	2.002***	2.635***	2.858***	2.381***	2.097***	0.479***	0.542***	0.640***	0.559***	0.522***	0.448***
	(0.135)	(0.133)	(0.127)	(0.129)	(0.148)	(0.148)	(0.046)	(0.046)	(0.043)	(0.044)	(0.055)	(0.056)
Shurban	-0.000	0.001***	0.001***	0.002***	-0.003***	-0.004***	0.003***	0.003***	0.004***	0.005***	0.003***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power	0.145***	0.117***			0.235***	0.250***	0.117***	0.107***			0.101***	0.107***
	(0.011)	(0.011)			(0.015)	(0.015)	(0.004)	(0.004)			(0.005)	(0.005)
Constant	7.617***	7.809***	8.421***	8.196***	7.340***	7.486***	10.596***	10.563***	11.167***	10.969***	10.770***	10.788***
	(0.079)	(0.078)	(0.065)	(0.065)	(0.089)	(0.087)	(0.026)	(0.026)	(0.021)	(0.021)	(0.030)	(0.031)
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	42552	42552	42744	42744	38834	38834	147749	147749	152594	152594	144373	144373
F	370.70***	395.21***	406.74***	379.74***	322.66***	323.63***	2827.11***	2871.20***	3040.23***	3065.99***	2623.75***	2603.62***
R-squared	0.240	0.259	0.255	0.236	0.239	0.239	0.383	0.384	0.383	0.389	0.369	0.367

Notes: Robust standard errors are reported in parentheses; *** p<0.01, ** p<0.05.
Source: Own estimates.