ESSAYS ON INDIAN MANUFACTURING SECTOR: A STUDY OF MISSING MIDDLE

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CERTIFICATE

Certified that the Thesis entitled **"Essays on Indian Manufacturing: A Study of** Missing **Middle"** submitted by me for the award of the Degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the supervision of Prof. Saikat Sinha Roy and Dr. Simontini Das, Department of Economics, Jadavpur University.

And that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere/elsewhere.

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CHAPTER 1
OVERVIEW

1.1 Statement of the problem

The study is a collection of essays investigating into firm size distribution in organised manufacturing sector in India. In specific, the thesis explores the phenomenon of 'Missing Middle' while examining firm size distribution in Indian organized manufacturing sector. The phenomenon of missing middle refers to the absence or relative scarcity of mid-sized firms in the size distribution of manufacturing firms.

Understanding size distribution of manufacturing firms in India is an important dimension of growth and structural change. With structural changes, like in many other developing countries, an interesting feature is said to have emerged in Indian manufacturing with regards to firm-size distribution in the form of "missing middle".[1] Along with size-class distribution of firms in organized manufacturing, scalar mobility of firms in terms of their entry and exit emerges as an important metric of the growth dynamism, which is influenced by a host of factors including industry characteristics, entry barriers, labour regulations, capital utilization and the development of operational capabilities over time, apart from intricate interplay of broader macroeconomic and policy variables such as foreign direct investment (FDI), trade orientation, productivity, and profitability particularly in developing countries [see, for instance, Caves 1998].

Traditionally, economic growth is accompanied by structural changes. The conventional path of structural transformation shows shifts in economic activities

[1] In this thesis, the terms "missing middle" or "shrinking middle" are used interchangeably to describe the absence or relative scarcity of mid-sized firms.

from agriculture to manufacturing and then to services.[2] However, there are exceptions to this conventional pattern. Similar pattern is often observed with regards to changes in scalar structure of firms, the absence of mid-sized firms raises question on growth of firms and conventional pattern of transformation of small enterprises to middle and then to large enterprises. Studies by Tybout (2000) for Latin American countries, Levy (2008) for the Mexican economy, Gelb & Rodrik (2016) in the context of African economies, Litte et al. (1987) and Leidholm & Mead (1987) for the developing economies show evidences missing middle in light of structural transformation. Missing middle as fallout of the structural change process draws importance because the presence of bimodality has been reflected in the distribution of wages, employment and productivity of manufacturing firms. This necessitates the study on the absence of mid-sized firms in firm size distribution.

The very existence of missing middle has turned out to be a contestable issue. In this regard, literature has been divided in two strands, one advocates for the existence of missing middle in the form of bimodality in the distribution of employment, whereas the other strand point towards the absence of it. In this scenario, a comprehensive review of literature concerning the size distribution of firm in the manufacturing sector is warranted. The absence of a definition of missing middle and its variability across national, sub-national level and across various product and technological classifications have significant relevance towards economic policy making.

[2] The development experience in India has been said to have skipped the manufacturing phase in the sense that the structural transformation has taken place in the economy with increasingly more and more reliance on the service sector. In this context, considerable debate exists in the literature behind the validation of the "manufacturing as an engine of growth" hypothesis. The importance of the service sector can also be highlighted from the deliberations of Ghani & O'Connell (2014) who rules for the reallocation of labour towards modern dynamic and IT –enabled services (and not manufacturing) to stimulate productivity and economic growth.

Absence of mid-sized firms is associated with polarisation of wages and productivity as well. The productive efficiency of firms in India is found to be low in the lower end of the distribution whereas the same has been high towards the higher end of the distribution (Mazumder & Sarkar, 2009b). The literature is often of the view that absence of mid-sized firms has close linkage with labour legislations. Pro-labour legislations have been associated with greater presence of missing middle or absence of mid-sized firms. This linkage relates to the provision for attainment of regulatory affirmation for retrenchment of workers beyond a certain number (in most cases 100 workers) as in Chapter V-B of the Industrial Disputes Act. Such evidences have been pointed out well by Besley & Burgess (2004), Amirapu & Gechter (2014) and others.

Using the unit level data of the Annual Survey of Industries (ASI), Ministry of Statistics and Programme Implementation, Government of India, the collection of essays explores the size distribution of firms across various levels of aggregation. The essays find that the very existence of missing middle is not uniform, it varies with the selection of method used and the level of aggregation. The choice of parametric or non-parametric methods, the selection of employment type – regular, contract or total workers, the level of data aggregation selected for analysis, namely aggregate level data, or state level, the classification of data based on product or technology, contribute to the very existence or non-existence of missing middle. The study further tries to investigate into the factors underlying the (non)existence of missing middle by adopting an econometric framework using firm and industry specific characteristics.

1.2 Some Stylised Facts on Indian Manufacturing

Economic growth has been found to be accelerating over the long run (see Banerjee & Sinha Roy, 2014, Balakrishnan et al., 2017, among others). Evidences of structural breaks in growth of the Indian economy have been observed over the long

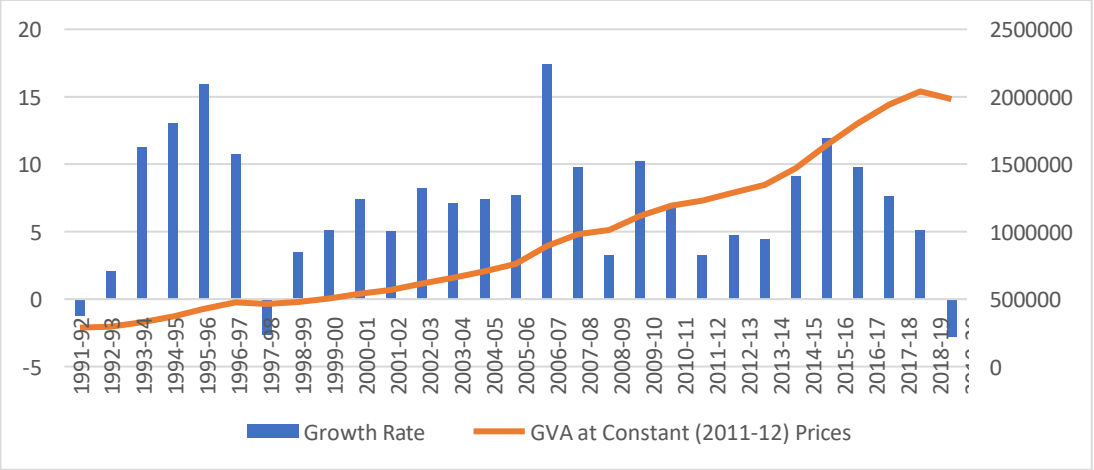
run (Balakrishnan & Parameswaran, 2007 a, b). The acceleration in growth is irrespective of the policy regime with pro-business reforms being initiated during the 1980s followed by the pro-market reforms since 1990s (Rodrik & Subramanium, 2004). The transition of the Indian economy from an agrarian economy to organized manufacturing followed by shift towards services raises queries on the structural change process in India. Dasgupta & Singh (2005) observe that the Indian economy has however deviated from the Kaldorian growth predictions. The linkage between growth and structural change relationship holds that structural change is not expected to affect growth but occur as a result of the growth process (Aggarwal, 2012). However, in the context of accelerating economic growth in India over a long period, Balakrishnan et al. (2017) have shown positive feedback mechanism underlying cumulative causation in the growth process. Further, Dasgupta & Singh (2005) says that India has taken advantages of its strengths in IT and use it extensively in all areas to upgrade its manufacturing sector, they deviate from the manufacturing as "the engine of growth" hypothesis. Recently, Dutta (2019) contradicted the notion of the service sector as a super performer by envisaging that the apparent stagnancy of manufacturing conceals the story of labour-saving technical progress under heightened competition causing slippage of value added away from the sector. The shifting of economic activity and the labour force towards higher productive activity as a feature of structural change can be well traced by studying the trends of productivity and employment. It is argued that the growth of the service sector has been productivity led, while low productivity of the manufacturing sector and the two aspects of dualism – the bi-polar distribution of employment within the formal or organized manufacturing sector and, the productivity gap between the smallest and the largest manufacturing units (Mazumder, 2003).

The industrial sector, manufacturing in specific, received policy attention since Indian Independence with the formulation of Industrial Policy Resolution (IPR) in 1948. After prolonged protection, Indian manufacturing witnessed significant reforms in the form of the scrapping of traditional reservation policy, like import controls and licensing system. These reforms were directed to free the sector from barriers to entry and from other restrictions to expansion, diversification and modifications. Indian manufacturing also received significant attention in the form of Make in India after 2014 along with a series of reforms measures targeted towards up-scaling of manufacturing activities including PLI schemes. The pattern of industrial growth however changed during the period prior to the 1990's (Ahluwalia, 1986). Goldar (2002) finds that the estimated growth of total factor productivity (TFP) in 1980s was higher than that of 1970s. While further enhancement of TFP growth thereafter is observed by Goldar (2004), the claim has been refuted by Unel (2003) and Balakrisnan & Pushpangadan (1994). As Figure 1.1 reveals, the growth of organised manufacturing in India since economic reforms in 1991 however varied.[3] Even though Balakrishnan & Babu (2003) find rising average growth rate of Indian manufacturing at the 2-digit level in post 1990s, there has been no commensurate increase in efficiency during the same period of time. The early 2000s witnessed maturing of economic reforms followed by consolidation of post-reforms growth, especially in manufacturing (Krishna et al. 2022). Erumban et al. (2019) using the KLEMS database point out that the structural transformation in India during post reforms incorporated a TFP growth with increase in allocation of capital across the sectors of the economy.

[3] As Krishna et al. (2018) observe, organized and unorganised manufacturing in India witnessed different growth rates over time.

Manufacturing growth however decelerated during the 2010s, as observed by Nagaraj (2025).

Figure 1.1: Growth of Organised Manufacturing in India



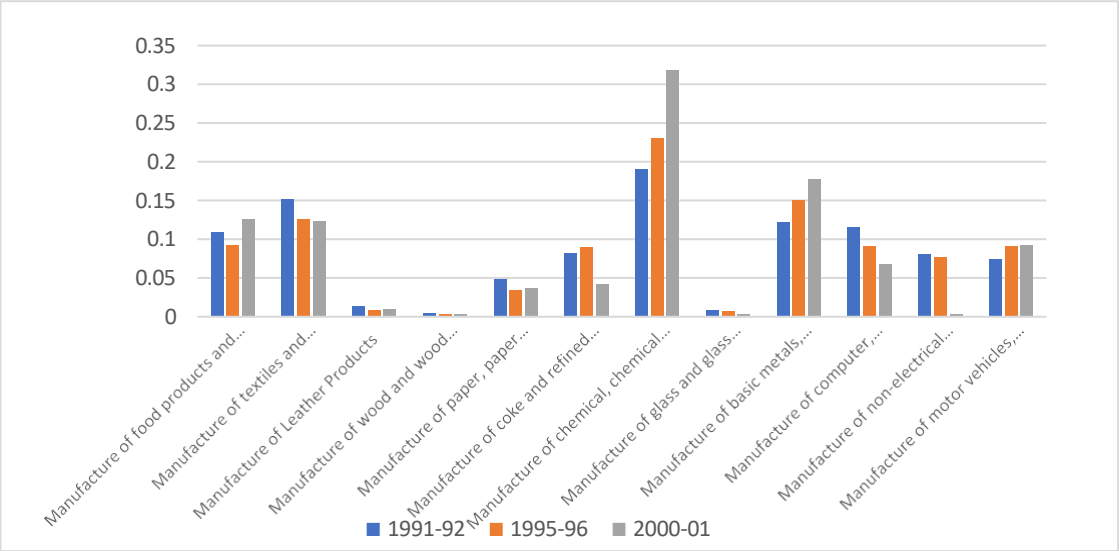
Source: Calculations based on ASI database

Even though Shanmugam & Bhaduri (2002) observe that large and younger firms in organised manufacturing grew slower than their smaller and younger counterparts, Krishna & Mitra (1998), Pattnayak & Thangavelu (2005) and Unel (2003) find that there has been acceleration in total factor productivity (TFP) in the firms during the reform period. On the other hand, studies by Trivedi et al. (2000), Srivastava (2000), and Balakrishnan et al. (2000) find a deceleration in growth of TFP in the 1990s in organised manufacturing. Krishna et al. (2020) found that TFP growth improved in the post reform period, but with a significant lag. Despite growth in labour productivity and TFP in the organised sector, Kathuria et al. (2010) show growth in labour productivity, TFP and capital intensity have slowed down in the unorganised sector during 2000-01 to 2005-06.

The structure within the organised manufacturing sector in India has changed significantly over time. A closer look at the share of GVA across manufacturing groups reveal that the traditional sectors like manufacture of food and food products,

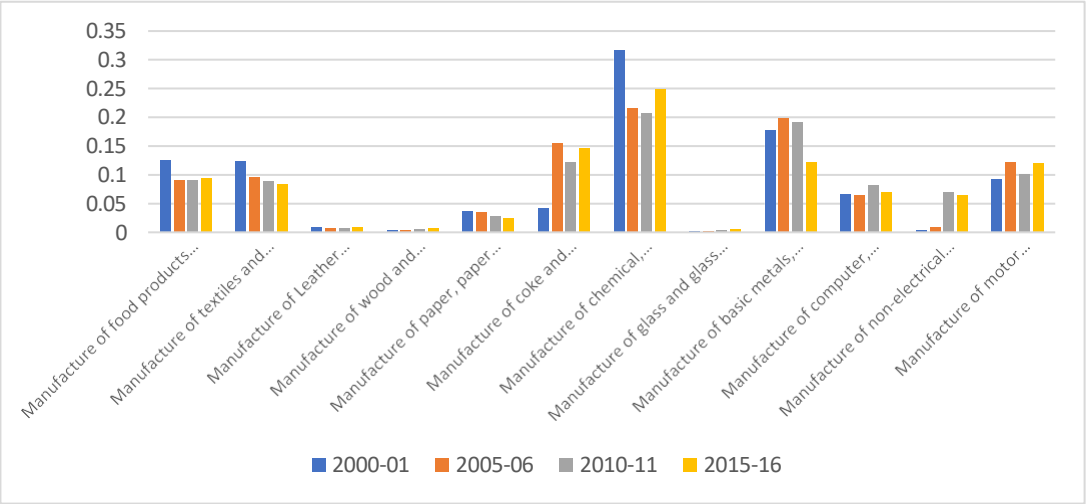
manufacture of textiles and wearing apparel have been prominent till the early 2000s (see Figure 1.2). Since the 2000s, as can be observed in Figure 1.3, there has been emergence of growth in industries like the manufacture of coke and refined petroleum; manufacture of chemical, chemical products, pharmaceuticals, medicinal chemical, botanical products, rubber and plastic products. This period also witnessed steady growth of machinery and electronics industry. Further, as Krishna et al. (2018) find, TPF growth in formal manufacturing in India has been mainly on account of improved TFP growth performance of Coke and refined petroleum products industry along with that in by Food, beverages and tobacco products, Chemicals and chemical products, and Textiles and leather products industries.

Figure 1.2: Share in GVA for Major Industrial Groups between 1991-92 and 2000-01



Source: Calculations based on ASI database

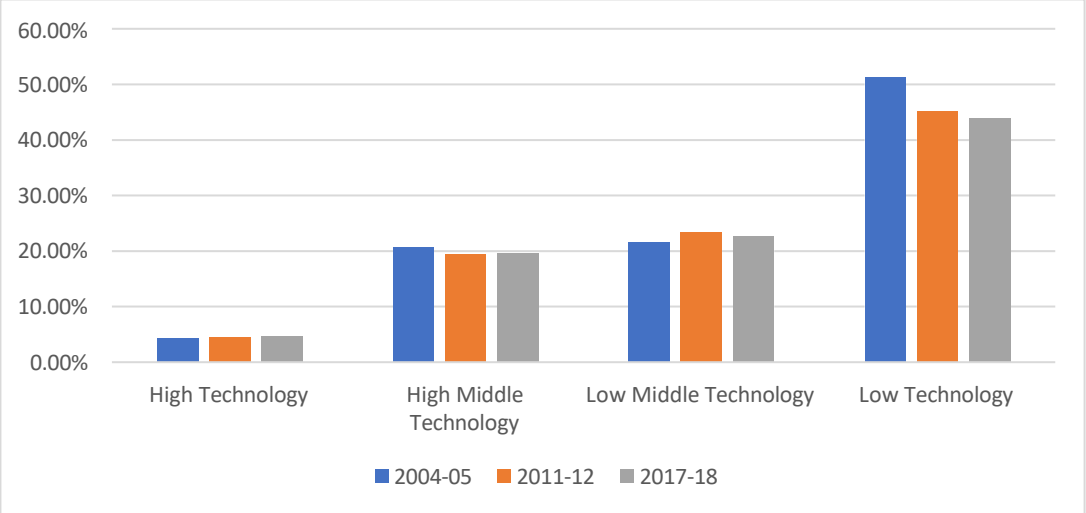
Figure 1.3: Share in GVA for Major Industrial Groups between 2000-01 and 2015-16



Source: Calculations based on ASI database

Further, across different levels of technology (shown in Figure 1.4), it is observed that the share of firms producing low technology products across different industrial groups has declined over the years between 2004-05 and 2017-18. There has been a marginal rise in the share of firms producing high technology products during the similar period of time.

Figure 1.4: Technology-wise share of firms in overall Indian Manufacturing

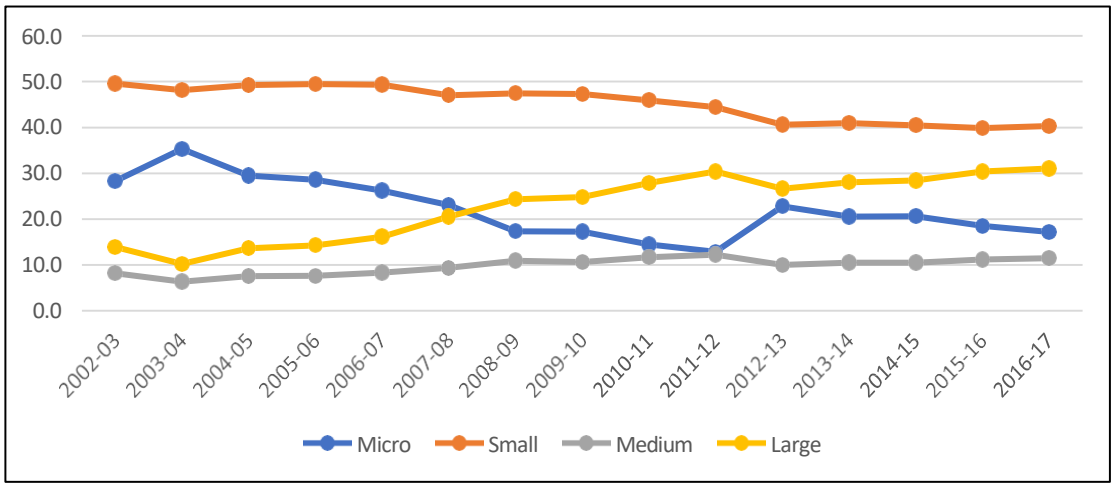


Source: Calculations based on ASI database

The Indian organised manufacturing also experienced shifts in firm sizes, with changes in market shares towards a small number of large firms and a large number of small firms (Govinda, 2016). A relatively lower share of mid-sized firms has led to the phenomenon of "shrinking middle" in the Indian manufacturing sector. Alfaro & Chari (2014), using the CMIE database for the period 1989-2005, finds mobility among the firms with the average size of Indian firm declining in the deregulated industries as the small firms enter the sample from the left tail of the size distribution, while incumbent firms get bigger following deregulation. In contrast, Bertrand et al. (2017) argue that the withdrawal of employment restrictions in the Industrial Disputes Act. relaxed the reservations on small-scale industries and the reforms since 1991 led to the increased use of contract labour thereby allowing large Indian firms to respond to shocks by adjusting profitability, expanding employment and investing in new products. This process thickens the right tail of the firm size distribution in India, and a decrease in average product of labour of large Indian firms.

Looking at the distribution of firms in India manufacturing based on unit level ASI data compiled for the period 2002-03 to 2016-17 (in Figure 1.5), the predominance of small sized firms is evident. This is despite the declining shares of micro and small sized firms in organised manufacturing over the years. On the other hand, the rising share of large firms is evident. Furthermore, the share of medium sized firms has persistently remained low over the entire time period of the study. The observed movement in the shares is thus indicative of changes in the size distribution of manufacturing firms in India despite the relative stagnancy in the share of mid-sized firms.

Figure 1.5: Size-wise share of firms in Indian Organised Manufacturing Sector between 2002-03 and 2016-17



Note: The categorization of enterprises is based on The MSMED Act, 2006.
Source: Calculations based on ASI database

In this perspective of variations in growth, structural change and continued reforms in manufacturing, dichotomy in the size distribution of firms is notable. With growth and structural change in organised manufacturing sector, while the predominance of small firms persists, the share of larger firms is found to increase. A re-examination of size distribution of firms in the context of firm dynamics, especially growth and transition, becomes essential. At this juncture, it is important to understand the strands of thought in the existing literature on the subject.

1.3 Review of literature

1.3.1 Theoretical Literature on Missing Middle

The concept of the "missing middle" plays a key role in understanding development challenges. It refers to a presumed gap in the size distribution of firms in developing economies, with a large number of small businesses and a few large corporations, but a scarcity of medium-sized firms. Two main development models use this idea to explain slow economic growth (Hsieh & Olken, 2014).

The first view of missing middle talks of the institutional environment in developing countries hinders small firms as compared to the large firms. the major reasons attributing to such preferential treatment to large firms are credit constraints, unequal access of resources and markets, and government biases. Small businesses struggle to get access to credit whereas for larger firms credit access is not an issue. Formal sector manufacturing firms benefit from better property rights, and large firms have better access to markets to sell their products. Also, Government policy favours large firms because most large firms in developing countries are state owned and are targeted by industrial policy (de Mel et al., 2008; Udry & Anagol 2006; Kremer et al., 2013).

The second view of missing middle dates back to the dual economy view by Lewis (1954), It suggests that while some large firms in developing countries are very productive, most are stuck at a low-productivity level. The model argues that medium and large firms face fixed costs or constraints including high costs of modern technology, regulations and taxes that small firms do not (Banerjee & Duflo, 2005, 2011). Modern technology can be too expensive for many firms in developing countries, limiting their growth potential, and large firms may be subject to regulations and taxes that smaller firms can avoid, hindering their ability to compete. The Harris-Todaro model exemplifies this view, proposing a "modern" sector with higher wages and a "traditional" sector with lower wages. Firms in the modern sector face regulations like minimum wage laws that make them less competitive against smaller firms in the traditional sector (Harris &Todaro, 1970). However, it was Raunch (1991) who formally showed that the Harris-Todaro mechanism could generate a “Missing Middle” assuming a fixed threshold due to minimum wage laws or labour unions above which firms have to pay above-market wages. In similar lines Krueger (2013),

McKinsey & Co. (2005), and Levy (2008) provide evidences where large firms India, Brazil and Mexico pay taxes and are subjected to regulations that smaller firms can evade. As a result, the distribution of returns on investment shows a "barbell" shape, with high returns for some firms and lower returns for others. Distribution of firms might be right-skewed instead of bimodal, meaning there are more small firms and fewer medium-sized ones. Returns on investment could be lower for smaller firms compared to large firms in this model.

The implications of this bi-modality or dualistic distribution of firms have been further mapped to a similar dualistic nature of productivity in the sense that firms at the lower end of the distribution exhibit low productivity while those at the other extreme are highly productive (Thomas, 2013). There are differences in product quality and lack of market integration between low quality products at the lower end of the distribution and high quality products at the other end (Mazumder & Sarkar, 2009b), the wage share also follows a similar pattern (Wei & Subramanium, 2015). Dasgupta (2016), where the author develops a dynamic model and shows that the missing middle disappears as a country develops, the bi-modality arises due to agents optimally selecting into a traditional and a modern sector, the bi-modality arises primarily because some agents, instead of running their own plants, choose to work for others. The key parameter in the model being mean level of knowledge of the newborn firms, the model reveals that for a low mean, the two sectors coexist, and as the mean rises the size distribution converges from a bi-modal to a uni-modal distribution.

Further, in the context of industrial transformation and labour migration, considerable attention has been garnered to the vanishing sectors. Industries or segments of production that face extinction due to various factors like labour

migration, economic pressure and structural change comprise the vanishing sectors. Marjit and Kar (2009) explains that not only the wage structures get affected, the production framework also gets modified due to emigration. These necessary lead to certain industries closing down as they are not in a position to pay the necessary wages for remaining workers. The emigration of unskilled labour when the capital share is greater in industrial sectors compared to service sectors leads to a scenario where the wage inequality heightens due to increased demand for skilled labour which the service sector increasingly captures leaving unskilled wages stagnant. The phenomenon reflects not only loss of industries but emergence of new sectors in response to changing labour dynamics. The vanishing sectors can also have ripple effects on surviving industries due to changes in factor pricing and labour supply(Marjit and Kar, 2013).The concept of disappearing firms and industries can be linked to the context of shifting technological paradigms suggesting that technological changes drive significant transformation leading to disappearance of firms that cannot adapt (Stubbart & Knight, 2006).

1.3.2 Literature on Missing Middle across Countries

The manufacturing sectors in developing countries have historically been characterized by substantial state intervention in the form of protectionist policies and heavy regulations. These measures, while often intended to shield domestic industries from external competition, have contributed to distinctive productivity patterns across firms. Tybout (2000) contends that such regulatory frameworks have fostered high cross-firm productivity differentials, creating an environment where only the most competitive or well-connected firms manage to thrive despite a uniformly challenging regulatory landscape. By protecting domestic industries from international

competition, governments inadvertently reward inefficiencies and hinder the organic growth of competitive capacities needed for sustained productivity improvement.

The imposition of protectionist measures has long been recognized as a double-edged sword in developing economies. On one hand, such measures serve as a temporary shield for emerging industries, allowing them to consolidate their operations and reduce vulnerabilities in the face of global competitive pressures. On the other hand, these policies often result in a regulatory burden that distorts market competition and ultimately perpetuates productivity disparities across firms. The phenomenon of high cross-firm productivity, as illuminated by Tybout (2000), underscores the inherent trade-offs: while a select group of firms may innovate or adapt despite these constraints, a larger portion of the industry remains mired in inefficiency, thereby dampening the overall industrial dynamism. This regulatory environment has had long-lasting implications on innovation, investment, and the overall efficiency of the manufacturing sector in developing countries.

Expanding upon this framework, Landesmann and Stollinger (2018) investigate the dynamics within lower middle-income nations in Europe and argue the relevance of the infant industry hypothesis for new entrants. Their analysis suggests that temporary protectionist policies are not merely barriers to competition, but also vital mechanisms that can nurture domestic firms until they attain the capacity to integrate successfully into global value chains (GVCs). The infant industry argument posits that emerging firms require an incubation period during which protectionist policies facilitate the accumulation of technical know-how, production efficiencies, and market competencies. As these firms mature, the evolution toward competitive integration in GVCs becomes a realistic possibility, thereby contributing to both national economic growth and global industrial competitiveness.

1.3.3 Literature on Missing Middle in India

In India, despite changes in policy regime since 1980s, the share of manufacturing sector has remained more or less stagnant (Aggarwal, 2018). Aggarwal (2012) argues that although the medium high-technology sector grew rapidly between the mid-1970s and the late 1990s, eventually medium low-tech industries including petroleum and steel products rose and account for over 40% of the total manufacturing. India has moved towards scale-based capital-intensive medium tech industries (low and high), and away from the labour-intensive low tech and science based high tech industries.

Productive efficiency of firms is quite low in India. Firms at the lower end of the distribution employing 5-9 people account for a high proportion (say, 55%) of the total employment (Mazumder & Sarkar, 2009b), the productive efficiency of such firms are low. On the other extreme, firms which employ 500 or more workers, productive efficiency is high with high wage and intensive use of capital. The wage pattern and jobs provided at the two extremes explain in part the transition of the Indian economy from agriculture to services with very few labour intensive firms in the middle range of the sector - now known as the "Missing Middle" in India's manufacturing (Wei & Balasubramanyam, 2015).

The "Missing Middle" literature for India attributes to the work of Little (1987), who finds a smaller proportion of workers employed in factories in the size class 200-499 workers in organised manufacturing compared to over half of the workers concentrated in large factories with over 1000 workers per factory, the remaining being employed in small factories employing less than 50 workers per factory. Tybout (2000) in the context of the Indian Economy finds that the size distribution of firms in OECDs and developing economies contrast each other; it is found that there is a spike

in the 1-4 worker class which quickly drops to the 10-49 worker class in India, but not true for US. Uncertainty about policies and demand conditions, also the regulatory hurdles of growing big and substantially high taxes limit the growth of small firms and they stay small. Krueger (2013) explains the missing middle in employment as an outcome of regulations governing enterprises in the private sector and regulations covering conditions of employment in labour. She further points out at relaxing the labour laws for the private manufacturing sector and removing entry barriers for unskilled labour which would lead to absorption of unskilled workers in large number and close the employment gap. Apart from finding the two modes in the distribution of labour, Mazumdar & Sarkar (2009b) points out that lack of market integration with low quality producers supplying the lower end segment and high quality producers supplying at the high end segment, whereas labour regulations, education policies, protection of SSIs coupled with hysteresis contribute to the missing middle phenomenon in India. Ramaswamy (2013) says that size dependent labour regulations and fiscal incentives induce a size distribution of factories with a missing middle. Missing middle exists because the benefits of size expansion are less than the cost of the regulatory compliances, also contract worker intensity was found to be higher in the 50-99 worker class which indicated that there is a tendency to stay small and avoid the regulations namely the Industrial Disputes Act which was enacted in 1947 and the threshold limit of 300 worker was amended to 100 in 1982 (which took effect in 1984). Another Act which comes at the 100 worker threshold is the Industrial Employment (Standing Orders) Act 1946 which says that any firm which employed more than 100 workers anytime during the last 12 months have to state the working conditions clearly and inform the workers about it before hiring them. If a regulator does not comply with the Act then a fine up to INR 5000 might be imposed by the regulators. The

regulatory hurdles coupled with the protection given the SSIs have limited them to remain small, willingly forging potential scale economies in production. The facts purported towards the existence of Missing Middle base their findings in the line with the dual economy theories of development which dates back to the work by Harris & Todaro (1970), down to recent work by Banerjee & Duflo (2005, 2011) where co-existence of large and small firms are talked about with firms facing prohibitive fixed costs of up-gradation and further choosing to stay small in order to bypass regulations.

Hsieh & Olken (2014), on the other hand, find no evidence of a missing middle regardless of how the data is sliced; they do not find any meaningful bunching of firms around regulatory thresholds. They base their case on the fact that firm size distributions are uni-modal in Indonesia, India and Mexico. When bins are constrained to have equal width, plant size distributions in Indonesia, India and Mexico do not exhibit bimodal shapes. Ghosh and Abraham (2019) using ASI level data, reaffirms the findings of Hsieh & Olken (2014) as they do not find any evidence of missing middle when the classification of data based on priori class interval is dropped. Chatterjee & Kanbur (2014), using the NSSO and ASI data, show that in the Indian scenario non-compliance with the Factories Act is a key feature of missing middle. They focus on the short hand characterization of the organized sector in terms of 10 workers or more with the use of electricity as the 20 worker criteria without electricity is increasingly irrelevant as the Act has not been revised since 1948[3]. They sub-divide and classify firm in four categories compliers (A), evaders (B), avoiders (C) and outsiders (D). Category A firms are those who have registered under the Factory Act, which could be found in ASI data. Category B firms are those who have 10 or more workers but have not opted for registration under the Factories Act. Category C represents a counterfactual scenario in the sense that it includes those enterprises

which cut labour employment just to stay out of the radar of regulation. Category D firms are those who naturally do not fall in the radar of regulation. The authors find that the numbers of non-compliant firms are more than twice the number of firms which are complying; further the non-compliance with the factories act is portrayed as a key feature of the missing middle in India. Similar arguments have been placed by Nagraj (2018) in the sense that the U shaped, or bimodal distribution of manufacturing employment by size of establishment or enterprise popularly termed as "missing middle" as outcome of rigid labour laws[4] is mis-interpretation and mis-measurement of evidence. The observed size distribution is nothing but widespread and growing evasion of official registration, or underreporting or mis-representation of the official data. The paper further says that the observed differences between organsied (formal) and unorganized (informal) labour market represents persistence of surplus labour and organisational dualism on account of technology and organization of production in the modern sector.

In response to Hsieh & Olken (2014), Tybout (2014) came with an explanation by studying deviations of firm size distribution from Pareto shape. Tybout suggests that bimodality is not to be associated with missing middle, there is existence of the missing middle in the sense that sifting cutoffs of labour employment weakens but does not reverse the missing middle result for India. The implications of this bi-modality or dualistic distribution of firms has been further mapped to a similar dualistic nature of productivity in the sense that firms at the lower end of the distribution exhibit low productivity while those at the other extreme are highly productive (Thomas, 2013); also there are differences in product quality and lack of market integration between low quality products at the lower end of the distribution and high quality products at the other end (Mazumder & Sarkar, 2009b) and the wage

share also follows a similar patterns (Wei & Subramanium, 2015). An interesting theoretical illustration has been provided by Dasgupta (2016), where the author develops a dynamic model and shows that the missing middle disappears as a country develops, the bi-modality arises due to agents optimally selecting into a traditional and a modern sector, the bi-modality arises primarily because some agents, instead of running their own plants, choose to work for others. The key parameter in the model being mean knowledge of the newborn firms, the model reveals that for a low mean, the two sectors coexist, and as the mean rises the size distribution converges from a bi-modal to a uni-modal distribution.

It can be clearly noted that the argument of missing middle revolves around the labour employment criterion, labour employment regulations, definition of cut off bins and regulatory inadequacies as well. In order to get a better view of the missing middle problem a brief study of the labour regulation in the context of Indian Economy is essential. Hasan & Jandoc (2013) uses data from the Indian manufacturing sector and describe the distribution of firm size in terms of employment and discuss implications for public policy, especially labour regulations. The authors find presence of large sized firms in states with flexible regulations; they find that the difference between states with flexible labour regulations and those with inflexible regulations turned out to be higher post 1982 when a key aspect of labour regulation was tightened as firms employing 100 or more workers were asked to seek Government permission before firing workers, in some states like West Bengal the threshold was dragged to 50. Since Government approval for retrenchment is difficult to obtain this fact has incentivized the formal manufacturing sector in India to conserve on hiring of labour and gravitate on capital intensive production techniques and processes (Panagariya, 2008). Dougherty et al. (2011) using plant level ASI data for the fiscal years reveal that the

state wise differences in labour market reforms led to differential performance in industrial performance of firms in with higher labour intensity.; they find that the positive effect of relaxed employment protection regulation on organised manufacturing is experienced through higher total factor productivity, also they find preliminary evidence to show that the effect of labour regulation reforms might be non-linear, which could potentially be explained by endogenous reallocation of plants from states with more stringent labour regulations to states with more flexible labour regulations. Besley & Burgess (2004) estimated the industrial relation climate in India over the period 1958-92, they found that States which amended the Industrial Disputes Act in a pro-worker route experienced lower output, employment, investment and productivity in registered and formal manufacturing; pro-worker regulation was also associated with increase in urban poverty and increased informal activities. They further develop a state wise index based on the labour regulations known as the Besley and Bergess (BB) Index.

The BB index has been subject to modifications by various authors, Basu & Karak (2019) re-estimates the labour regulation scenario by constructing a modified version of the BB index, by including profitability as an ingredient of the index. A critical survey of the modifications was presented by Bhattarcharjea (2019) where he talks of modification of the BB index in terms of proper allocation of weightage, coding amendments and usage of dummies right from the inception of the index till date. Bhattarcharjea (2019) suggested that the handful of coding amendments would not undermine the main econometric results as the measurement errors in an explanatory variable bias the estimated regression coefficient towards zero. The coefficients thus obtained could be questioned in terms of their magnitude but not in terms of their sign or significance. The associated cost of labour regulations and the

evidence of their impact on misallocation of resources across firms can be clearly seen from the deliberations of Amirapu & Gechter (2014) that higher costs are associated with lower rates of future employment growth in registered (but not unregistered) manufacturing, suggesting that these regulatory costs may play a role in encouraging informality.

As the exiting literature on missing middle shows, most manufacturing enterprises in India cluster at the lower and upper extremes of the firm size distribution. In this pattern, a large share of employment and economic activity is concentrated in small firms (often defined as those employing fewer than 50 workers) and in a limited number of very large firms, with a relatively scarce medium-sized enterprises (Ghosh & Abraham, 2021; Parida et al., 2021).

Gaps in literature

At the outset, the literature does not converge on the definition of missing middle. For instance, while Krueger (2013) define the middle bin as the 200-499 worker class, while Tybout (2000) defines the middle bin to be 10-49 worker class, in short, the definition of the middle bin needs to be addressed.

Second, the existing literature on missing middle is based on analysis at an aggregate level. There is a need to explore the dynamics of size distribution of firms at the State level as well. It is to be noted in the literature that labour legislations have been cited as one of the reasons underlying missing middle, and the labour regulations vary across Indian States as they are part of the Concurrent List. Some states may practice relatively more pro-labour legislation than other. In this regard, studying the size distribution of firms at the State level is of pivotal importance which needs to be addressed.

Third, most studies have focused on the employment criterion while investigating the missing middle phenomenon. A study based on product level classification and technology based classification is rare and a disaggregate analysis on the absence of mid-sized firms based on industry groups and technological categories is yet to be studied.

Fourth, most studies on missing middle in Indian manufacturing employ parametric methods to understand the firm size distribution. Frequency distribution is used as a metric in these exercises, irrespective of whether classes are of equal or unequal width. Frequency density for parametric methods in addition to use of non-parametric method are major methodological gaps in the literature deciphering missing middle.

Last, even though the association of labour regulations and missing middle has been investigated in the literature, there exists ample scope to develop a better index more suitable to represent the state wise disaggregate level labour regulation scenario. Construction of labour legislation scale needs quantification of the labour regulations and is susceptible to subjective judgment. Further, even though the literature highlights the primacy of labour legislations, it does not focus on the role of firm-specific and state specific factors, among others, in determining the missing middle in Indian manufacturing.

1.4 Objectives of the study

The objectives of the thesis are:

(i) to decipher missing middle by studying the size distribution of firms at the aggregate level resorting to methodological improvements;

(ii) to decode the missing middle phenomenon at the disaggregate level, first at the state level, then across different product groups and finally across different levels of technological categories;

(iii) to econometrically investigate into the factors determining missing middle focusing on the importance of with labour legislation.

The analysis in the collection of core essays is based on the micro-data from the Annual Survey of Industries (ASI) on organised manufacturing.

The analysis aims at probing the core focus of whether or not the "Missing Middle" is visible in the firm size distribution for the organsied manufacturing sector of the Indian economy. For this purpose, the study makes use of total, regular and contract workers. This approach intends to deepen the understanding of the 'Missing Middle' range and analyse it from multiple employment dimensions. Aggregation occurs at two principal levels. Initially, a national level analysis which offers a broad insight into firm size distribution of the organized manufacturing sector. Subsequently, more focused attention is given to the detailed sub-national analysis and the 20 major states of India between 2000 and 2016-17. This stratified approach seeks to explain and better capture the missing middle phenomenon while highlighting regional disparities in firm size distribution.

The second objective of the thesis is to examine the missing middle phenomenon at a disaggregate level. To do so, firms are categorized according to OECD technology classifications – low, low medium, high medium, and high – and analysed within each category. Using unit-level data from the Annual Survey of Industries (ASI) covering 2004–05 to 2017–18, the investigation provides a novel account of the size distribution of firms in India's organized manufacturing sector. The analysis moves from a

detailed, product-level view across different technology categories to an examination of firm size based on the total and regular workers and the role of contract workers in determining the firm size distribution pattern is discussed. This disaggregated approach is intended to deepen our understanding about the nature of the distributions and to shed light on the dynamics underlying the observed pattern.

Finally, the third objective aims to examine the relationship between labour legislation and missing middle, which has been carried out using an econometric framework. Contract workers play an important role in explaining the link between missing middle and labour legislation. Using text mining, the study incorporates the labour legislations across Indian States and quantifies the same in form of a Labour Legislation Index. As firms have started to rely increasingly on contract workers to circumvent stringent labour legislations, contract worker intensity have been used instead. Further, firm specific and industry specific controls are used to understand the extent of linkage of missing middle with labour legislation. The literature, method and findings on labour legislation has been discussed in details in the chapters 4 of the thesis.

1.5 Data, Methods and Summary of Findings

Data and Methods

For an empirical study on missing middle in India, time comparable dataset is required. Data on organised manufacturing sector[4] at the plant level have been

[4] While the study focusses on the organised manufacturing sector in India, it is to be noted that the unorganised sector has not been considered. Prior to the availability of the Annual Survey of Unincorporated Sector Enterprises data (ASUSE) from 2021-22, the National Sample Survey Organisation (NSSO) used to publish the Survey on Unincorporated Non-Agricultural Enterprises (Excluding Construction) every 5 years, with the latest being the 73rd round data in 2015-16. It is to be noted that the present study restricts the time period from 2000-01 to 2017-18, given the aberrations which might surface by merging the ASI and NSS databases. Further, as the unorganised manufacturing sector does not come under the purview of labour legislation, the sector is not taken into consideration for analysis.

obtained from the Annual Survey of Industry (ASI) database[5] for the 15-year period, 2002-03 to 2016-17 available in the micro data repository of the Ministry of Statistics and Programme Implementation, Government of India. With significant adjustments in the Indian economy since 1991 and consolidation of post reforms manufacturing growth and productivity growth since 2000, the early 2000s provide a premise to study the emerging trends and patterns in manufacturing. The analysis stops at 2016-17, a year during a phase of declining manufacturing growth since 2010. Further, as observed earlier in the chapter, there has been wide ranging structural change in Indian manufacturing during this period. The chosen period of study thus stands important in explaining the firm dynamics as it includes a phase of high growth followed by a phase of relative stagnation in manufacturing.

At the micro level, the ASI provides plant level data, the essay uses "plant" and "firm" interchangeably hereafter. The ASI sampling frame is classified in two sectors, viz., the Census and the Sample sectors.

While the Census sector consists of large plants surveyed every year, the Sample sector plants are chosen via stratification and the number of factories therein vary from year to year. For the census sector[6], the ASI enumerates all the registered manufacturing units employing 100 or more workers (the threshold of 100 workers is relaxed for certain states), and units in the sample sector employ less than 100 workers. The multiplier used to arrive at population figures is unity for the census sector and

[5] Even though Raj & Sen (2016) show the importance of unorganized manufacturing firms in understanding the pattern of firm size distribution, unorganised manufacturing sector has not been taken to account in this study.

[6] The Factories Act (1948) states that all enterprises in manufacturing who use electricity and have 10 workers or more, and all enterprises with 20 workers or more who do not use electricity, are required to register. Registered enterprises are referred to as the organized ("formal") sector. Information about registered enterprises is gathered through the ASI. Every five years the National Sample Survey Organisation (NSSO) conducts a survey of enterprises that are not registered under the Factories Act, in other words, of the "unorganized" sector.

that for the sample units (with varying threshold as per different states) are provided by the ASI. The ASI panel data, if accessed, considers only the census firms. Hence, panel data are not considered here due to information deficit. Further to be noted, the identifiers for the surveyed factories change every year and as a result, the non-panel framework for analysis is adhered to.

For the purpose of the study, the variable "average persons employed" is extracted for "regular workers", which includes both male and female workers under full time employee payroll, "contract workers", which depicts the number of workers employed via contracts and "total workers" which is the sum of "regular" and "contract" workers. "Total workers" refers to "production workers" in the database (the detailed data extraction process adopted is provided in the Data Appendix).

At the state level, data is mined for the 20 major States of India using the state codes provided by the ASI, the states being Andhra Pradesh, Assam, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal. Alike that of the aggregate level, the methodological improvements have been undertaken to study the size distribution of firms at the state level.

At the disaggregate level for product specific and technology specific analysis of missing middle, the ASI plant level/ unit level dataset has been mined and explored at three different time points 2004-05, 2011-12 and 2017-18. At the 2-digit level, a concordance has been created between NIC 2004 and NIC 2008, post which the distribution has been analysed (the concordance table is provided in annexure in Table A1.1). In order to carry out the analysis at the technology level, the OECD

classification (Hatzichronoglo, 1997) has been used, manufacturing activities have been classified at the 4-digit level of NIC to materialise the classification based on technology (detailed classification has been provided in the annexure in Table A1.2). The analysis moves from a detailed, product-level view across different technology categories to an examination of firm size based on the total workers, as well as on the separate contributions of regular and contract workers. This disaggregated approach is intended to deepen our understanding about the characteristics of the distributions and to shed light on the dynamics underlying the alleged bimodal pattern.

The study of size distribution using unequal bins and frequency, poses serious discrepancy in measurement caused by differences in bin width. The study bases its findings on frequency densities instead of frequencies. The frequency densities are plotted against the respective bins and frequency curves are arrived at, first for the unequal bins and then for the equal bins.

For an enquiry into firm size distribution, the entities are generally classified on the basis of the size of the bins. For instance, while Moscarini et al. (2008) and Fort et al. (2013) use three unequal bins (1-49), (50-499) and 500+, Mazumder & Sarkar (2009) use the unequal bins as (0-5), (6-10), (11-50), (50-100), (101-200), (200-500) and 500+. Ramaswamy (2013), using the Mazumder-Sarkar classification, extends the open-ended bin of 500+ to comment on the labour regulation as well. A few earlier studies on India have also taken resort to unequal bins, but the reasons underlying choice of unequal bin are not clarified in those studies. The frequency curve uses an average figure for each of the bins, and unequal bins distort the shape of the curve. Instead of frequencies, the present analysis uses frequency densities, which gives a methodological improvement for analyzing the size distribution as the disparity faced with unequal bins is adjusted. The study uses unequal bins along with

the use of equal bins. The frequency distribution of firm size studied by taking equal bins considers a class width of 25, the bins range from (0-25), (25-50) (475-500) and (500-above). In this way, 90% of the firms are covered. As regards unequal bins, there are four bins of equal width (0-25, 25-50, 50-75 and 75-100) to begin with, and post 100 workers, the bins used by Ramaswamy (2013) have been used subject to a modification. The bins with unequal width thus considered in this study are 0-25, 25-50, 50-75, 75-100, 100-199, 199-499, 499-999, 999-1999, 1999-4999 and 4999 & above).

The study of size distribution using frequency of unequal bins poses serious misrepresentation of fact and in order to take care of the misrepresentation caused by disparity between the bin width, the entire study bases its finding on frequency densities instead of frequencies. As for the parametric method, the frequency densities are plotted against the respective bins to arrive at frequency curves. This is done for both unequal and equal bins. In contrast, the non-parametric method uses the Kernel Density estimation to infer on the size distribution of firms. The Kernel density plot uses each data point as the centre of a normalised density function, referred to as the Kernel. It is noteworthy that the shape of frequency curve depends on the selection of the bin width and number of bins corresponding to the range of observations. Densities are then added vertically to produce the estimation of the distribution. In contrast to a frequency curve, discontinuities or jumps are not observed with Kernel density estimates. If a normal is chosen as the density function, we obtain a Gaussian (stochastic) Kernel density estimation of the distribution.

A non-parametric Kernel Density function is given by:

$$f_k = \frac{1}{nh}\sum_{i=1}^{n} k\left(\frac{x - x_i}{h}\right)$$

Where,

h: denotes the bandwidth

n: denotes total data points or the number of observations

k: denotes the specific kernel function such that $\int_{-\infty}^{\infty} k(x)\,dx = 1$

(Gaussian in this case, k = k(x) = $\frac{1}{\sqrt{2\pi}} e^{-x^2/2}$)

$\frac{x-x_i}{h}$: measures the distance between the reference point x to the other x_i, divided by the bandwidth h.

The optimal bandwidth or the smoothing parameter (h) is chosen from Silverman (1986) as-

$h = \frac{0.9y}{n^{1/5}}$;

y = min ($\sqrt{var(x)}, R_x/1.349$), where R_x is the inter quartile range.

In order to describe the binned data, an equally spaced mesh with bin widthΔ is defined with t_j denoting the centre of j^{th}bin with n_j observations. Thus t_{j+1} - t_j = Δ for all j and $\sum n_j$ = n. The Kernel estimator using binned data is given as:

$$g_k = \frac{1}{nh} \sum_{j=-\infty}^{\infty} n_j k\left(\frac{x - t_j}{h}\right)$$

The Kernel for the equal bins has been computed using 21 data points of frequency densities. Following Scott & Sheather (1985), it can be said that there is no adverse effect of binning on the integrated mean squared error of a Kernel estimate.

The Kernel density gives a better representation of a probability density function over the frequency density estimate.

While the distribution of firms at aggregate level and at disaggregate state level were studied with the equal bins and unequal bins, the detailed discussion is provided in Chapter 2. The disaggregate 2-digit product level and technology level analysis has been carried out using equals bins only, details of which are discussed in Chapter 3.

Summary of findings

The first objective explores the presence of missing middle at the aggregate level. The analysis reveals nuanced evidences on presence of missing middle when the parametric estimates were used. The non-parametric estimates at the aggregate level confirm the presence of missing middle in a lower bin mainly below the 50-worker bin. Further, the aggregate level analyses show that missing middle was present in the distribution of regular workers and not in the distribution of total workers. This draws importance on the use of contract workers shaping the size distribution of firms.

The disaggregate level analysis at the state level provides a deeper understanding of missing middle. Parametric estimates show the presence of missing middle in the distribution of regular workers and total workers as well. However, it is important to note that missing middle has been observed around the 100-worker threshold. This observation shows in the importance of labour legislation as one of the reasons explaining missing middle. Further, the importance of contract workers is also highlighted at disaggregate state level analysis as firms tend to hire more contract workers around the regulatory threshold to bypass the labour legislations.

The disaggregate level analysis at the 2-digit product level and across technology categories provide the idea that technologically intensive firms are more prone to exhibit the phenomenon of missing middle. Industries in technologically intensive production process like those of computer, electronics and motor vehicles are more prone to have a bimodal distribution of employment in the form of a missing middle. Once again, the presence of missing middle has been more in the distribution of regular workers and lesser on total workers, which again raises the importance of contract workers in shaping the size distribution of firms.

Firm specific characteristics like those of age of firms, skill level of workers, capital intensity, sales and output are also important factors in shaping the size distribution of firms in organised manufacturing. The level of technology used is an important industry level characteristics which is observed from the disaggregate level study. The disaggregate level analysis also points at the importance of contract workers in shaping the size distribution of firms as the contract workers are used to circumvent the labour legislations.

The third objective investigates into the question whether labour legislations determine the firm size distribution. A Labour Legislation Index is constructed and used for the purpose along with a set of firm specific and industry specific control variables in the ordered pooled logit model estimation. It was observed that firms inherently tend to use more of contract labour and deliberately stay small in order to bypass the labour legislations. This essentially establishes the linkage between labour legislation and missing middle in the context of organised manufacturing in India. The importance of firm specific and industry specific factors however cannot be denied in the (non) existence of missing middle.

1.6 Chapter scheme

The essay begins with an overview of the issue of missing middle. Apart from the statement of the problem and the motivation behind the study, the first chapter presents certain stylised facts on growth and structural change along with a review of a large body of both theoretical and empirical literature. The gaps in the existing literature are identified, which set the objectives of the study. The databased used is discussed along with a brief on the method. These set the background to the detailed empirical analyses carried out in later chapters.

The second chapter titled “Firm size distribution in Indian manufacturing: Insights on Missing Middle” is an attempt to address the much debatable issue of (non)-existence of Missing Middle, suggesting methodological improvements in studying the size distribution of manufacturing firms in terms of employment.

The third chapter titled “Exploring Missing Middle across Product groups and Technological categories in India’s Manufacturing” uses Annual Survey of Industries (ASI) unit level data to focus on studying the size distribution of firms in the organised manufacturing sector in India at a detailed disaggregate level, specifically across product classification and across technological classifications.

The fourth chapter titled “Factors determining the "Missing Middle": An Econometric Investigation” investigates the factors influencing the "missing middle" phenomenon in India, focusing on the role of labour regulations, skilled workers, and contract workers. A labour regulation index is constructed for the purpose using text mining techniques to assess the pro-labour orientation of Indian states.

The fifth chapter concludes the essays by providing a summary of observations from each of the chapters. Further, the chapter discusses the implications for policy and future scope of research.

Annexure to Chapter 1

Table A1.1 -Classification of industries at the 4-digit level across various levels of technology.

High-technology industries	NIC 2008-Class
Aircraft and spacecraft	3030
Pharmaceuticals	2100
Office, accounting and computing machinery	2610 2620 2817
Radio, TV and communications equipment	2630 2640
Medical, precision and optical instruments	2660 2670 3250
Medium-high-technology industries	**NIC 2008-Class**
Electrical machinery and apparatus, n.e.c.	2651 2680 2710 2740 2731 2732 2733 2740 2750 2790
Motor vehicles, trailers and semi-trailers	2910 2920 2930
Chemicals excluding pharmaceuticals	2011 2012 2021 2022 2023 2029 2720
Railroad equipment and transport equipment, n.e.c.	3020 3040 3091 3092 3099
Machinery and equipment, n.e.c.	2513 2811 2812 2813 2814 2815

	2816 2818 2819 2821 2822 2823 2824 2825 2826 2829
Medium-low-technology industries	**NIC 2008-Class**
Building and repairing of ships and boats	3011 3012 3315
Rubber and plastics products	2211 2219 2220 2013
Coke, refined petroleum products and nuclear fuel	1910 1920
Other non-metallic mineral products	2310 2391 2392 2393 2394 2395 2396 2399
Basic metals and fabricated metal products	2410 2420 2431 2432 2511 2512
Low-technology industries	**NIC 2008-Class**
Manufacturing, n.e.c.; Recycling	3211 2520 2591 2592 2593 2599 2652 3100 3212 3220 3230 3240 3290
Wood, pulp, paper, paper products, printing and publishing	1610 1621

	1622 1623 1629 1701 1702 1709 1811
Food products, beverages and tobacco	1010 1020 1030 1040 1050 1061 1062 1071 1072 1073 1074 1075 1079 1080 1200 1101 1102 1103 1104
Textiles, textile products, leather and footwear	1311 1312 1313 1391 1392 1393 1394 1399 1410 1420 1430 1511 1512 1520 2030

Source: Author's Tabulation; Technological classifications are as per Hatzichronoglou (1997).

Table A1.2: Concordance at 2 Digit level of NIC

S No	NIC 2008	NIC 2004	Description
1	Division 10+11	Division 15	Manufacture of food products and beverages
2	Division 12	Division 16	Manufacture of tobacco products
3	Division 13	Division 17	Manufacture of textiles
4	Division 14	Division 18	Manufacture of wearing apparel
5	Division 15	Division 19	Manufacture of leather and related products
6	Division 16	Division 20	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
7	Division 17	Division 21	Manufacture of paper and paper products
8	Division 18	Division 22	Printing and reproduction of recorded media
9	Division 19	Division 23	Manufacture of coke and refined petroleum products
10	Division 20	Division 24	Manufacture of chemicals and chemical products
11	Division 22	Division 25	Manufacture of rubber and plastics products
12	Division 23	Division 26	Manufacture of other non-metallic mineral products
13	Division 24	Division 27	Manufacture of basic metals
14	Division 25	Division 28	Manufacture of fabricated metal products, except machinery and equipment
15	Division 28	Division 29	Manufacture of machinery and equipment n.e.c
16	Division 26	Division 30	Manufacture of computer, electronic and optical product
17	Division 27	Division 31	Manufacture of electrical equipment
18	Division 21	Division 33	Manufacture of pharmaceuticals, medicinal chemical and botanical products
19	Division 29	Division 34	Manufacture of motor vehicles, trailers and semi-trailers
20	Division 30	Division 35	Manufacture of other transport equipment
21	Division 31	Division 36	Manufacture of furniture

CHAPTER 2

FIRM-SIZE DISTRIBUTION IN INDIAN MANUFACTURING
Insights on Missing Middle[7]

2.1 Introduction

The aim of this chapter is to analyse the pattern of firm-size distribution in the organised manufacturing sector in India. As observed in Chapter 1, the literature on missing middle in organised Indian manufacturing are far from conclusive. The stylized facts in Chapter 1 show that despite growth and structural change in Indian manufacturing, the share of mid-sized firms in aggregate manufacturing is relatively low and has remained stagnant since early 2000s. In contrast, the respective shares of small and large sized firms increased.

In India, the process of structural change, especially in the organised manufacturing sector, has resulted in an interesting feature of firm size distribution with the absence of mid-sized firms in the employment distribution, which is referred to as "missing middle" in the literature (Little, 1987; Tybout, 2000, Mazumder & Sarkar, 2009a). The empirical literature has observed a bimodal distribution of firms, which is also reflected in firm-level productivity. While Little (1987) suggests that small firms have both low capital and low labour productivity, Nagaraj (2018) shows that the mid-size firms with 50-500 workers enjoy highest labour and capital productivity. Indian firms operate in more capital-intensive industries than predicted from the experience of other countries with similar labour supplies, development levels, and institutional quality (Hasan & Jandoc, 2013). The very existence of 'missing middle' in Indian manufacturing is still debated and hence, a study of 'missing middle' in the Indian context becomes important.

[7] A version of this chapter has been accepted for publication at The Economic and Political Weekly.

This chapter is an attempt to relook at the size distribution of firms in the organised manufacturing sector in India. In this perspective of variations in growth and continued reforms in manufacturing, re-examination of size distribution of firms in the context of firm dynamics, especially growth and transition, becomes essential.

Using parametric as well as non-parametric methods as empirical strategy on plant level data from the Annual Survey of Industries (ASI) database, the chapter investigates into the firm size distribution in aggregate manufacturing at the national and the sub-national levels in India. The chapter finds that the very existence of missing middle depends on the definition of manufacturing employment, the definition of 'middle bin', and the level of aggregation used. In doing so, the Section 2.2 presents further details on data and method used. Section 2.3 discusses the detailed empirical results and analyses. The Section 2.4 summarises the major empirical findings.

2.2 Further on Data and Methods

To recapitulate from Chapter 1, the empirical analysis on firm size distribution in organised manufacturing in India is carried out using ASI plant level data for the period 2002-03 to 2016-17. The results of this study can be compared and contrasted with those of earlier studies (e.g. Nagaraj, 2018; Ghosh & Abraham, 2021) for almost the similar period. The study is carried out at national as well as at sub-national levels. The sub-national data are collected for 20 major States of India including Andhra Pradesh, Assam, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Data exploration is carried out at each time period to examine the (non)existence of bimodality of firm size distribution for an enquiry into firm size

distribution, the plants are generally classified on the basis of the size of the bins. For instance, while Moscarini et al. (2008) and Fort et al. (2013) use three unequal bins (1-49), (50-499) and 500+, Mazumder & Sarkar (2009b) use the unequal bins as (0-5), (6-10), (11-50), (50-100), (101-200), (200-500) and 500+. Ramaswamy (2013), using the Mazumder-Sarkar classification, extends the open-ended bin of 500+ to comment on the labour regulation as well. A few earlier studies on India have also resorted to unequal bins without clarifying the reasons underlying the choice.

This study uses unequal bins along with the use of equal bins. Instead of frequencies, the present analysis uses frequency density, which is a methodological improvement for analyzing the size distribution as the disparity faced with unequal bins is adjusted. The frequency distribution of firm size with regards to equal bins is studied considering a class width of 25, the bins range from (0-25), (25-50) (475-500) and (500-above). In this way, 90% of the firms are covered. As regards unequal bins, there are four bins of equal width (0-25, 25-50, 50-75 and 75-100) to begin with, and post 100 workers, the bin classification used by Ramaswamy (2013) has been largely followed. The bins with unequal width thus considered are 0-25, 25-50, 50-75, 75-100, 100-199, 199-499, 499-999, 999-1999, 1999-4999 and 4999 & above). As discussed in Chapter 1, Kernel density estimates are used as alternate measure. The non-parametric Kernel density estimates, as discussed in Chapter 1, have distinct advantage over estimates obtained from parametric measures.

In parametric estimates, frequency distribution generally uses an average value of the variable for each bin, and such distribution of the variable based on bins of unequal width cannot be interpreted correctly. Correcting for this anomaly, this study uses frequency density instead. As for the parametric method, the frequency densities are plotted against the respective bins to arrive at the frequency distribution. This is done

for both unequal and equal bins. In contrast, the non-parametric method uses the Kernel Density estimation to infer on the size distribution of firms. The Kernel density plot uses each data point as the centre of a normalised density function, referred to as the Kernel. It is to be noted that the shape of frequency curve depends on the selection of the bin width and number of bins corresponding to the range of observations. Densities are then added vertically to produce the estimation of the distribution. In contrast to a frequency curve, discontinuities or jumps are not observed with Kernel density estimates. If a normal is chosen as the density function, we obtain a Gaussian (stochastic) Kernel density estimation of the distribution.

The Kernel has been computed using 21 data points of frequency densities. Frequency density as well as Kernel density estimates plots are obtained at the national level and at the state level with regards to regular and total workers. For both unequal and equal bins, a total of 360 frequency curves have been observed for the 15-year period. For non-parametric density estimation, 45 Kernel Density estimates/ plots at national level and 180 Kernel Density estimates/plots at the state level are studied to analyse the size distribution of firms.

The chapter thus has four-fold improvements in methodology in terms of: taking total workers along with regular workers in studying firm-size distribution with implications for contract workers, using equal and unequal bins in deciphering size distribution, estimating frequency densities in observing firm size distribution, and using parametric and non-parametric methods as empirical strategy. The methodological caveats in the existing studies will be thus addressed in the present study.

2.3 The Results: Findings at the All-India and Sub-national levels

Understanding the size distribution of firms is the key to deciphering the missing middle in Indian Industry. This is done, as observed earlier in the essay, using

frequency densities for the unequal bins followed by the equal bin. The analysis begins with the study of size distribution of firms at the aggregate level. It is evident from Table 2.1 that there is no presence of bimodality both in cases of unequal and equal bins for all the years. This result holds true with regards to all three categories of workers, regular, contract and total, between 2002-03 and 2016-17see Figures A2.1 and A2.2. The only exception to this pattern is in 2004-05 using equal bins. The parametric findings are complemented by non-parametric Kernel Density plots.

Table 2.1: Bimodality at the Aggregate Level: Regular and Total Workers

	Unequal Bins*				Equal Bins#				Kernel Density			
Year	Regular Workers	Bins	Total Workers	Bins	Regular Workers	Bins	Total Workers	Bins	Regular Workers	Bins	Total Workers	Bins
2002-03	N	-	N	-	N	-	N	-	-	-	-	-
2003-04	N	-	N	-	N	-	N	-	-	-	-	-
2004-05	N	-	N	-	N	-	Y	100-125	-	-	-	-
2005-06	N	-	N	-	N	-	N	-	Y	25-50	-	-
2006-07	N	-	N	-	N	-	N	-	-	-	-	-
2007-08	N	-	N	-	N	-	N	-	Y	25-50	-	-
2008-09	N	-	N	-	N	-	N	-	Y	25-50	-	-
2009-10	N	-	N	-	N	-	N	-	-	-	-	-

Year	Unequal Bins*				Equal Bins#				Kernel Density			
	Regular Workers	Bins	Total Workers	Bins	Regular Workers	Bins	Total Workers	Bins	Regular Workers	Bins	Total Workers	Bins
2010-11	N	-	N	-	N	-	N	-	Y	25-50	-	-
2011-12	N	-	N	-	N	-	N	-	Y	25-50	-	-
2012-13	N	-	N	-	N	-	N	-	Y	25-50	-	-
2013-14	N	-	N	-	N	-	N	-	Y	25-50	-	-
2014-15	N	-	N	-	N	-	N	-	-	-	-	-
2015-16	N	-	N	-	N	-	N	-	-	-	-	-
2016-17	N	-	N	-	N	-	N	-	Y	25-50	Y	50-75

Source: Calculations based on ASI unit level records
Note: * Unequal Bins: 0-25, 25-50, 50-75, 75-100, 100-199, 199-499, 499-999, 999-1999, 1999-4999 and 4999-above;
Equal Bins: 0-25, 25-50, 50-75, 75-100, 100-125, 125-150, 150-175, 175-200, 200-225, 225-250, 250-275, 275-300, 300-325, 325-350, 350-375, 375-400, 400-425, 425-450, 450-475, 475-500 and 500-above.
Y: Denotes presence of bimodality, N: denotes no presence of bimodality

The analysis of firm size distribution using Kernel Density plots at the aggregate level is followed by a state-level analysis. Table 2.1 along with Figure A2.3 summarizes the results of the Kernel density estimates at the aggregate level. The non-parametric results at the aggregate level presented in Table 2.1 show more than one mode in the distribution of regular workers in many years between 2002-03 and 2016-17. Further, missing middle, based on distribution of regular workers, is observed in the 25-50 bin. Further, in most years, the presence of contract workers has smoothened the distribution of total workers. The firm size distribution using regular

workers along with that of total workers reveals that presence of contract workers have smoothened the distribution.

The (non)existence of missing middle in firm size distribution (for unequal bins) in aggregate manufacturing at the sub-national level is summarized in Table 2.2. Predominantly, in this case, barring a few exceptions, there is lack of evidence of missing middle in aggregate manufacturing at the sub-national level across three time points. Even if missing middle is found to exist, the bin where missing middle is observed to exist varies across states. The size distribution of firms using equal bins at the sub-national level, as in Table 3, seem to provide evidence on the contrary.

Table 2.2: Bimodality in Firm-size Distribution in Manufacturing at the Sub-national Level: Regular and Total Workers (unequal bins*)

	Regular Workers		Total Workers		Regular Workers		Total Workers		Regular Workers		Total Workers	
State	**2002-03**	**Bins**	**2002-03**	**Bins**	**2009-10**	**Bins**	**2009-10**	**Bins**	**2016-17**	**Bins**	**2016-17**	**Bins**
Andhra Pradesh	-	-	-	-	-	-	-	-	-	-	-	-
Assam	Y	75-100	Y	75-100	Y	100-199	Y	100-199	-	-	-	-
Chhattisgarh	-	-	-	-	-	-	-	-	-	-	-	-
Delhi	-	-	-	-	-	-	-	-	-	-	-	-
Goa	-	-	-	-	-	-	-	-	-	-	-	-
Gujarat	-	-	-	-	-	-	-	-	-	-	-	-
Haryana	-	-	-	-	-	-	-	-	-	-	-	-

West Bengal	Uttarakhand	Uttar Pradesh	Tamil Nadu	Rajasthan	Punjab	Odissa	Maharashtra	Madhya Pradesh	Kerala	Karnataka	Jharkhand	Himachal Pradesh	**State**	
-	-	-	-	Y	-	-	-	-	-	-	-	-	**2002-03**	**Regular Workers**
-	-	-	-	50-75	-	-	-	-	-	-	-	-	**Bins**	
-	-	-	-	Y	-	-	Y	-	-	-	-	-	**2002-03**	**Total Workers**
-	-	-	-	50-75	-	-	75-100	-	-	-	-	-	**Bins**	
-	-	-	-	-	-	-	-	-	-	-	-	-	**2009-10**	**Regular Workers**
-	-	-	-	-	-	-	-	-	-	-	-	-	**Bins**	
-	-	-	-	-	-	Y	-	-	-	-	-	-	**2009-10**	**Total Workers**
-	-	-	-	-	-	100-199	-	-	-	-	-	-	**Bins**	
-	-	-	-	-	-	-	-	-	-	-	-	-	**2016-17**	**Regular Workers**
-	-	-	-	-	-	-	-	-	-	-	-	-	**Bins**	
-	Y	-	-	-	-	-	-	-	-	-	-	Y	**2016-17**	**Total Workers**
-	75-100	-	-	-	-	-	-	-	-	-	-	50-75	**Bins**	

Source: Calculations based on ASI unit level records
Note: ' Y' denotes presence of bimodality. * The classification of unequal bins is as in Table

Table 2.3: Bimodality in Firm-size Distribution in Manufacturing at the Sub-national Level: Regular and Total Workers (equal bins*)

	State	Andhra Pradesh	Assam	Chhattisgarh	Delhi	Goa	Gujarat	Haryana	Himachal Pradesh	Jharkhand	Karnataka	Kerala	Madhya Pradesh	Maharashtra
Regular Workers	**2002-03**	-	Y	-	Y	-	-	-	-	-	-	Y	-	-
	Bins	-	75-100	-	100-125	-	-	-	-	-	-	100-125	-	-
Total Workers	**2002-03**	-	Y	-	Y	-	Y	-	-	-	-	Y	-	Y
	Bins	-	75-100	-	100-125	-	100-125	-	-	-	-	100-125	-	75-100
Regular Workers	**2009-10**	-	Y	-	-	-	-	-	-	Y	Y	Y	-	-
	Bins	-	100-125	-	-	-	-	-	-	100-125	100-125	100-125	-	-
Total Workers	**2009-10**	-	Y	Y	-	-	-	-	-	Y	Y	Y	-	-
	Bins	-	100-125	100-125	-	-	-	-	-	100-125	100-125	100-125	-	-
Regular Workers	**2016-17**	-	Y	-	-	-	-	-	-	-	-	-	-	-
	Bins	-	100-125	-	-	-	-	-	-	-	-	-	-	-
Total Workers	**2016-17**	-	Y	-	-	Y	-	-	Y	-	-	-	-	-
	Bins	-	100-125	-	-	100-125	-	-	50-75	-	-	-	-	-

State	Regular Workers		Total Workers		Regular Workers		Total Workers		Regular Workers		Total Workers	
	2002-03	Bins	2002-03	Bins	2009-10	Bins	2009-10	Bins	2016-17	Bins	2016-17	Bins
Odissa	-	-	-	-	Y	100-125	Y	100-125	-	-	-	-
Punjab	-	-	-	-	-	-	-	-	-	-	-	-
Rajastha n	Y	50-75	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	-	-	Y	100-125	-	-	Y	100-125	-	-	-	-
Uttarakh and	-	-	-	-	-	-	Y	100-125	-	-	Y	75-100
West Bengal	-	-	-	-	-	-	-	-	-	-	-	-

Source: Calculations based on ASI unit level records
Note: 'Y' denotes presence of bimodality. * The classification of equal bins is as in Table 2.1.

The frequency density estimates using equal bins for regular as well as total workers across states reveal that more states show the presence of bimodality in 2009-10 over 2002-03. However, the pattern reverses in 2016-17. Nonetheless, missing middle in aggregate manufacturing across states is mostly evident in the bin 100-125. These evidences on the pattern of distribution with regards to regular workers are indicative of the importance of labour regulations, but the results seem to be counter-intuitive for total workers.

Apart from parametric estimates, inter-state analysis of firm size distribution in Indian manufacturing is also carried out using 180 kernel density estimates and 60 plots. It is to be noted that each plot summaries the distribution of the key variables

for a particular state at three time points 2002-03, 2009-10 and 2016-17. Table 2.4 presents the summary of the findings on the size distribution of firms using the Kernel density plots for regular and total workers.

A bird's eye view of distribution of regular workers shows the presence of multiple peaks/ modes has increased over the years between 2002-03 and 2016-17. In 2002-03, while only two states, namely Haryana and Orissa, confirm the presence of bimodality or multimodality, the number of states showing the presence of missing middle increased to five (namely Andhra Pradesh, Gujarat, Haryana, Jharkhand, and Rajasthan) in 2009-10. In 2016-17, thirteen out of twenty States showed presence of bimodality or multimodality in the distribution of regular workers. The distribution of total workers however shows lesser incidence of bimodality than regular workers across Indian states over the period of time. It is thus important to note that the presence of contract workers may have been lowering the incidence of missing middle in Indian manufacturing across time.

Table 2.4: Bimodality in Firm-size Distribution in Manufacturing at the Sub-national Level Using Kernel Density Estimates: Regular and Total Workers

	Regular Workers		Total Workers		Regular Workers		Total Workers		Regular Workers		Total Workers	
States	2002-03	Bins	2002-03	Bins	2009-10	Bins	2009-10	Bins	2016-17	Bins	2016-17	Bins
Andhra Pradesh	-	-	-	-	Y	50-75	Y	50-75	-	-	Y	50-75
Assam	-	-	-	-	-	-	-	-	-	-	-	-
Chhattisgarh	-	-	-	-	-	-	-	-	Y	25-50	Y	50-75
Delhi	-	-	-	-	-	-	-	-	Y	50-75	Y	50-75

Uttar Pradesh	Tamil Nadu	Rajasthan	Punjab	Odissa	Maharashtra	Madhya Pradesh	Kerala	Karnataka	Jharkhand	Himachal Pradesh	Haryana	Gujarat	Goa	**States**	
-	-	-	-	Y	-	-	-	-	-	-	Y	-	-	**2002-03**	**Regular Workers**
-	-	-	-	50-75	-	-	-	-	-	-	50-75	-	-	**Bins**	
-	-	-	-	Y	Y	-	-	-	-	-	-	-	-	**2002-03**	**Total Workers**
-	-	-	-	50-75	75-100	-	-	-	-	-	-	-	-	**Bins**	
-	-	Y	-	-	-	-	-	-	Y	-	Y	Y	-	**2009-10**	**Regular Workers**
-	-	50-75	-	-	-	-	-	-	50-75	-	50-75	50-75	-	**Bins**	
-	-	-	-	-	-	-	-	-	Y	-	-	-	-	**2009-10**	**Total Workers**
-	-	-	-	-	-	-	-	-	50-75	-	-	-	-	**Bins**	
Y	-	Y	-	Y	Y	Y	Y	-	Y	-	Y	Y	Y	**2016-17**	**Regular Workers**
25-50	-	25-50	-	25-50	50-75	25-50	25-50	-	25-50	-	25-50	50-75	25-50	**Bins**	
-	-	Y	-	-	Y	-	-	-	Y	-	-	-	Y	**2016-17**	**Total Workers**
-	-	25-50	-	-	50-75	-	-	-	50-75	-	-	-	25-50	**Bins**	

	Regular Workers		Total Workers		Regular Workers		Total Workers		Regular Workers		Total Workers	
States	2002-03	Bins	2002-03	Bins	2009-10	Bins	2009-10	Bins	2016-17	Bins	2016-17	Bins
Uttarakhand	-	-	-	-	-	-	-	-	-	-	-	-
West Bengal	-	-	-	-	-	-	-	-	Y	75-100	Y	75-100

Source: Calculations based on ASI unit level records
Note: 'Y' denotes presence of bimodality. The classification of equal bins is as in Table 2.1.

It has been observed that the second peak lies well below the 100-worker threshold. At the aggregate level the bimodal peak occurs in the 25-50 bin whereas at inter-state level, the peaks range between 25-50 bin to 75-100 bin. For the distribution of regular workers, states like Haryana, Jharkhand, Odissa and Rajasthan reveal a downward mobility of the bimodal bin. In most states with observed missing middle, bimodality occurs in the bin 25-50 in 2016-17.

In explaining the results on bi-modality of firm size distribution of regular workers and total workers, use of contract workers in organised manufacturing plays a vital role as a mechanism for firms to maintain flexibility in workforce. Registered manufacturing in India has witnessed a notable increase in the contract worker intensity from 10 workers per factory in 2002 to about 18 workers per factory in 2017 (Bhardwaj, 2021). Further, Ramaswamy (2013) provides evidence of increased contract worker intensity around the regulatory threshold of 100 workers. Such observed increases are largely on account as firms increasingly relying on these workers in order to navigate stringent labour laws and market rigidities (Das et al., 2024; Singh et al., 2017; Kapoor & Krishnapriya 2019). Even though increasing use of contract workers provide cost savings and operational flexibility, and export-oriented firms are more inclined towards the use of contract labour (Goldar, 2024),

employing contract workers raises concerns regarding workforce security and social welfare (Das et al. 2015; Singh et al. 2017). The contract worker intensity however varies across scalar structure of firms: while large firms, capable of absorbing compliance costs of inflexible labour laws, are less contract worker intensive, small firms often opt for greater use of contract worker (Nagaraj, 2003; Sapkal, 2016).

As far as the distribution of contract workers in Indian manufacturing is concerned, it follows a unimodal pattern with the number of firms using contract workers peaking towards the beginning of distribution. This is to say that the peak use of contract labour occurs when the average firm size is small, and as firms grow in size the use of contract labour tapers out.

On the whole, the parametric frequency estimates demonstrate the absence of bimodality at the aggregate level, indicating no 'missing middle' in the distribution of regular and total workers. Conversely, non-parametric Kernel density estimates identify a 'missing middle' in the distribution of regular worker at the aggregate level. At the state level, using parametric methods, there are a few instances of bimodality. The non-parametric estimates also reveal larger number of states with bimodality. While the parametric findings based on equal and unequal bins are largely in tandem with those of Hsieh & Olken (2014) and Ghosh & Abraham (2021), the non-parametric results with regards to regular workers are largely in conformity with those of Tybout (2000), Mazumder & Sarkar (2009b), Krueger (2013) and Ramaswamy (2013).

Some important studies hinted at the importance of the 100-125 bin towards labour regulation as the underlying cause of Missing Middle in the form of bimodality. However, labour regulation in India may not explain the observed bimodality at a lower bin (25-50) both at the national as well as sub-national levels. It can thus be

argued that existing labour regulations alone are not sufficient to explain bimodality in the firm size distribution in Indian manufacturing. This contention is based on the observation of the existence of the second modal bin below the regulatory threshold.

Furthermore, the evidence suggests firm mobility across distributional bins. Mobility of firms is thus found to be critical for the structural evolution of industries. A detailed analysis on mobility of firms using the Transition Probability Matrix would have revealed further meaningful insights, which remains outside the scope of this study. The scope remains restricted on account of the absence of factory identifiers at the plant level.

2.4 Summary of findings

There is no universal answer to the question whether there is existence or non-existence of missing middle in aggregate manufacturing sector in India. The results vary across the time period, choice of bin width and categories of workers used to study the distribution. While the aggregate analysis using frequency density shows no bimodality in the distribution of regular and the total workers as well. The results hold true both for equal bin and unequal bin analyses. Nagaraj (2018) explains the U shaped or bimodal distribution of manufacturing employment as mis-interpretation and mis-measurement of evidence, which might be the case for the absence of Missing Middle when parametric analysis is carried out. The Kernel density estimates for the aggregate level data reveals bimodality in the distribution of regular workers in 25-50 bin across most years between 2002-03 and 2016-17. However, the analysis shows relatively lesser incidence of bimodality in the distribution of total workers.

Alike the national level analysis, the parametric frequency density analysis for regular and total workers is unable to find extensive presence of bimodality at the aggregate state level. The non-parametric analysis using the Kernel Density estimates

show the increasing presence of bimodality over the three time points for the regular workers. The non-parametric findings at the sub-national and at the aggregate level further reaffirms the duality in manufacturing.

The evidence of missing middle is despite wide-ranging reforms in industrial and other regulatory policies, but the observed bimodality in the firm-size distribution cannot be solely on account of existing labour regulations. The role of contract workers cannot be denied in shaping up the distribution of manufacturing employment, where these workers are often employed to circumvent the existing regulatory hurdles.

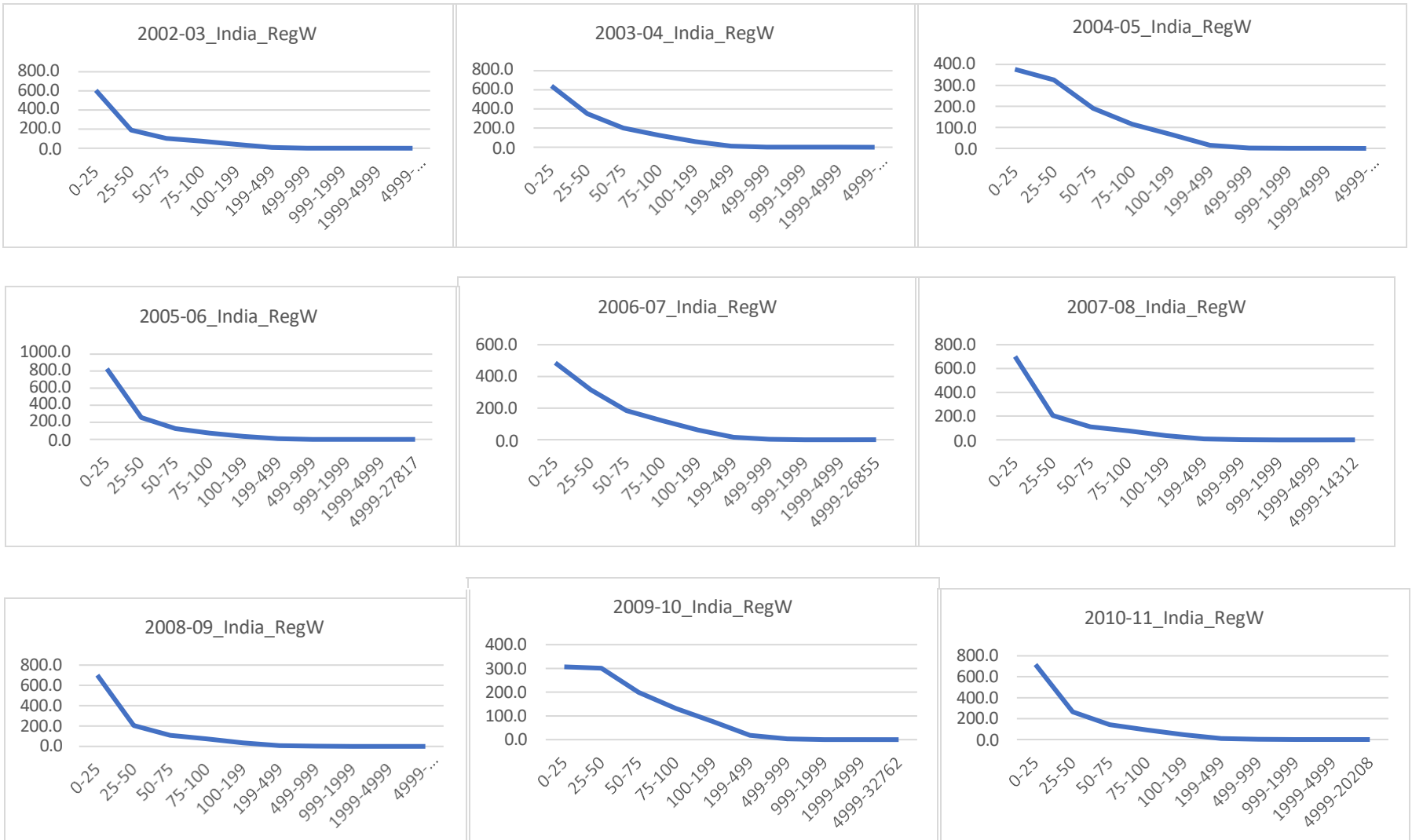
Annexure to Chapter 2

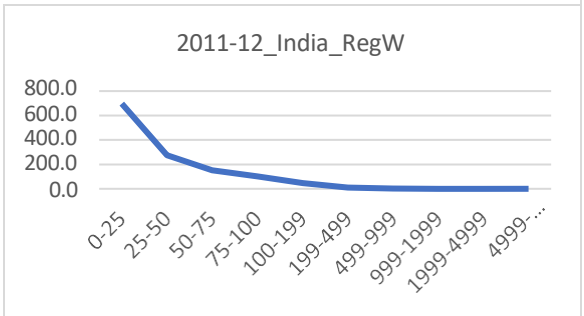
Table A2.1: Summary of major results

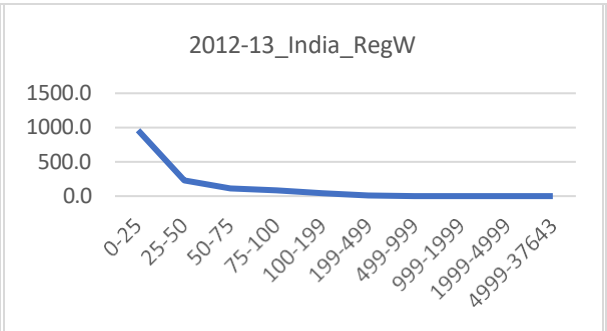
S No	Description	Bins	Tool	Major Findings
1	*Aggregate level*	Unequal Bins	Frequency Curve	No bimodality for Regular Workers and Total Worker
2	*Aggregate level*	Equal Bins	Frequency Curve	No bimodality for Regular Workers and Total Worker
3	Disaggregate/State level for Regular Workers	Unequal Bins	Frequency Curve	Bimodality present bins ranging from 50-75 to 100-199 in 2002-03 and 2009-10. No bimodality in 2016-17.
4	Disaggregate/ State level for Total Workers	Unequal Bins	Frequency Curve	Bimodality present at all the three time points, bin ranges from 50-75 to 100-199.
5	Disaggregate/State level for Regular Workers	Equal Bins	Frequency Curve	Bimodality present in 2002-03 and 2009-10, bins ranging from 50-75 to 100-125. In 2016-17 bimodality observed only in Assam in 100-125 bin.
6	Disaggregate/ State level for Total Workers	Equal Bins	Frequency Curve	Bimodality present across all the three time points in bins ranging from 75-100 to 100-125

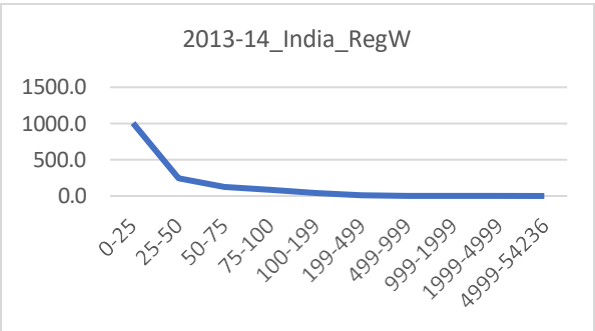
7	*Aggregate level*	Equal Bins	Kernel Density plots	For Regular Workers bimodality present in 25-50 bin across all years from 2005-06 to 2016-17 except 2006-07, 2009-10, 2014-15 and 2015-16. Bimodality present for Total Workers in 2016-17 only, in the 50-75 bin.
8	Disaggregate/ State level for Regular Workers	Equal Bins	Kernel Density plots	Bimodality present across all years in bins 25-50 to 75-100, presence of bimodality increases over years. 13/20 States showed bimodality in 2016-17, up from 5/20 in 2009-10 and 2/20 in 2002-03.
9	Disaggregate/ State level for Total Workers	Equal Bins	Kernel Density plots	Bimodality present across all years in bins 25-50 to 75-100, presence of bimodality increases over years. 8/20 States showed bimodality in 2016-17, up from 2/20 in 2009-10 and 2002-03.

Figure A2.1: Firm size distribution in aggregate manufacturing in India using unequal bins: 2002-03 to 2016-17




2011-12_India_RegW
800.0
600.0
400.0
200.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
499-999
999-1999
1999-4999
4999-...


2012-13_India_RegW
1500.0
1000.0
500.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
499-999
999-1999
1999-4999
4999-37643


2013-14_India_RegW
1500.0
1000.0
500.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
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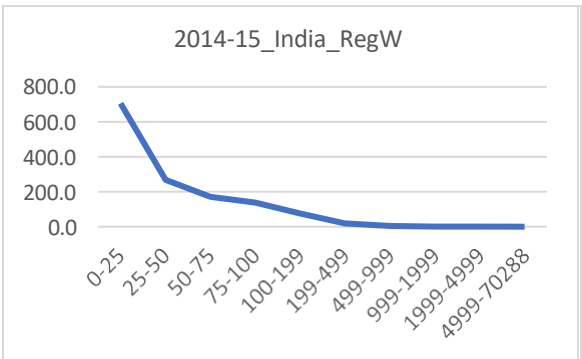
999-1999
1999-4999
4999-54236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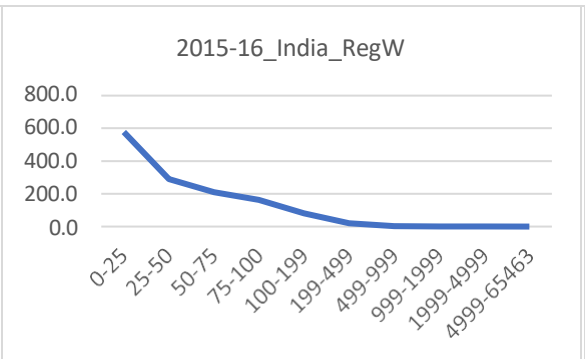
800.0
600.0
400.0
200.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
499-999
999-1999
1999-4999
4999-70288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600.0
400.0
200.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
499-999
999-1999
1999-4999
4999-65463

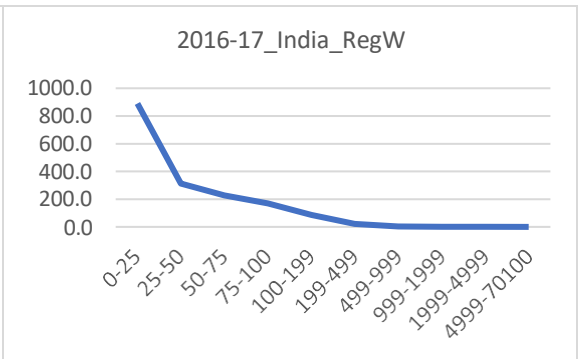
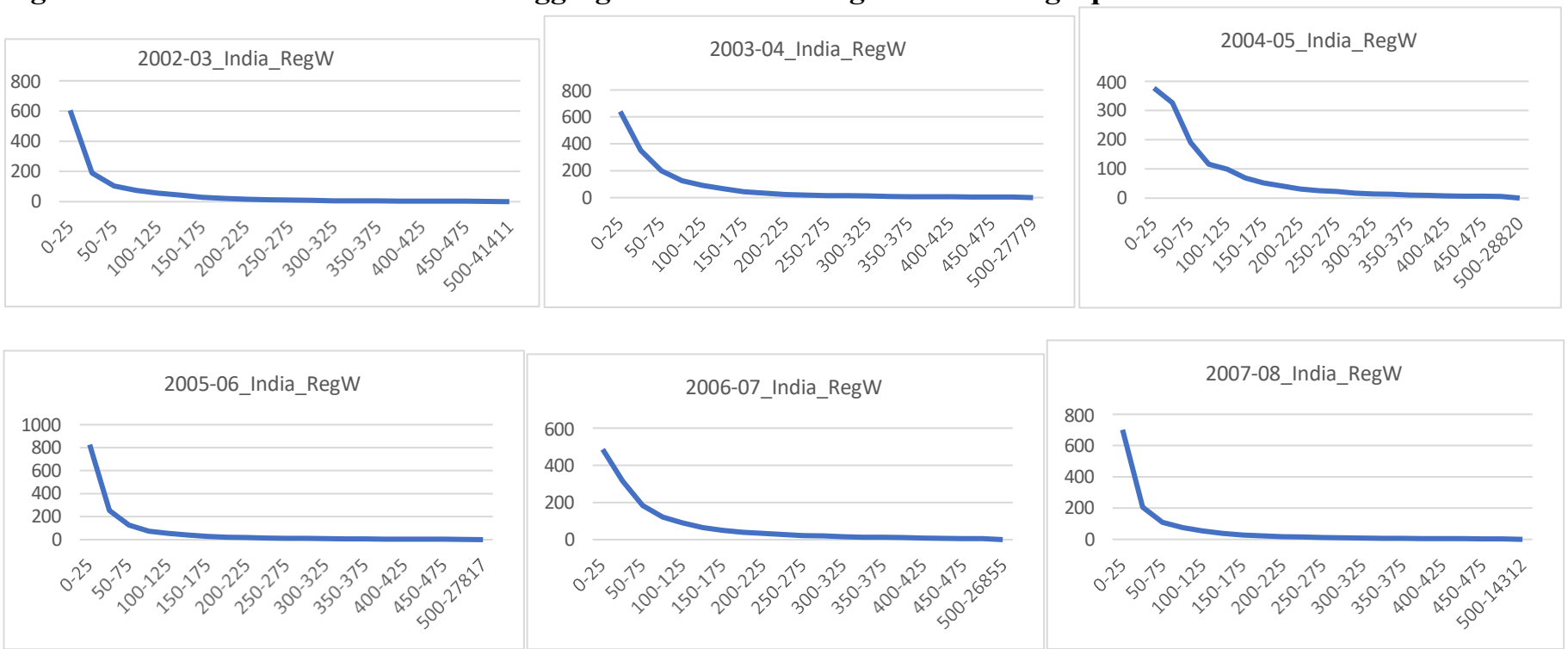
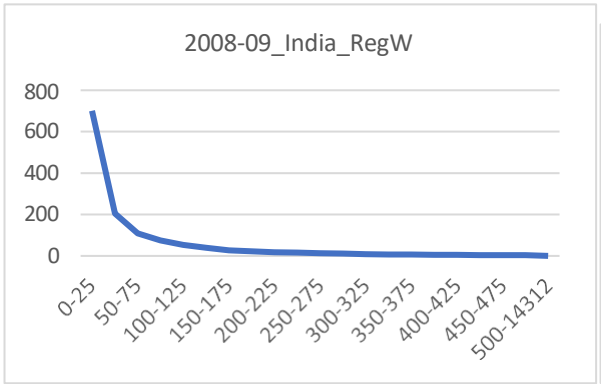
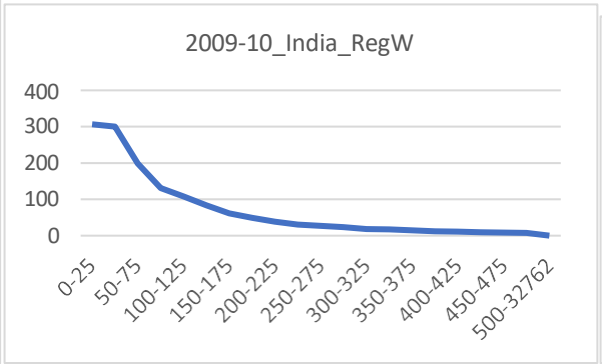
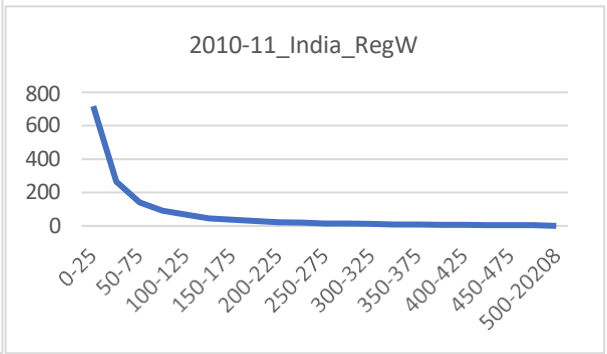

2016-17_India_RegW
1000.0
800.0
600.0
400.0
200.0
0.0
0-25
25-50
50-75
75-100
100-199
199-499
499-999
999-1999
1999-4999
4999-70100

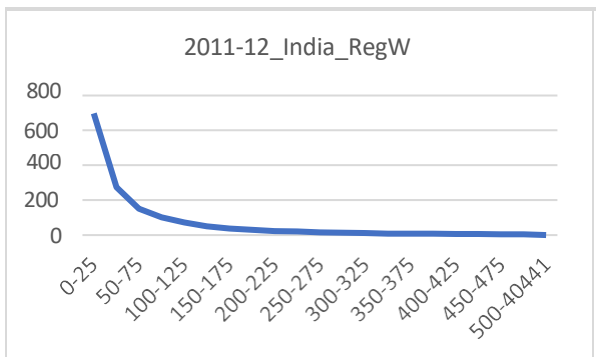
Figure A2.2: Firm size distribution in aggregate manufacturing in India using equal bins: 2002-03 to 2016-17

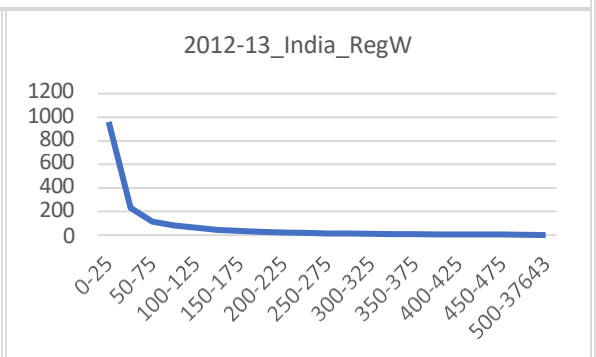


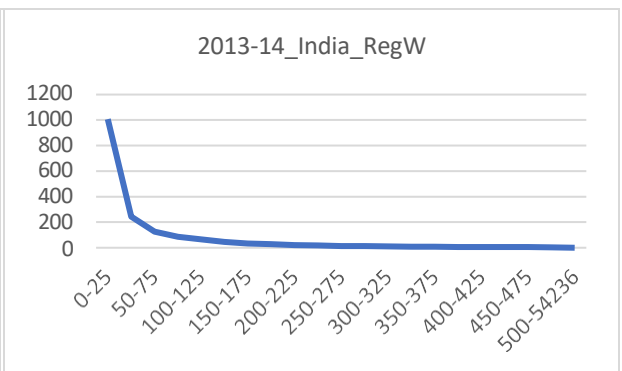

2008-09_India_RegW
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-14312

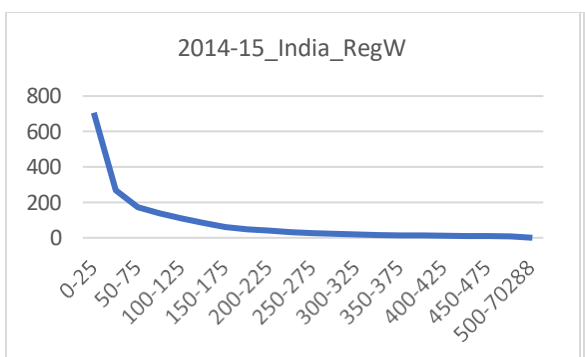

2009-10_India_RegW
400
300
200
100
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-32762

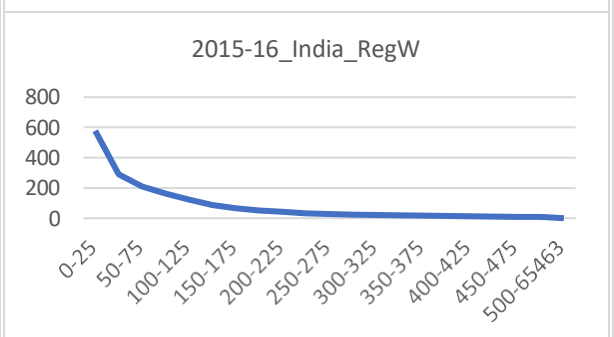

2010-11_India_RegW
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-20208


2011-12_India_RegW
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-40441


2012-13_India_RegW
1200
1000
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-37643


2013-14_India_RegW
1200
1000
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-54236


2014-15_India_RegW
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-70288


2015-16_India_RegW
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-65463

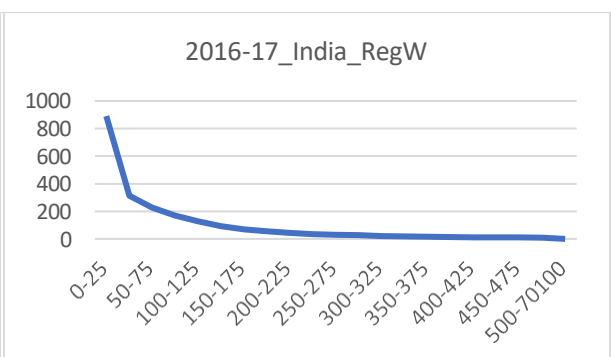
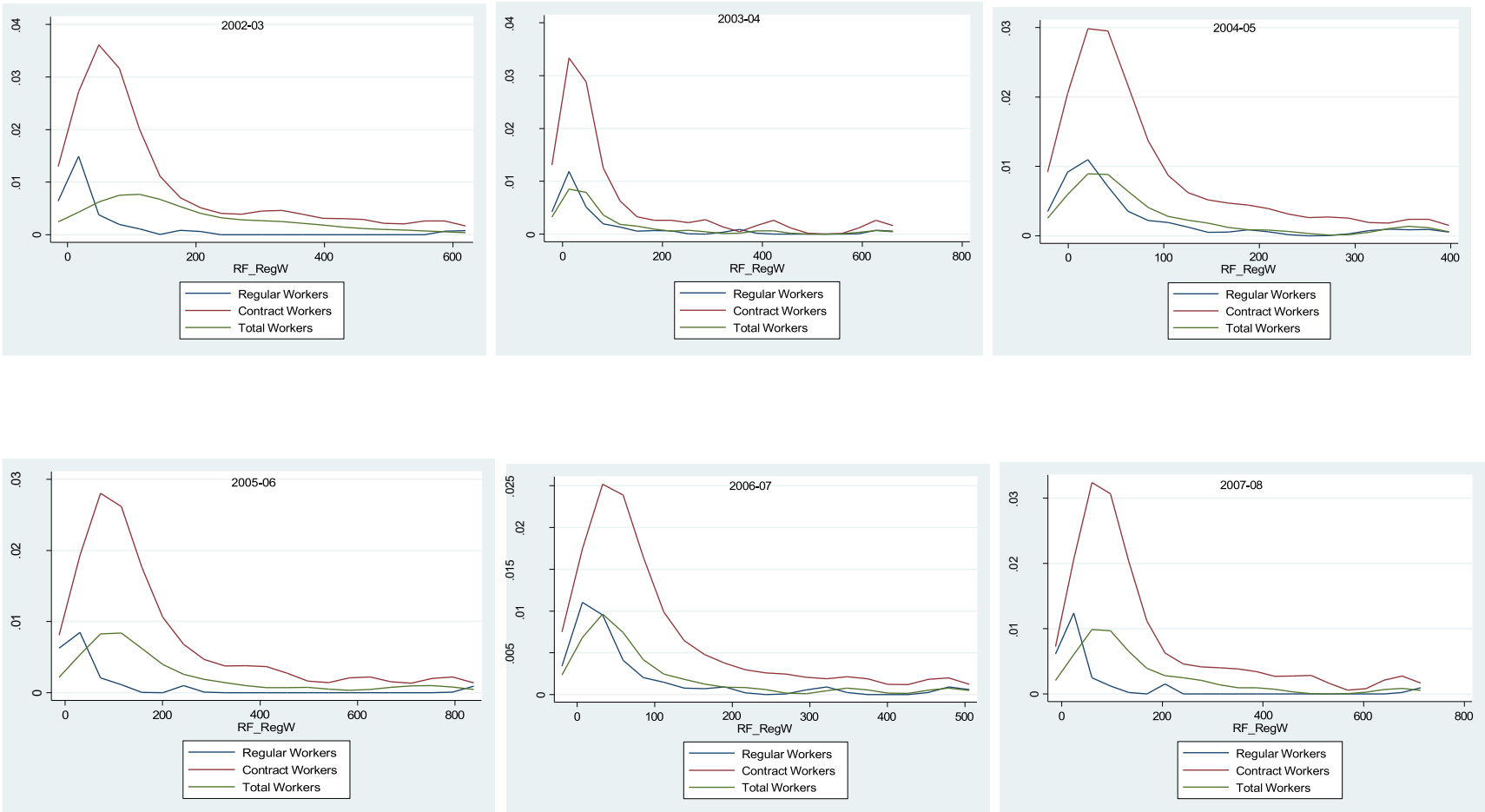
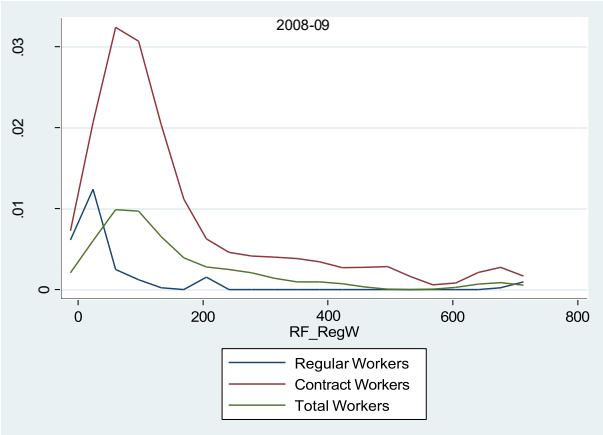
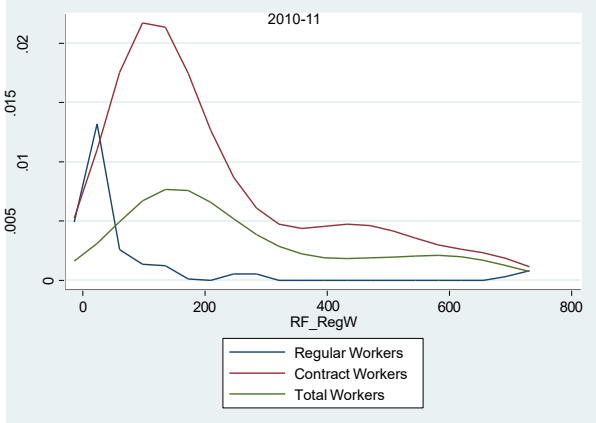

2016-17_India_RegW
1000
800
600
400
200
0
0-25
50-75
100-125
150-175
200-225
250-275
300-325
350-375
400-425
450-475
500-70100

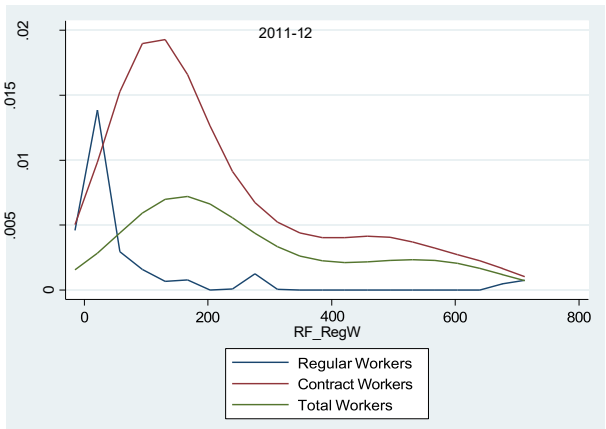
Figure A2.3: Firm size distribution in aggregate manufacturing in India using Kernel density plots: 2002-03 to 2016-17

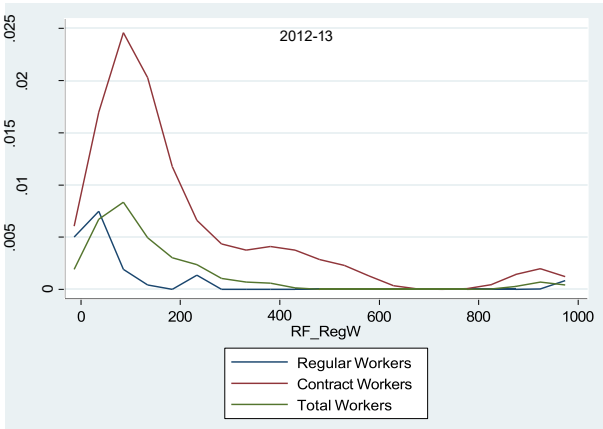


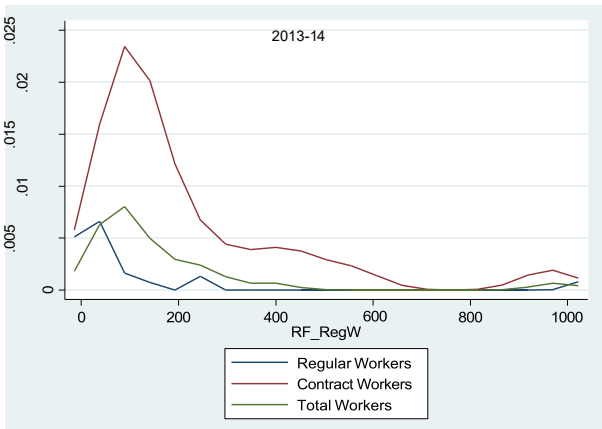

2008-09
0
.01
.02
.03
0
200
400
600
800
RF_RegW
Regular Workers
Contract Workers
Total Workers


2009-10
0
.005
.01
.015
.02
0
100
200
300
400
RF_RegW
Regular Workers
Contract Workers
Total Workers


2010-11
0
.005
.01
.015
.02
0
200
400
600
800
RF_RegW
Regular Workers
Contract Workers
Total Workers


2011-12
0
.005
.01
.015
.02
0
200
400
600
800
RF_RegW
Regular Workers
Contract Workers
Total Workers


2012-13
0
.005
.01
.015
.02
.025
0
200
400
600
800
1000
RF_RegW
Regular Workers
Contract Workers
Total Workers


2013-14
0
.005
.01
.015
.02
.025
0
200
400
600
800
1000
RF_RegW
Regular Workers
Contract Workers
Total Workers

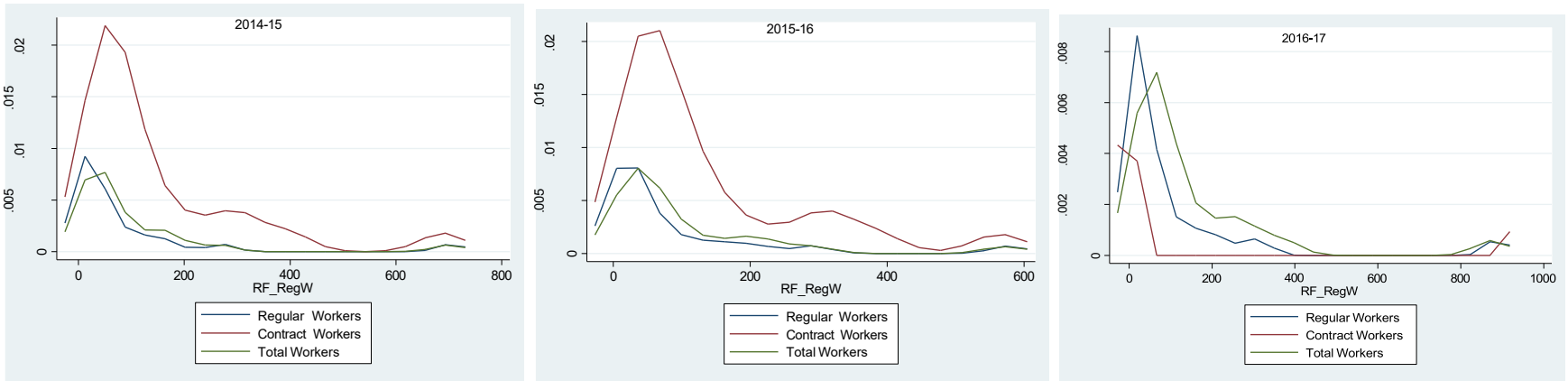
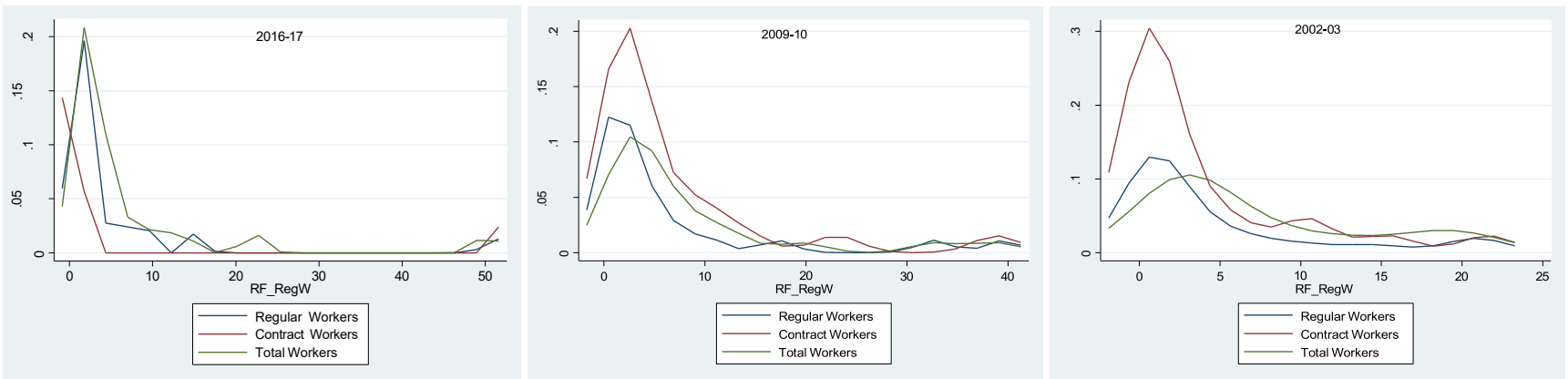
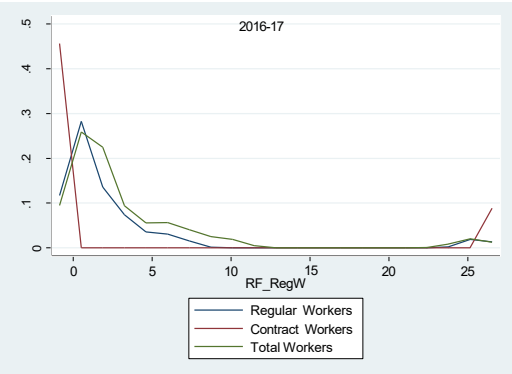


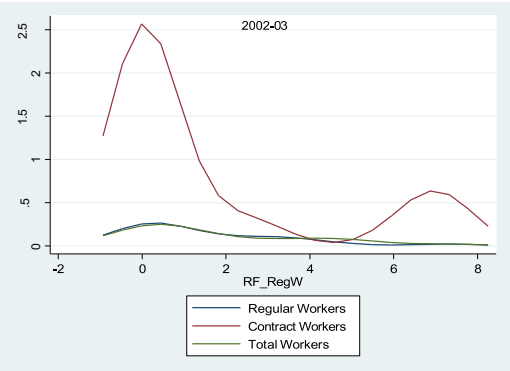
Figure A2.4: Presence of bimodality at the disaggregate/ State level using Kernel Density plots for the distribution of Regular Workers and Total Workers from 2002-03 to 2016-17 for equal bins

Andhra Pradesh

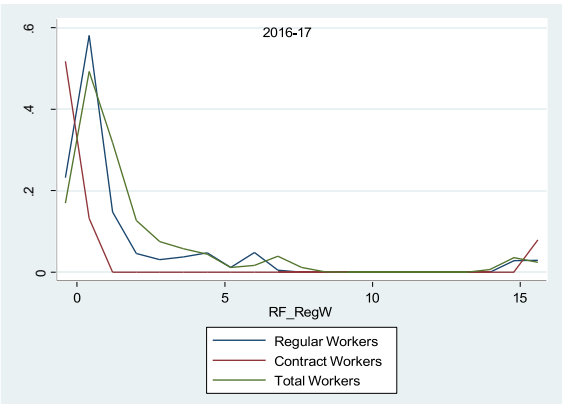


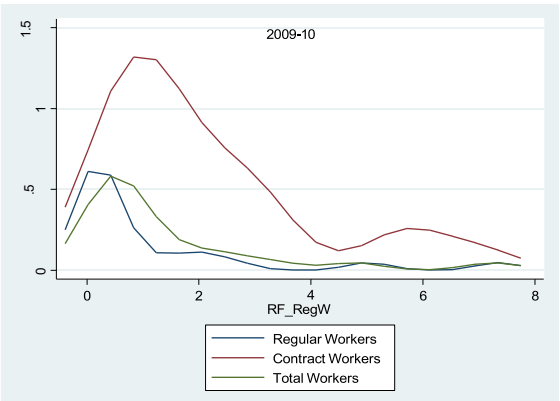
Assam

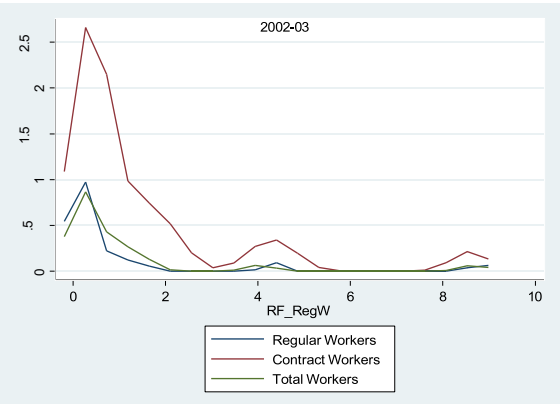




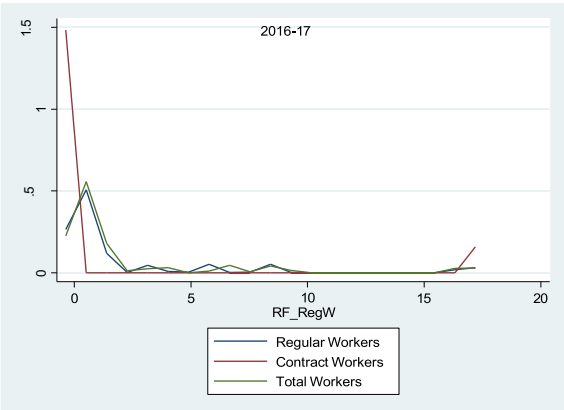
Chattisgarh

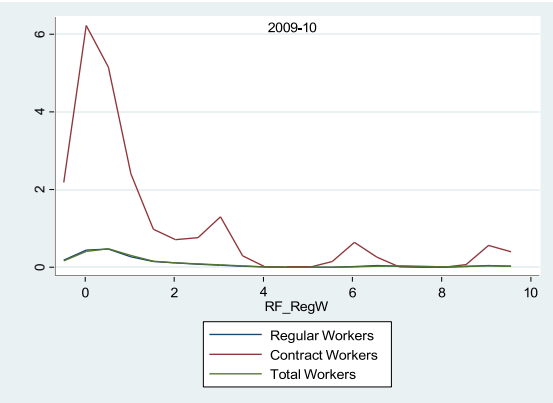


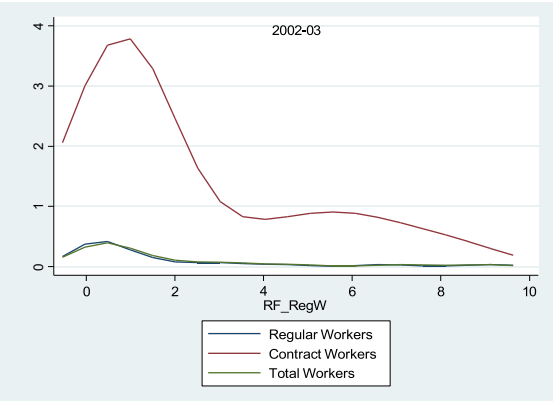




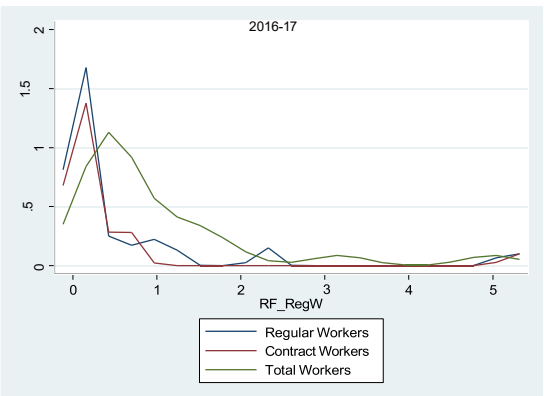
Delhi

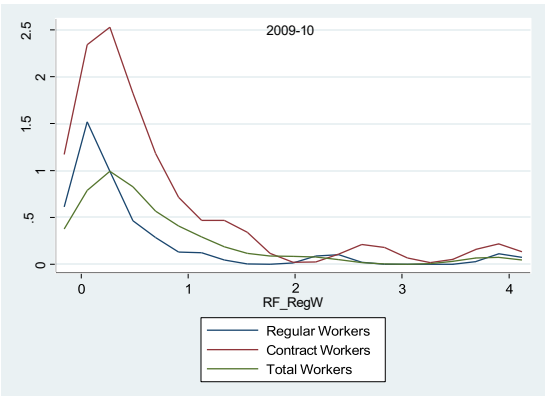

2016-17
RF_RegW
Regular Workers
Contract Workers
Total Workers

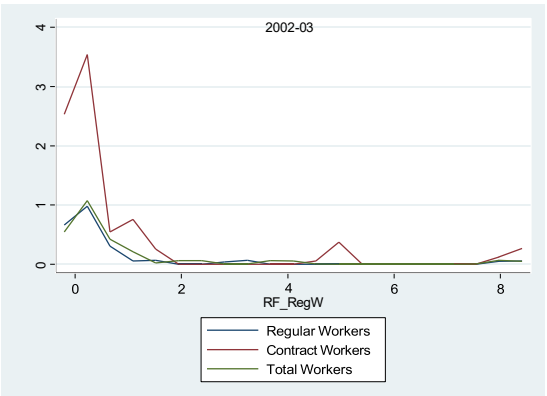

2009-10
RF_RegW
Regular Workers
Contract Workers
Total Workers


2002-03
RF_RegW
Regular Workers
Contract Workers
Total Workers

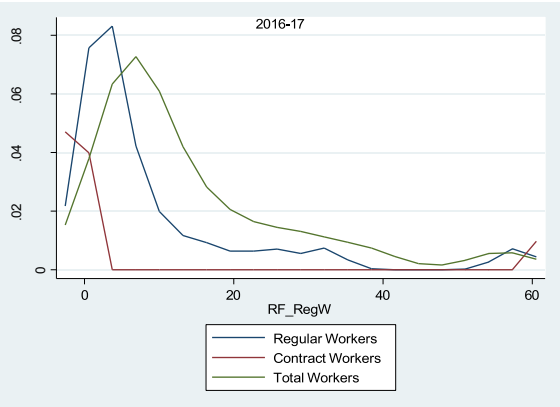
Goa

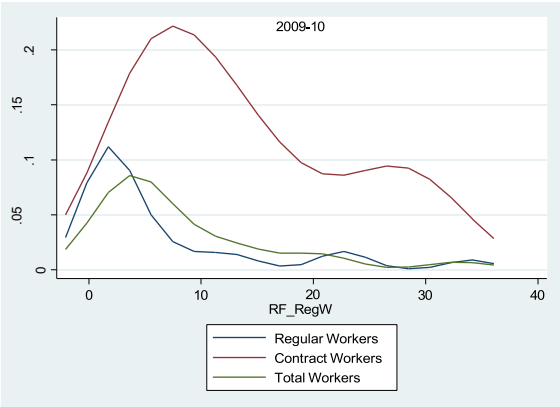

2016-17
RF_RegW
Regular Workers
Contract Workers
Total Workers


2009-10
RF_RegW
Regular Workers
Contract Workers
Total Workers

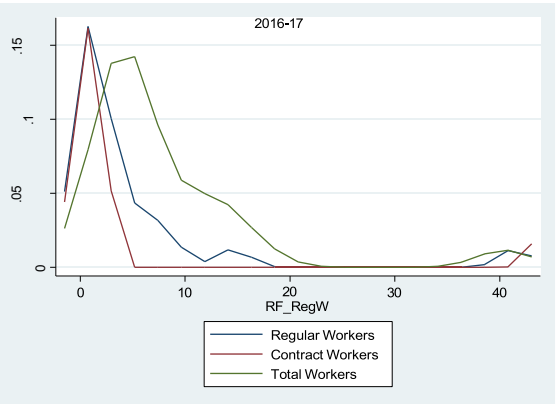

2002-03
RF_RegW
Regular Workers
Contract Workers
Total Workers

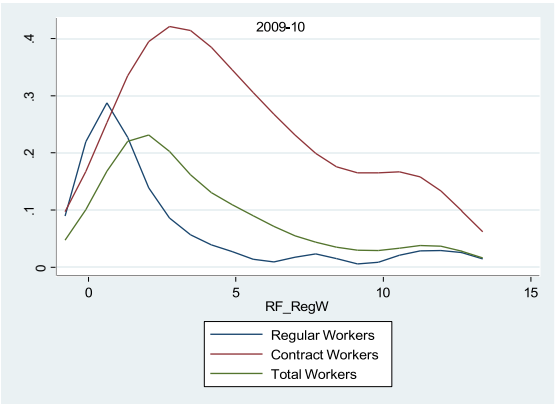
Gujarat

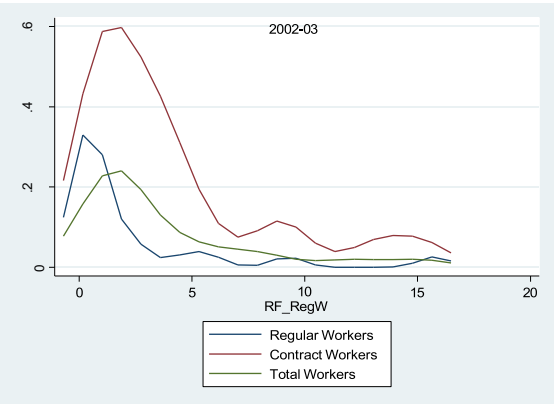




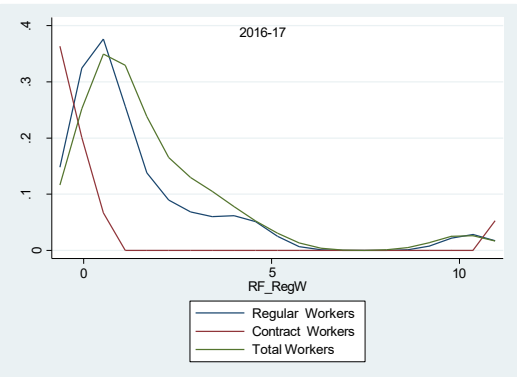
Haryana

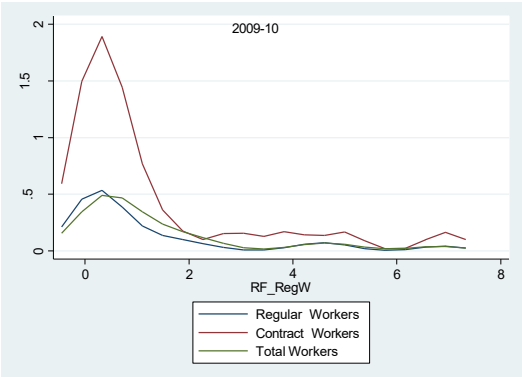


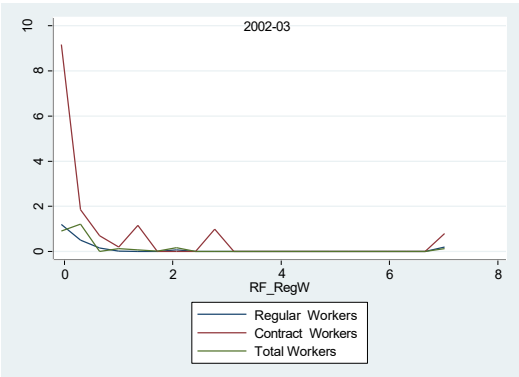




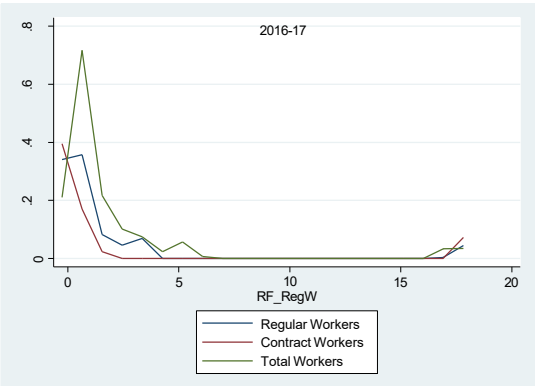
Himachal Pradesh

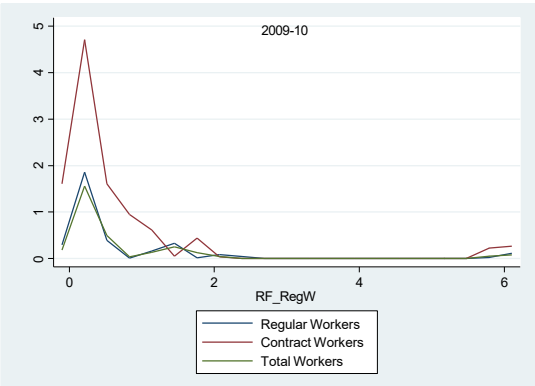


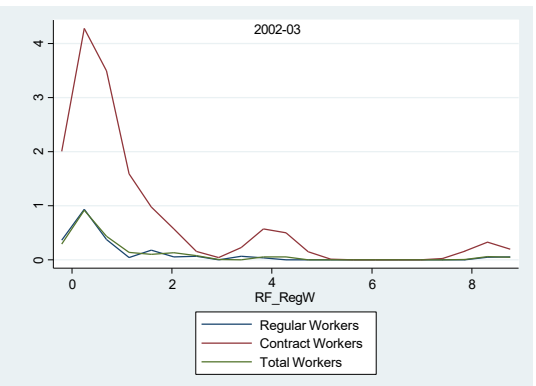




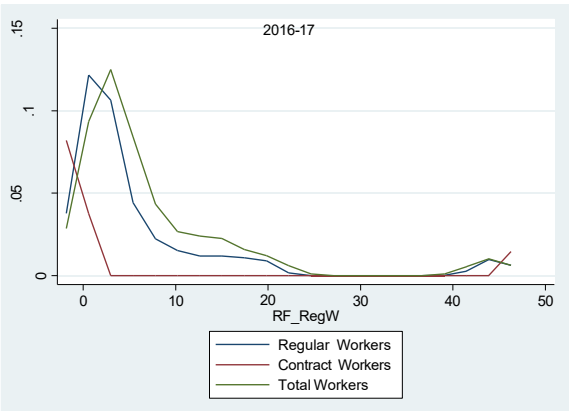
Jharkhand

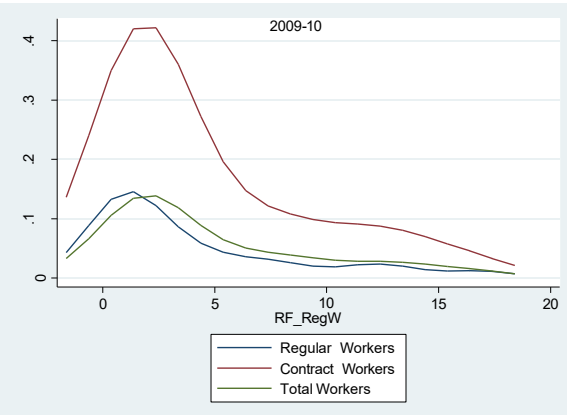


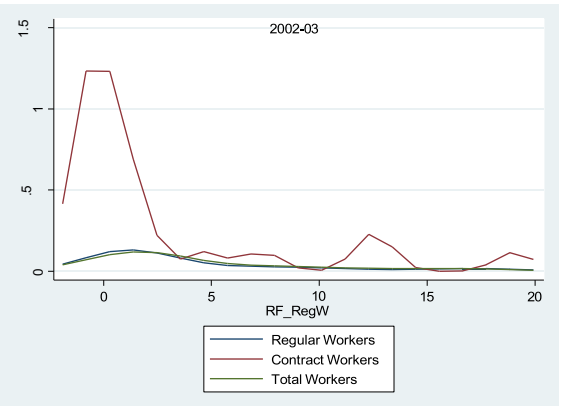




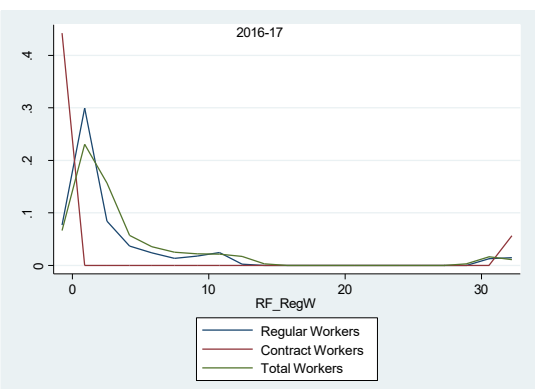
Karnataka

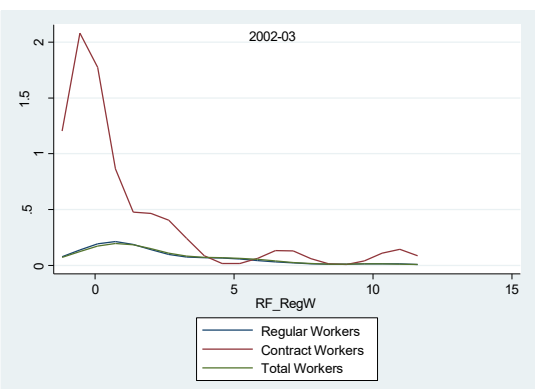




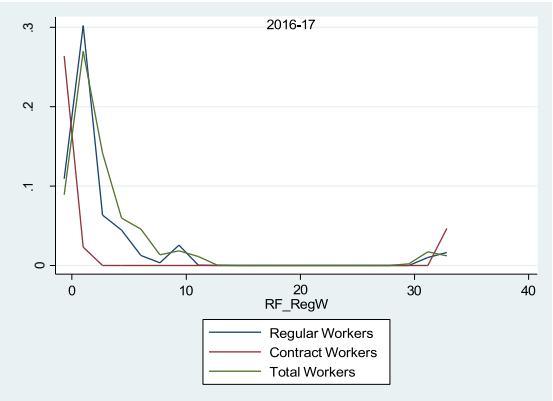


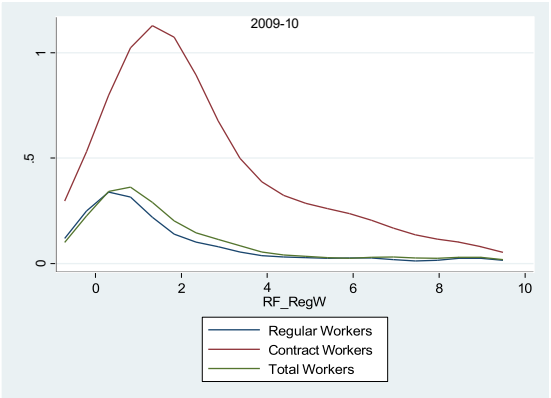
Kerala

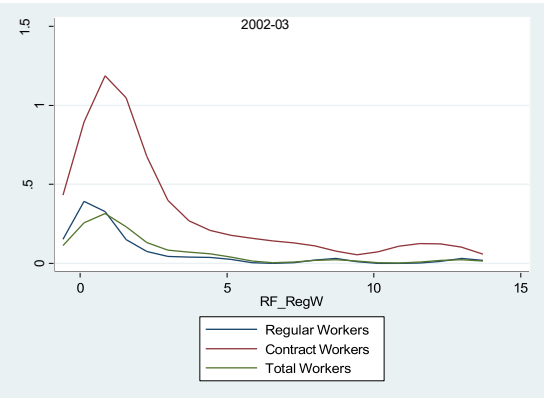




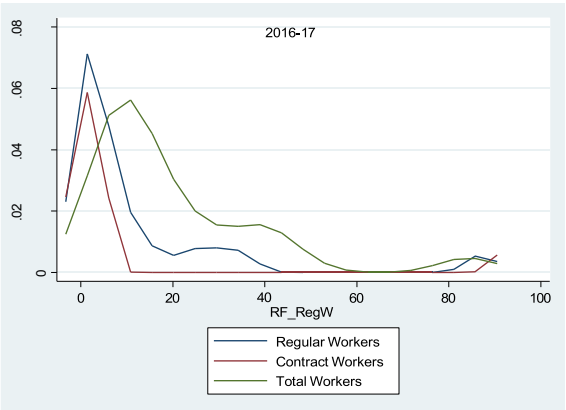
Madhya Pradesh

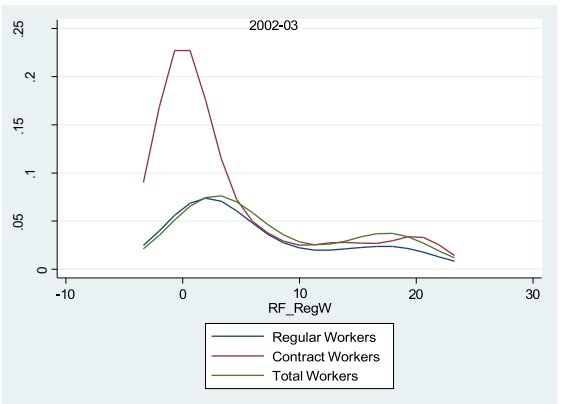




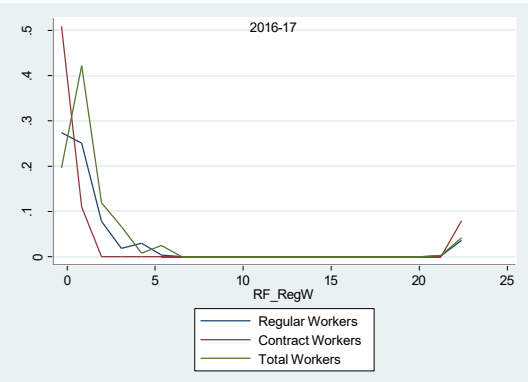


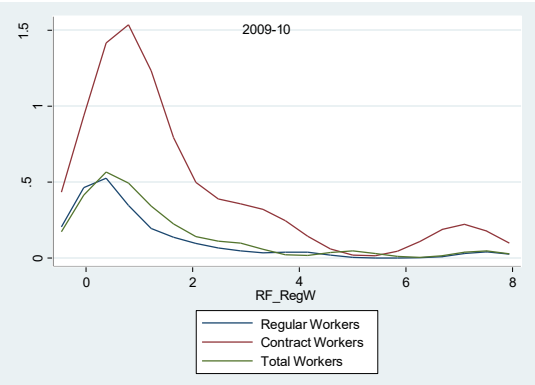
Maharashtra

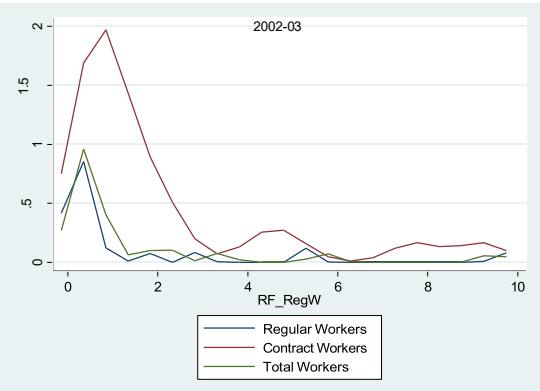




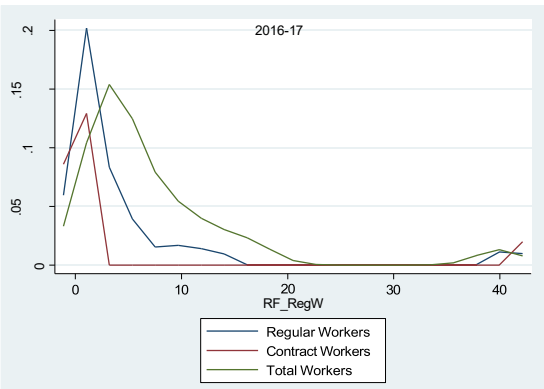
Odissa

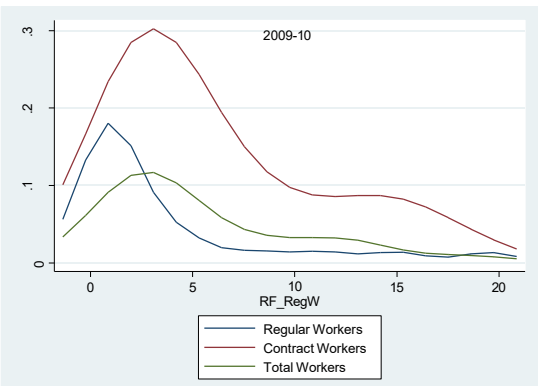


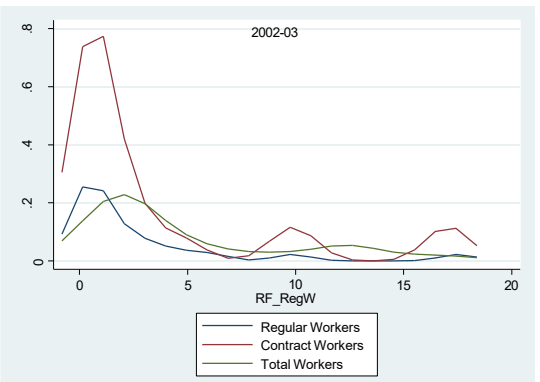




Punjab







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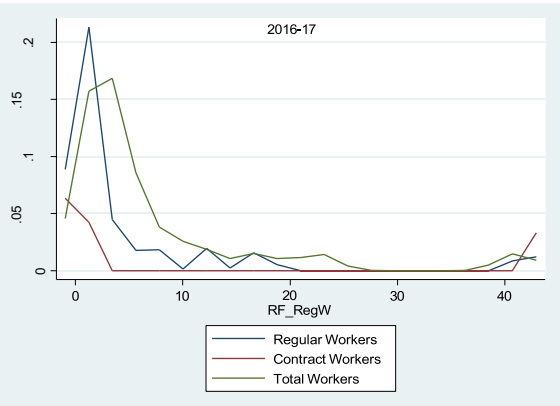
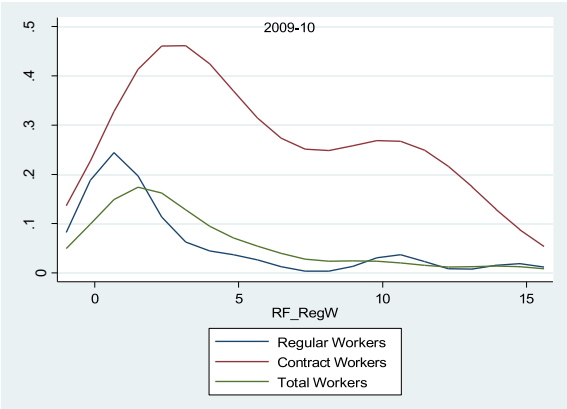
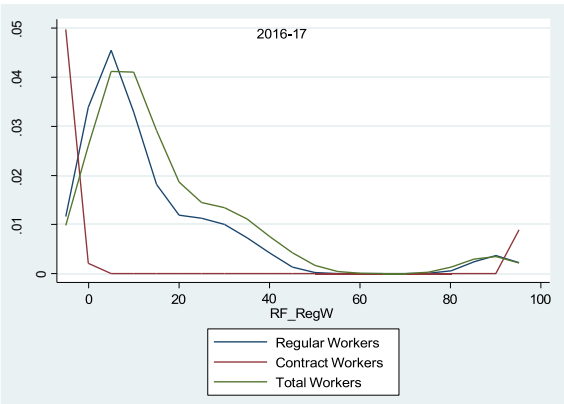
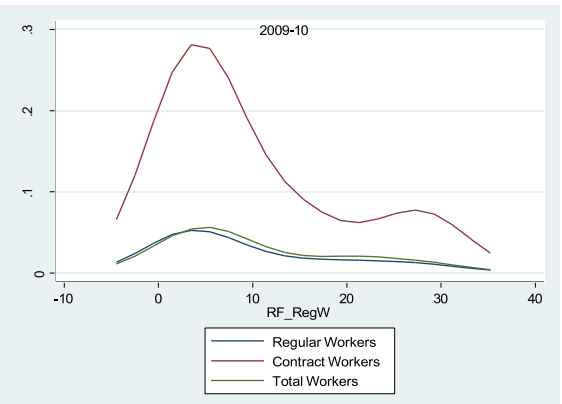
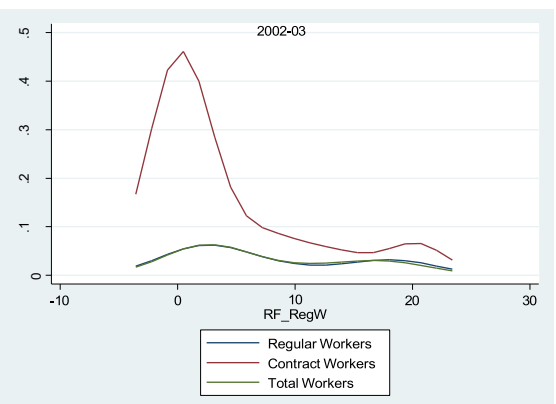




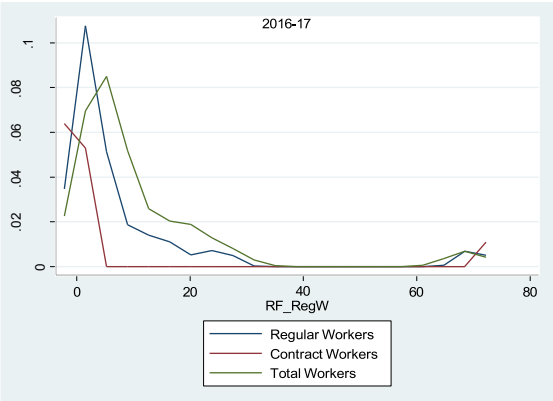
Tamil Nadu

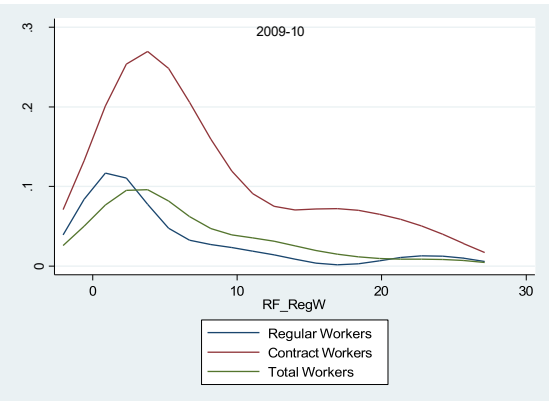


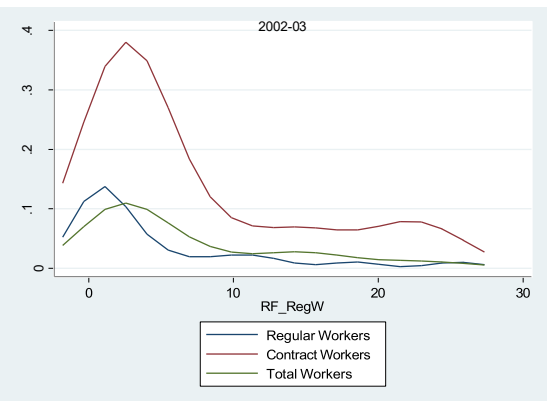




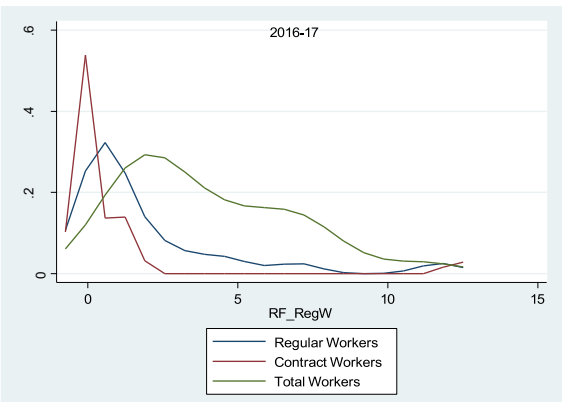
Uttar Pradesh

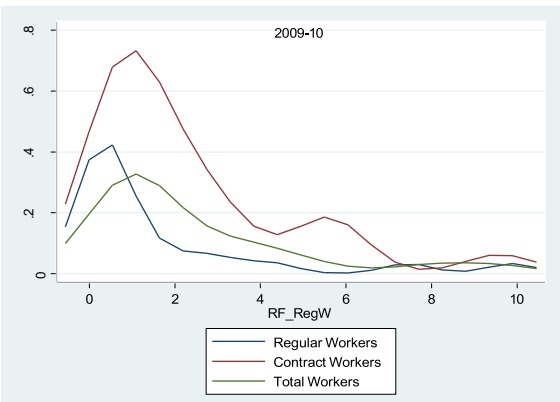


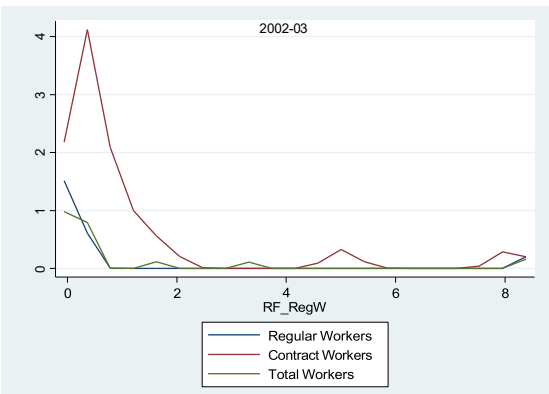




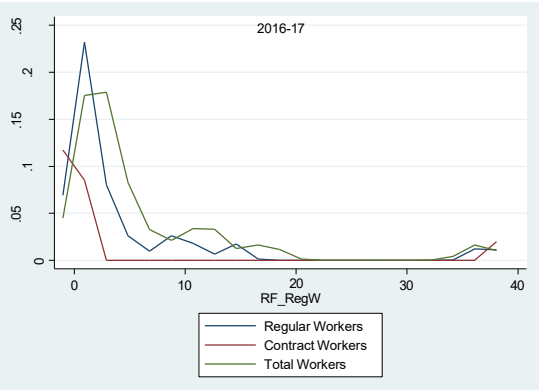
Uttarakhand

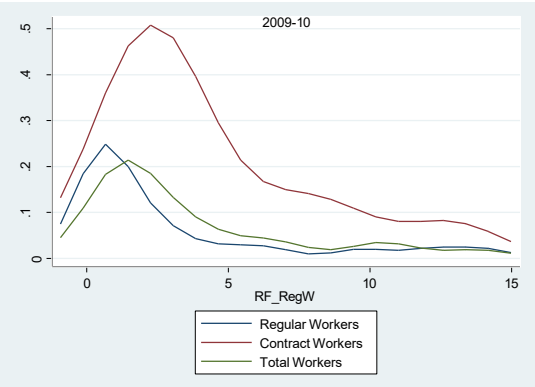






West Bengal


2016-17
0
.05
.1
.15
.2
.25
0
10
20
30
40
RF_RegW
Regular Workers
Contract Workers
Total Workers


2009-10
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.1
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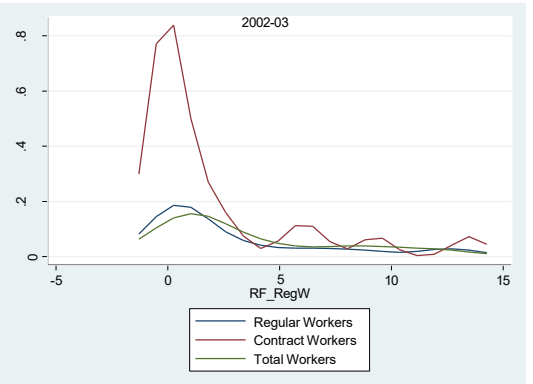
.5
0
5
10
15
RF_RegW
Regular Workers
Contract Workers
Total Workers


2002-03
0
.2
.4
.6
.8
-5
0
5
10
15
RF_RegW
Regular Workers
Contract Workers
Total Workers

CHAPTER 3

EXPLORING MISSING MIDDLE ACROSS PRODUCT GROUPS AND TECHNOLOGICAL CATEGORIES IN INDIAN MANUFACTURING

3.1. Introduction

Earlier studies, for instance Little (1987); Mazumdar & Sarkar (2003, 2009a), Ramaswamy (2013, 2015), and Krueger (2013), as discussed in Chapter 1 of this study, observed bimodality in firm-size distribution with a notable absence of medium-sized firms. Chapter 2 also arrives at similar evidence, though the relative absence of mid-sized plants varies with the choice of bin width, the definition of worker and the level of aggregation used[8]. The present chapter explores size distribution of firms, the phenomenon of missing middle in particular, at a detailed disaggregate level across product groups and technological categories. A study of missing middle for product groups and industries characterised by technology is impending following wide-ranging changes in the structure of manufacturing production, as observed in Chapter 1, along with changes in sectoral policy in Indian manufacturing. This nuanced exploration of the issue of missing middle thus assumes importance for boosting output and employment growth across sectors in Indian manufacturing.

The chapter also delves deeper with regards to the definition of workers as used in Chapter 2 in order to have a detailed view of the scalar distribution of employment and further aid in nuanced evidence on the dynamics of firm-size distribution. This chapter using Annual Survey of Industries (ASI) unit level database goes on to address how firm size distribution differ across different 2-digit NIC product groups and technological categories. The investigation into the distribution of firm size helps to understand whether the absence of mid-sized plants varies across product groups (2- digit NIC) and technological categories, in

[8]. Other studies (including Hsieh & Olken, 2014; Nagaraj, 2018; Ghosh & Abraham, 2021) however show absence of missing middle in aggregate manufacturing.

particular exploring whether presence of missing middle depends on product and technological characteristics. The chapter is organised as follows. The next section presents certain stylised facts, which encourages conducting a study of this kind. This is followed by an empirical exploration of the size distribution of firms at the 2-digit product levels, and then by an analysis with respect to industries classified by technology in section 3.3. The paper summarises the major findings in section 3.4.

3.2. Some more Stylised Facts

As observed in Chapter 1, there has been evidence of structural transformation withing the organised manufacturing sector. Prior to the 2000s organised manufacturing in India had predominant presence of low-technology industries. The scenario changed post 2000s where the share of technologically intensive industries like computer and electronics, motor vehicles witnessed significant increase in the share of GVA. Using the MSME definition of MSMED Act 2006, the firms have been classified based on the criteria of investment in plant, machinery and equipment. The scaler distribution of firms witnessed significant structural transformation, the share of large firms witnessed a significant increase over the years whereas the share of micro firms declined. Though predominant in nature, the share of small firms also witnessed a fall. The share of medium size firm on the other hand has been stagnant all throughout the period since 2000s At the 2-digit level, as can be observed from Figures 3.1a, 3.1b & 3.1c, the shares of micro enterprises in total declined between 2004-05 and 2017-18 albeit having a large share in some product groups. For instance, the share exceeded 50% of total for manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials, manufacture of paper and paper products, manufacture of fabricated metal products, except machinery and equipment, and manufacture of computer, electronic and optical product in 2004-05. By 2011-12, the share of micro enterprises declined except for manufacture of textiles and manufacture of paper and paper products. In 2017-18, the share of

micro enterprises in total for most industrial product groups is lower than before. The share of small enterprises increased all throughout the period till 2017-18. The large enterprises across most industrial groups have grown significantly compared to that in 2004-05. The increase in share of large enterprises have been most prominent in manufacture of chemicals and chemical products, manufacture of basic metals, manufacture of electrical equipment, manufacture of pharmaceuticals, medicinal chemical and botanical products, manufacture of motor vehicles, trailers and semi-trailers and manufacture of other transport equipment. The medium enterprises, in sharp contrast, remained low and stagnant mostly at around the 10% mark across product divisions as compared to the other three categories of firms across product groups.

Figure 3.1a: Size class-wise share of firms in Organised Manufacturing in India :2004-05

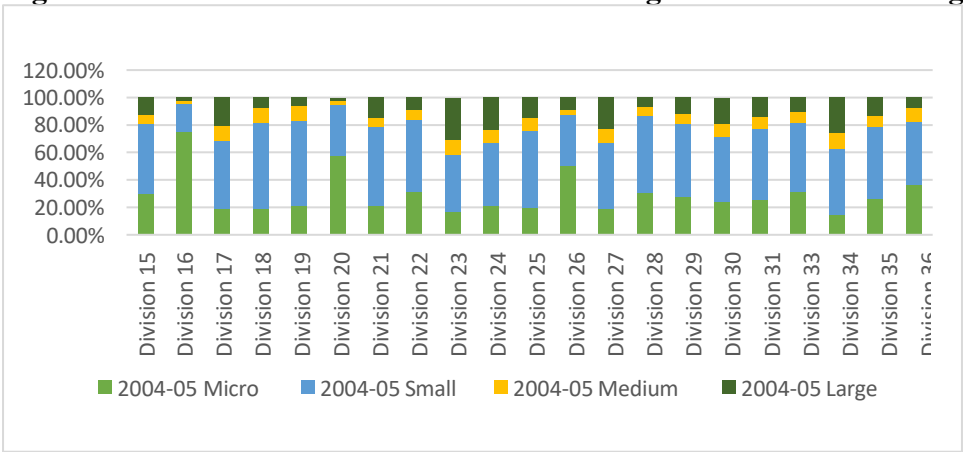


Figure 3.1b: Size class-wise share of firms in Organised Manufacturing in India: 2011-12

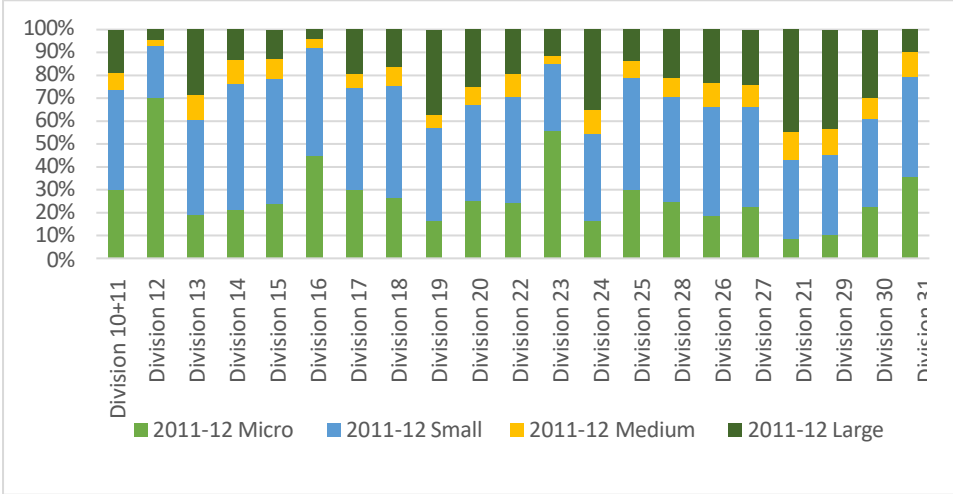
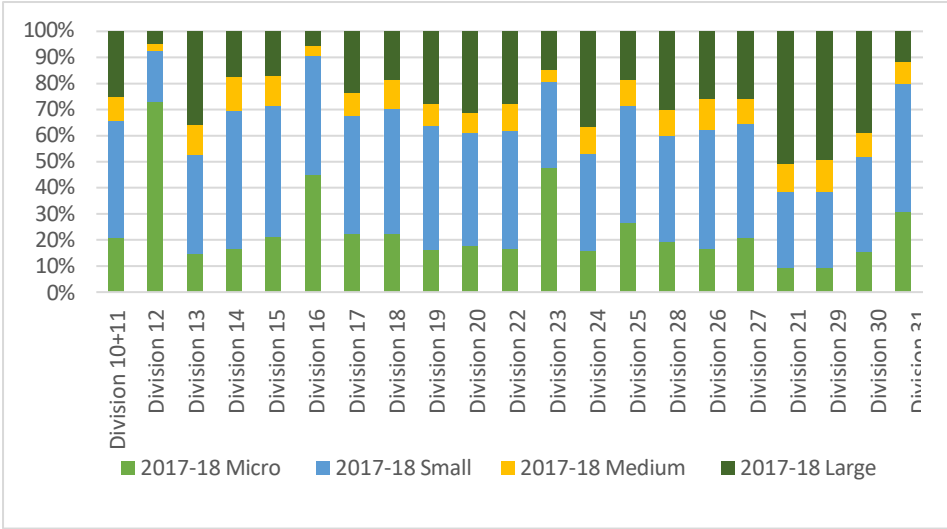


Figure 3.1c: Size class-wise share of firms in Indian Organised Manufacturing in India: 2017-18



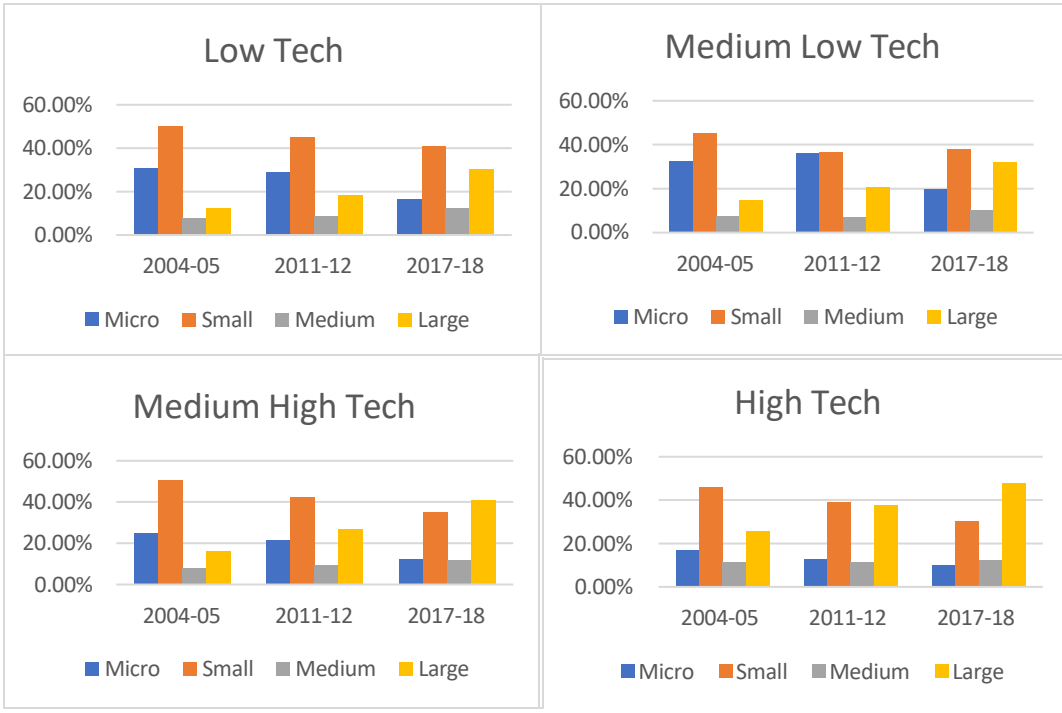
(Note: - The product groups are based on 2-digit level of NIC Classification. Divisions for 2004-05 are as per NIC 2004 and those for 2011-12 and 2017-18 are as per NIC 2008)

Micro	Investment in plant and machinery <Rs. 25 Lakh
Small	Rs. 25 Lakh<Investment in plant and machinery<Rs. 5 Crore
Medium	Rs. 5 Crore<Investment in plant and machinery<Rs. 10Crore
Large	Investment in plant and machinery>Rs. 10 Crore

Source: Calculations based on ASI database

Similarly, across different levels of technology, the share of medium sized firms has been low and mostly the lowest across all three time points (see Figure 3.2). Across the four different levels of technology, the share of micro and small industries is found to be decreasing, while the share of large firms increased over the years. The medium sized firms show more nuanced changes, while gaining in some years and remaining relatively stable in some others. The preliminary observations point out to the fact that there has been a shift in scalar structure across industry groups as well as within the four technological categories between 2004-05 and 2017-18.

Figure 3.2- Size class-wise share of firms across different levels of technology in Organised Manufacturing Sector in India



Note: The technology classifications are already provided in the annexure A1. The size class classification is as in Figure 3.1
Source: Calculations based on ASI database

The unfolding of the above stylised facts provides a premise to explore deeper in the size distribution of firms across different product groups and technological categories. In this backdrop, investigating into size distribution of firms in the context of firm dynamics, especially growth and transition, becomes essential.

3.3. Incidence of Missing Middle

Earlier in this essay, it has been observed that the share of mid-sized firms is low across product groups and industries based on technological classification. An attempt has been made to study this dip in employment and further to identify the bins in which the dip in employment is observed.

The empirical analysis on missing middle uses Annual Survey of Industries (ASI) unit level data to focus on studying the size distribution of firms in the organised manufacturing

sector in India at a detailed disaggregate level between 2004-05 and 2017-18[9]. In this understanding of size distribution of firms are the categories of workers, namely "regular", "contract" and "total" workers. To re-iterate, the information on different types of workers is obtained from the values of "average persons employed" in block E of the questionnaire of the ASI unit level database. The analysis begins with studying the distribution for regular workers, followed by the distribution of total workers. An understanding of the distribution of total workers is important because total workers include both regular and contract workers.

In the empirical analysis, three different time points are considered, namely 2004-04, 2011-12 and 2017-18. The data are made comparable across three time points, when the ASI classification changed from NIC 2004 to NIC 2008, on basis of a concordance table (Table A1.1) given in Annexure to Chapter 1. Further, the description of 2-digit manufacturing product groups and technological categories are given in Table A1.2.

As estimation strategy to understand firm size distribution, as used in the earlier chapter, both parametric as well as the more flexible non-parametric methods, in specific the Kernel density approach, are employed. This allows for a more flexible examination of size distribution of firms. The granular approaches allow for a focused examination of firm size distribution within each industry. By employing both methods, robust understanding of the firm size distribution within each industry is aimed to be achieved, allowing for a more nuanced picture of the shrinking middle phenomenon.

To reiterate, the chapter also has four-fold improvements in methodology in terms of use of: total workers along with regular workers with implications for distribution of contract workers, equal and unequal bins in deciphering size distribution, frequency densities in observing firm size distribution, and use of both parametric and non-parametric methods.

[9] A brief account of the database in provided in Chapter 1.

3.4 Industry Level Analysis of Missing Middle

The parametric estimates reveal that out of the 21 industries (at the 2-digit NIC level) studied, only two – namely, the manufacture of food products and beverages, and the manufacture of basic metals – do not exhibit a shrinking middle across all three time points. This pattern of missing middle is more evident with passage of time between 2004-05 and 2017-18. This suggests a significant decline in the share of workers in the mid-sized plants within a vast array of Indian manufacturing industries with time (see Table 3.1). This pattern can be on account of the deeper impact of policy reforms over time.

Table 3.1: Size-class Distribution of Plants at the 2-digit level NIC Product Groups: Parametric estimates

Parametric Estimates				2004-05				2011-12				2017-18			
S No	NIC 2008	NIC 2004	Description	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins
1	Division 10+11	Division 15	Manufacture of food products	-	-	-	-	-	-	-	-	-	-	-	-
2	Division 12	Division 16	Manufacture of tobacco	-	-	Y	75-100	Y	125-150	Y	125-150	Y	75-100	Y	75-100
3	Division 13	Division 17	Manufacture of textiles	-	-	-	-	Y	100-125	-	-	-	-	Y	50-75
4	Division 14	Division 18	Manufacture of wearing	Y	150-175	Y	175-200	-	-	-	-	Y	50-75	Y	75-100
5	Division 15	Division 19	Manufacture of leather	-	-	-	-	-	-	Y	75-100	-	-	Y	75-100
6	Division 16	Division 20	Manufacture of wood and	-	-	-	-	-	-	Y	150-175	-	-	-	-

Parametric Estimates	S No	7	8	9	10	11	12	13	14	15	16
	NIC 2008	**Division 17**	**Division 18**	**Division 19**	**Division 20**	**Division 22**	**Division 23**	**Division 24**	**Division 25**	**Division 28**	**Division 26**
	NIC 2004	**Division 21**	**Division 22**	**Division 23**	**Division 24**	**Division 25**	**Division 26**	**Division 27**	**Division 28**	**Division 29**	**Division 30**
	Description	**Manufacture of paper and paper**	**Printing and reproducti**	**Manufacture of coke and**	**Manufacture of chemicals**	**Manufacture of rubber and plastics products**	**Manufacture of other non-**	**Manufacture of basic metals**	**Manufacture of fabricated**	**Manufacture of machinery**	**Manufacture of computer,**
2004-05	**Regular Worker**	-	-	-	-	-	-	-	-	-	-
	Bins	-	-	-	-	-	-	-	-	-	-
	Total Worker	-	-	Y	-	-	-	-	-	-	Y
	Bins	-	-	75-100	-	-	-	-	-	-	100-125
2011-12	**Regular Worker**	-	-	-	-	-	-	-	-	-	-
	Bins	-	-	-	-	-	-	-	-	-	-
	Total Worker	-	Y	Y	-	-	Y	-	-	-	Y
	Bins	-	25-50	50-75	-	-	75-100	-	-	-	75-100
2017-18	**Regular Worker**	-	-	-	-	-	-	-	-	-	-
	Bins	-	-	-	-	-	-	-	-	-	-
	Total Worker	Y	Y	-	Y	Y	Y	-	Y	Y	Y
	Bins	75-100	75-100	-	50-75	75-100	25-75	-	75-100	50-75	75-100

Parametric Estimates				2004-05				2011-12				2017-18			
S No	NIC 2008	NIC 2004	Description	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins
17	Division 27	Division 31	Manufacture of electrical	-	-	Y	75-100	Y	75-100	Y	75-100	-	-	Y	75-100
18	Division 21	Division 33	Manufacture of pharmaceu	-	-	Y	100-125	-	-	Y	175-200	-	-	Y	75-100
19	Division 29	Division 34	Manufacture of motor vehicles,	-	-	Y	75-100	Y	100-125	Y	125-150	-	-	Y	75-100
20	Division 30	Division 35	Manufacture of other transport	-	-	Y	125-150	-	-	-	-	-	-	Y	75-100
21	Division 31	Division 36	Manufacture of furnitur	Y	125-150	Y	150-175	-	-	-	-	-	-	Y	75-100

Source: Authors' Tabulation; Y- denotes presence of a Missing/ shrinking middle

Notably, the relatively lower presence of mid-sized plants missing appears particularly pronounced in industries such as tobacco products, manufacture of computer, electronic and optical products, manufacture of electrical equipment, pharmaceuticals, medicinal chemical and botanical products, and motor vehicles, trailers and semi-trailers. Interestingly, across all these industries, the shrinking middle is observed primarily within a specific range of worker bins – typically between 75-100, 100-125, and 125-150 employees. This observation aligns with that by Ngai & Pissarides (2007) on structural changes in growth models across different sectors. Further, as Alfaro & Chari (2014) observe, there can be non-linear distributional impact of policy changes on industries, potentially offering another avenue for further investigation.

The non-parametric analysis strengthens the findings on shrinking middle phenomenon as observed from the parametric estimates. Examining the data without assuming a specific

distribution pattern provides a more granular view, as in Table 3.2. Here, the incidence of shrinking middle increases over time. By 2017-18, the analysis identifies 12 out of the 21 industries exhibit this phenomenon. This suggests an accelerating shift in the firm size distribution pattern in a larger number of industries. Furthermore, the analysis reveals another intriguing aspect – the bins where the shrinking middle is observed vary. Unlike the specific range identified through parametric estimates, non-parametric analysis suggests that the shrinking middle phenomenon is observed across a wider spectrum of firm size, ranging from those with as few as 50-75 workers to those with 175-200 workers. This variation underscores the complexity of the phenomenon and suggests that there is evidence beyond a single, specific bin where absence of mid-sized firms can be observed and thus suggesting the possible varying impact of the factors apart from stringent labour regulations driving the phenomenon of shrinking middle. These other determinants can be firm level characteristics, industry level attributes and other macroeconomic and policy factors.

Table 3.2: Size-class Distribution of Plants at the 2-digit level NIC Product Groups: Non-parametric estimates

Non-parametric estimates				2004-05				2011-12				2017-18			
S No	NIC 2008	NIC 2004	Description	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins
1	Division 10+11	Division 15	Manufacture of food products and	-	-	-	-	-	-	-	-	Y	175-200	-	-
2	Division 12	Division 16	Manufacture of tobacco products	-	-	-	-	Y	175-200	-	-	-	-	-	-
3	Division 13	Division 17	Manufacture of textiles	-	-	-	-	-	-	-	-	-	-	-	-

14	13	12	11	10	9	8	7	6	5	4	S No	Non-parametric estimates
Division 25	Division 24	Division 23	Division 22	Division 20	Division 19	Division 18	Division 17	Division 16	Division 15	Division 14	NIC 2008	
Division 28	Division 27	Division 26	Division 25	Division 24	Division 23	Division 22	Division 21	Division 20	Division 19	Division 18	NIC 2004	
Manufacture of fabricated metal	Manufacture of basic metals	Manufacture of other non-metallic	Manufacture of rubber and	Manufacture of chemicals and	Manufacture of coke and refined petroleum	Printing and reproduction of	Manufacture of paper and paper products	Manufacture of wood and products of	Manufacture of leather and related	Manufacture of wearing apparel	Description	
-	-	-	-	-	Y	-	-	-	-	-	Regular Worker	2004-05
-	-	-	-	-	100-125	-	-	-	-	-	Bins	
-	-	-	-	-	-	-	-	-	-	-	Total Worker	
-	-	-	-	-	-	-	-	-	-	-	Bins	
-	-	-	-	-	-	-	-	-	-	-	Regular Worker	2011-12
-	-	-	-	-	-	-	-	-	-	-	Bins	
-	-	-	-	-	-	-	-	-	-	-	Total Worker	
-	-	-	-	-	-	-	-	-	-	-	Bins	
-	-	Y	-	Y	Y	Y	-	Y	Y	Y	Regular Worker	2017-18
-	-	100-125	-	150-175	50-75	175-200	-	100-120	125-150	200-225	Bins	
-	-	Y	-	-	Y	-	-	Y	-	-	Total Worker	
-	-	200-225	-	-	125-150	-	-	125-150	-	-	Bins	

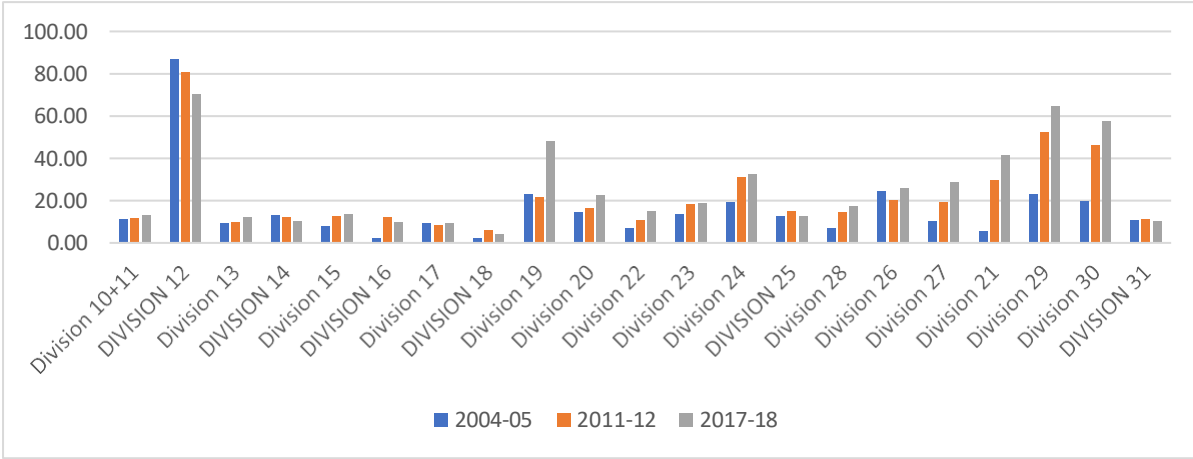
Non-parametric estimates				2004-05				2011-12				2017-18			
S No	NIC 2008	NIC 2004	Description	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins	Regular Worker	Bins	Total Worker	Bins
15	Division 28	Division 29	Manufacture of machinery and	-	-	-	-	-	-	-	-	Y	150-750	-	-
16	Division 26	Division 30	Manufacture of computer, electronic	Y	100-125	-	-	-	-	-	-	Y	175-200	-	-
17	Division 27	Division 31	Manufacture of electrical equipment	-	-	-	-	-	-	-	-	Y	150-175	Y	175-200
18	Division 21	Division 33	Manufacture of pharmaceuticals,	Y	75-100	-	-	-	-	-	-	-	-	-	-
19	Division 29	Division 34	Manufacture of motor vehicles, trailers and	-	-	-	-	-	-	-	-	-	-	-	-
20	Division 30	Division 35	Manufacture of other transport equipment	-	-	-	-	-	-	-	-	Y	175-200	-	-
21	Division 31	Division 36	Manufacture of furniture	Y	125-150	-	-	-	-	-	-	Y	100-125	Y	125-150

Source: Authors' Tabulation; Y- denotes presence of a Missing/ shrinking middle

Both the parametric and non-parametric analyses with regards to product groups reveal another interesting observation – a noticeable decline in the intensity of regular worker along with the increasing trend of the intensity of contract workers. This shift in workforce composition aligns with the narrative of the "missing middle" phenomenon. The presence of shrinking middle could be accompanied by a shift in worker deployment strategies, with firms using more of contract workers than regular workers, as evident in Figure 3.3 where the intensity of contract worker per factory is rising over the years across most industries. For

instance, baring 6 products groups (Manufacture of food products; Manufacture of wearing; Manufacture of wood and products of wood; Printing and reproduction of recorded media; Manufacture of fabricated metal products, except machinery; Manufacture of furniture), 15 groups have shown increase in contract worker intensity over the years. As against regular workers, the total workers bring in more flexibility as it includes contract workers as well. Indian manufacturing has thus witnessed notable increases in the share of contract workers across product groups. Compared to regular workers, contract workers generally come with lesser compliance costs for firms, particularly under the Indian labour laws (Sakpal, 2016). The contract workers play an important role in shaping the size distribution of firms (Ramaswamy, 2013; Nagaraj 2018), which helps the firms to maintain flexibility in workforce. The firms increasingly rely on them in order to navigate stringent labour laws and market rigidities (Singh et al., 2017; Kapoor & Krishnapriya 2019).

Figure 3.3: Contract workers per factory across 2-digit NIC product levels



Source: Author's tabulation; Divisions are as per NIC 2008.

3.5 Technology characteristics of plants and Missing Middle

The product-specific analysis is followed by an exploration of missing middle or shrinking middle across industries in different technology categories. To reiterate, the firms are classified using OECD technological classification, at the 4-digit level of classification (the classifications along with concordance are provided in the Table A1.1 in the annexure to Chapter 1). Alike the product level analysis, the analysis based on technology characteristics of industries is carried out studying the distribution for regular workers, post which the distribution of total workers has also been studied. Needless to say, the analysis of total workers is necessitated in order to highlight the role of contract workers in shaping the size distribution of firms. The parametric analysis has been carried out using frequency curves using frequency densities, while the non-parametric analysis has used Kernel density estimates. The parametric estimates show presence of missing middle across different technological categories across different time points. In particular, the analysis based on parametric techniques points to evidence of shrinking middle in the high-technology sector.

Table 3.3: Technology-wise Evidence of Missing Middle: Parametric Estimates

Years	Worker Type	High Technology	Bins	High Medium Technology	Bins	Low Medium Technology	Bins	Low Technology	Bins
2004-05	Regular Workers	-	-	-	-	-	-	-	-
2004-05	Total Workers	-	-	-	-	-	-	Y	75-100
2011-12	Regular Workers	Y	150-175	-	-	-	-	-	-
2011-12	Total Workers	-	-	-	-	-	-	-	-
2017-18	Regular Workers	Y	175-200	-	-	-	-	-	-
2017-18	Total Workers	Y	75-100	Y	50-75	Y	50-75	-	-

Source- Authors tabulation
Y- denotes presence of a Missing/ shrinking middle

Table 3.3 also clearly demonstrates an increasing presence of a shrinking middle across industries classified on technological characteristics during the time period. This translates to a decline in the proportion of mid-sized firms within this sector, indicating a widening gap between large firms and smaller plants across technological categories. Interestingly, the high-medium and low-medium technology sectors exhibit a different pattern. Shrinking middle class was only observed at a single time point (2011-12) for the total worker distribution in these sectors. There is concentration of shrinking middle in the 50-75, 75-100, 150-175 and 175-200 bin with respect to the high technology sector. Notably, the low-technology sector, displayed no evidence of a shrinking middle class.

The non-parametric analysis offers more nuanced evidence on the shrinking middle phenomenon in industries across different technology categories. While the analysis using parametric techniques suggest absence of shrinking middle in the low-technology sector, the non-parametric approach reveals a single instance of a shrinking middle for regular workers in manufacture of tobacco and tobacco products in 2011-12. The findings highlight that technologically less advanced sectors are more likely to follow this trend.

Table 3.4: Technology Category wise Evidence on Missing Middle: Non-parametric Estimates

Years	Worker Type	High Technology	Bins	High Medium Technology	Bins	Low Medium Technology	Bins	Low Technology	Bins
2004-05	Regular Workers	Y	175-200	-	-	Y	225-250	-	-
2004-05	Total Workers	-	-	-	-	Y	150-175	-	-
2011-12	Regular Workers	Y	125-150	Y	175-200	Y	150-175	Y	150-175
2011-12	Total Workers	-	-	-	-	Y	125-150	-	-
2017-18	Regular Workers	Y	225-250	Y	175-200	Y	125-150	-	-
2017-18	Total Workers	-	-	-	-	Y	125-150	-	-

Source- Authors tabulation
Y- denotes presence of a Missing/ shrinking middle

The high-medium technology sector also demonstrates shrinking middle in the non-parametric analysis. Here, the shrinking middle class is confined to the distribution of regular workers, but this appears across only two time points, viz. 2011-12 and 2017-18. This suggests a potential decline in mid-sized firms employing regular workers within this sector; however, the distribution of total workers does not reveal any evidence on shrinking middle.

The most significant deviation from the parametric analysis comes for the low-medium technology sector. Unlike the initial picture of absence of shrinking middle, the non-parametric approach reveals a persistent shrinking middle class across all three time points for both regular and total worker distributions. Additionally, the worker size ranges in this technology segment are broader, for instance in a wider band from 125-150 to 225-250 workers. The findings point out that instance of shrinking middle is prominent in the low-medium technology sector.

The non-parametric estimates for high-technology sector reveal the consistent presence of a shrinking middle class across all time points for regular workers. This reinforces the notion

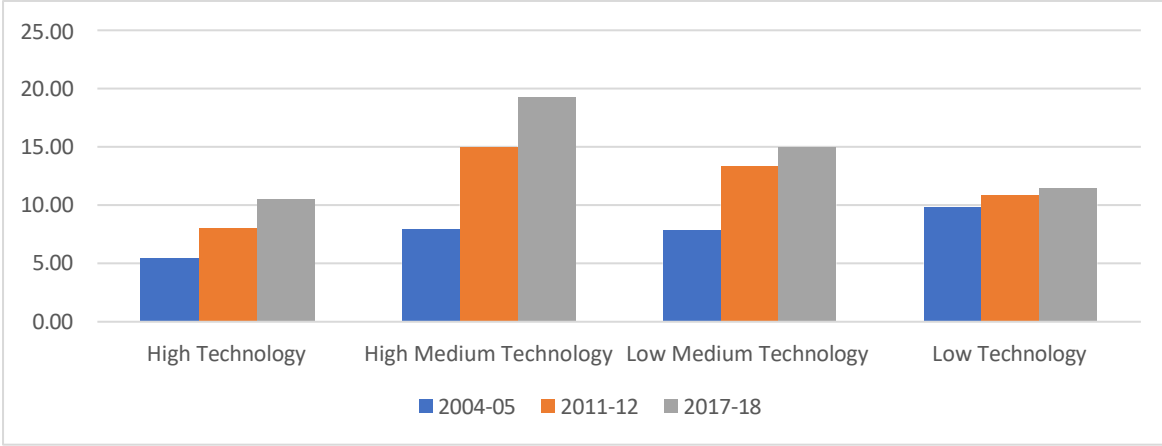
that innovation and automation in production process within this sector might be creating a scenario dominated by large high technology plants with a smaller pool of highly specialized jobs.

On the whole, a closer examination reveals four key insights regarding the shrinking middle class within the manufacturing sector, categorized by the technology classification. First, widespread presence of shrinking middle is observed with the only exception of food and beverage and basic metals industries. Notably, sectors heavily reliant on more advanced technology, such as electronics, pharmaceuticals, and motor vehicles have consistently experienced a shrinking middle class across the years. For the electronics industry, there is particular focus on technologies and automation and, therefore, a requirement of skilled personnel working in the sector in areas including engineering and information technology (IT) (Liu et al., 2021). In this industry, there tends to be rapid labour productivity growth caused by adopting newer technologies and approaches (Lim & Lee, 2002). Conversely, the pharmaceutical industry is marked by high inter-sector linkages, especially with manufacturing, transport, and postal services, reflecting a high economic spillover to other industries (Das & Kashyap, 2021). Moreover, cost-sharing and entry barriers in the pharmaceutical sector can affect aggregate productivity and wage levels (Grossmann, 2013). The automotive industry has both labour-intensive and capital-intensive procedures, with associated effects on labour allocation and productivity (Liu et al., 2021). The shrinking middle phenomenon is observed for both regular and total worker categories, suggesting a decrease in the number of mid-sized firms across all worker types within these sectors.

Second, the analysis delves into the specific firm size ranges affected by the shrinking middle class. Interestingly, the results from parametric and non-parametric approaches are different. While the parametric estimates suggest a shrinking middle around the 100-worker threshold, perhaps influenced by labour regulations, the non-parametric estimates reveal a broader range

– from 50 to 250 workers. This observation can also be clubbed to that of increase in contract worker intensity, as observed in Figure 3.4, with the contract workers playing a significant role to evade regulatory hurdles. This discrepancy highlights the need for further investigation into factors beyond labour regulations, likely linked to technological and other characteristics, which are also shaping up this trend.

Figure 3.4: Contract worker per factory across levels of technology



Source: Author's tabulation; Technology classifications are as per Hatzichronoglo (1997).

Third, the analysis underscores a clear linkage between technology status and the shrinking middle class. The technology level analysis shows that high-tech sectors consistently displayed a shrinking middle class, while low-tech sectors do not reveal such a pattern with the latter exhibiting lower incidences of a shrinking middle class.

Last, but not of least significance, the incidence of a shrinking middle appears to be increasing across a large number of sectors over time. Compared to earlier years, a significant increase is observed in 2017-18, with 12 out of 21 sectors showing evidence of a shrinking middle. This necessitates further investigation to understand the specific factors driving this trend of increasing evidence of missing middle.

3.6 Summary of Major Findings

The paper has explored the size distribution of firms in Indian manufacturing first at the disaggregated product level as well across different technological categories. The technological categories include high technology, high medium technology, low medium technology and low technology. Such analyses are necessitated based on the structural changes within manufacturing sector towards (which products and technological categories).

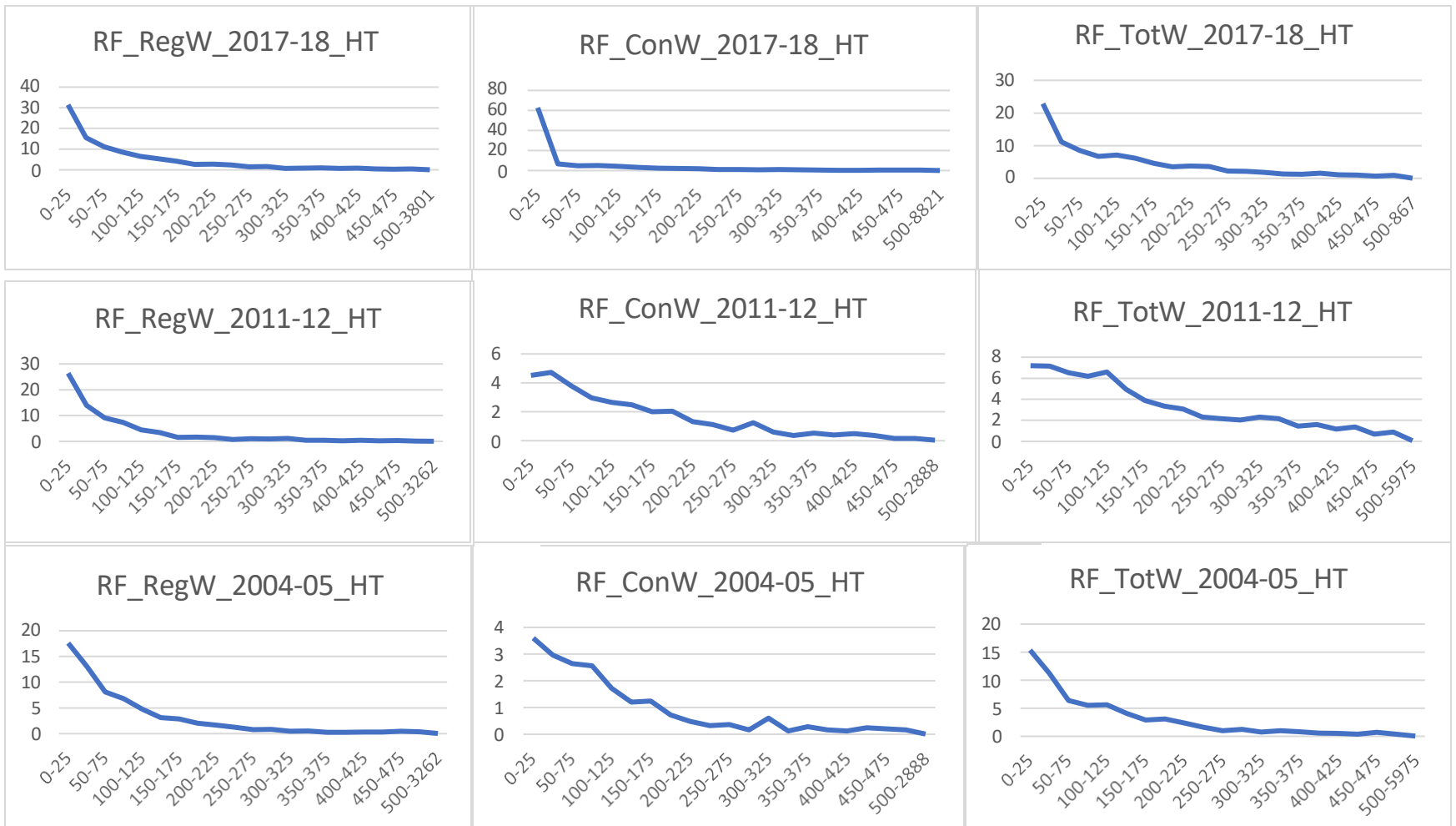
The industry level analysis reveals that the incidence of shrinking middle is increasing over time. In 2017-18, a total of 12 out of 21 industries exhibited the phenomenon of shrinking middle as evident from the non-parametric analysis. Further, it is observed that the bin sizes where the shrinking middle is observed also exhibits widespread variation which lays emphasis on factors other than labour legislation. The evidence on absence of mid-sized firms varies across industries as well. Such evidence points to other firm specific and industry specific factors like age of firm, skill intensity of workers, capital intensity, the level of technology used in production process are at play in determining missing middle which might affect the absence of mid-sized firms.

The technology level analysis finds that the high-technology sector and low-medium technology sector show higher presence of shrinking middle. The prevalence of shrinking middle is more pronounced industries with higher technological intensity. Industries like electronics, pharmaceuticals and motor vehicles which are technology intensive are found to be exhibiting the phenomenon of shrinking middle. Additionally, alike the industry level findings, the shrinking middle is not restricted to the 100-worker threshold, it is observed in a wider band ranging from 125-150 workers to 225-250 workers. The prevalence of shrinking middle to the low-medium sector could be attributed to factors like lack of finance, regulatory hurdles, informality trap, market access and lack of skill development (Mukherjee, 2018; Mer & Virdi, 2024; Manida & Arumugam, 2024).

It is interesting to note that the intensity of contract worker is on the rise. Rising contract worker intensity is brought about by several factors including globalization, competition from imports, and the call for flexibility in the labour market (Goldar & Aggarwal, 2012; Sakpal, 2016; Saha et al., 2013; Nagar, 2017; Chakraborty et al., 2021). Indian firms have been found to opt for contract employees rather than regular employees to avoid stringent labour regulations, lower overhead expenses, and improve competitiveness (Bose & Ramaswamy, 2020; Mitra & Ghosh, 2022; Nagar, 2017; Neog & Sahoo, 2020). A detailed analysis of various factors determining the absence of mid-sized firms in firm size distribution is taken up in Chapter 4.

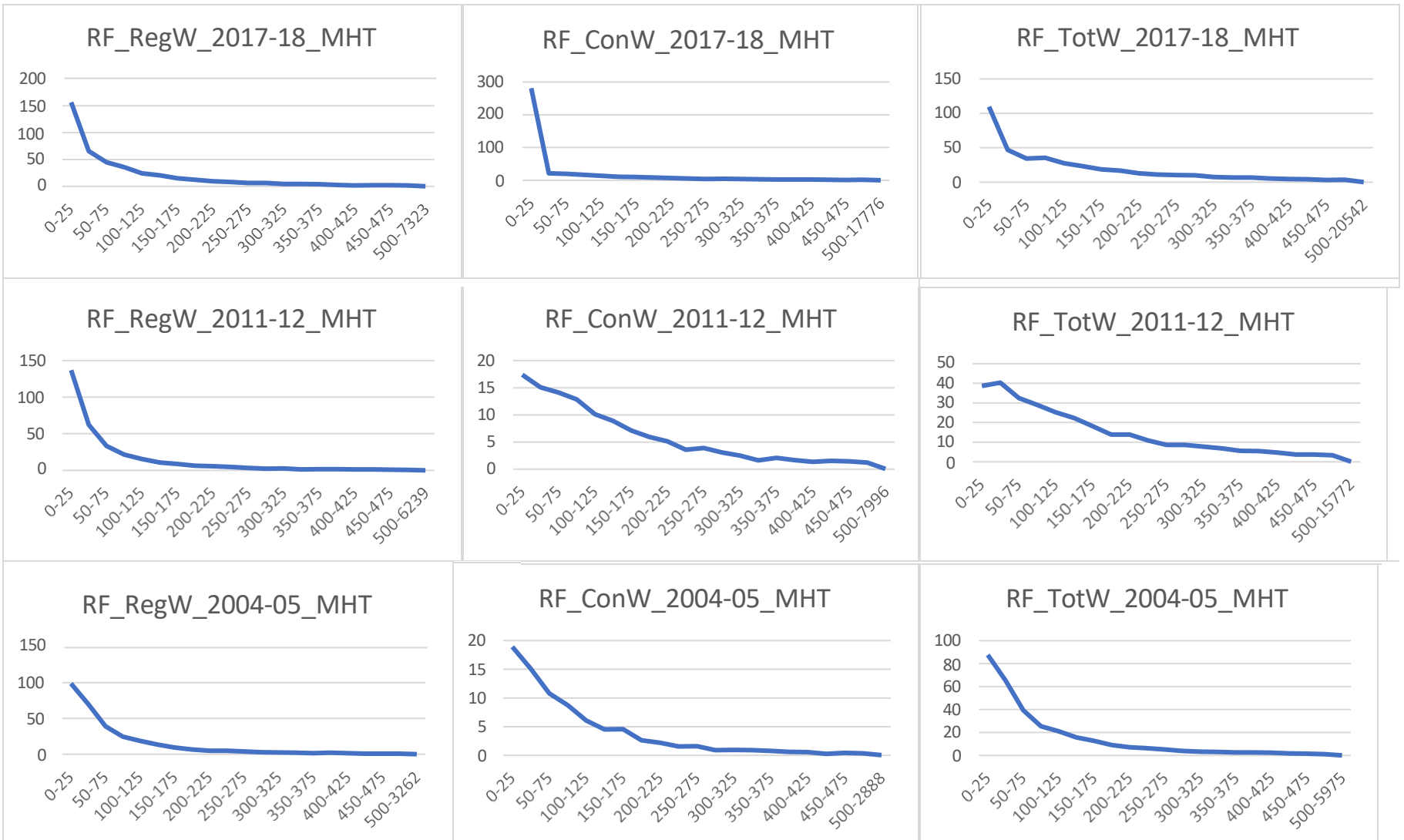
Annexure to Chapter 3

Figures A3.1 – Technology wise parametric estimates across different levels of workers for High Technology sector.



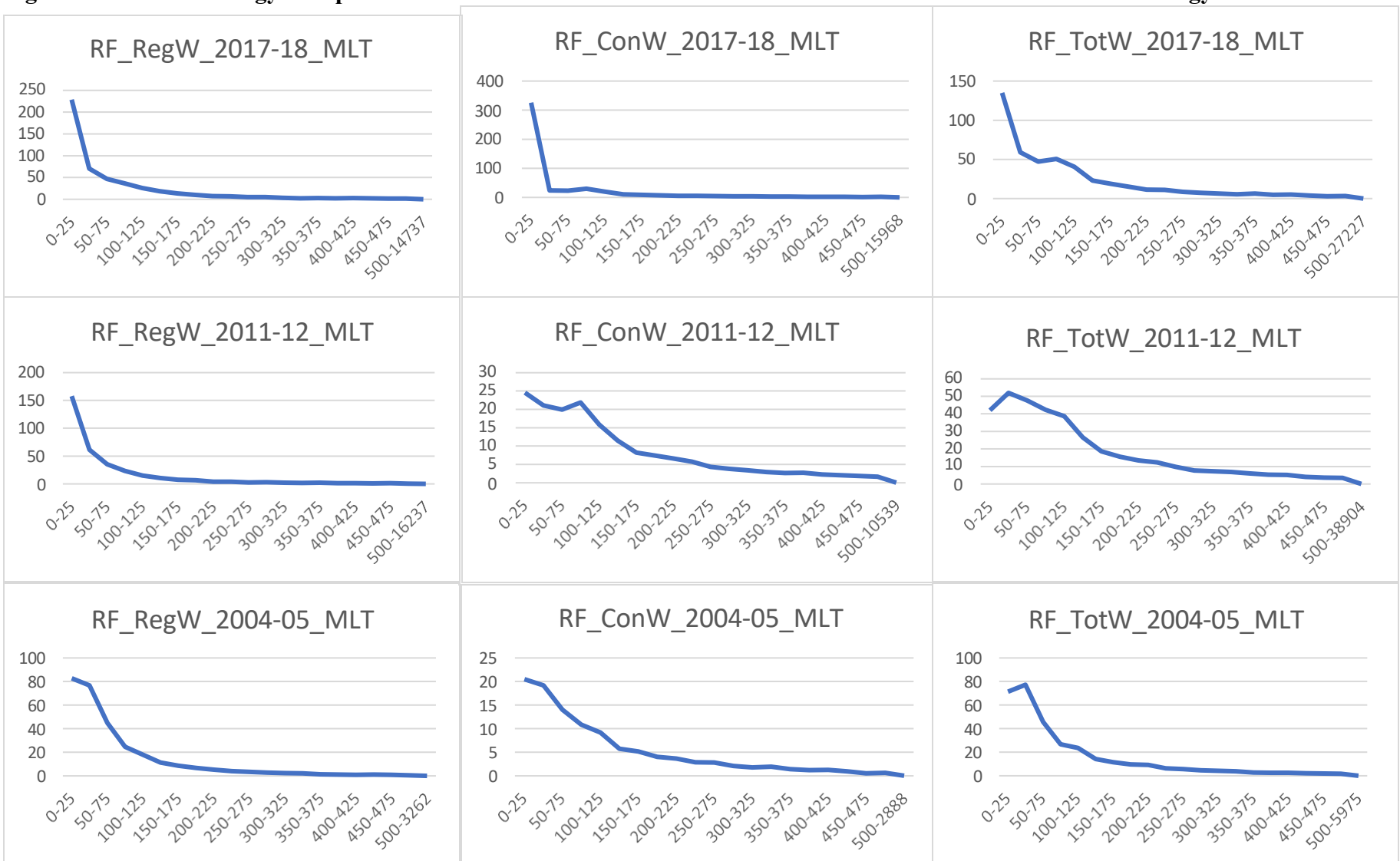
Source: Authors' Tabulation

Figures A3.2 – Technology wise parametric estimates across different levels of workers for Medium High Technology sector.



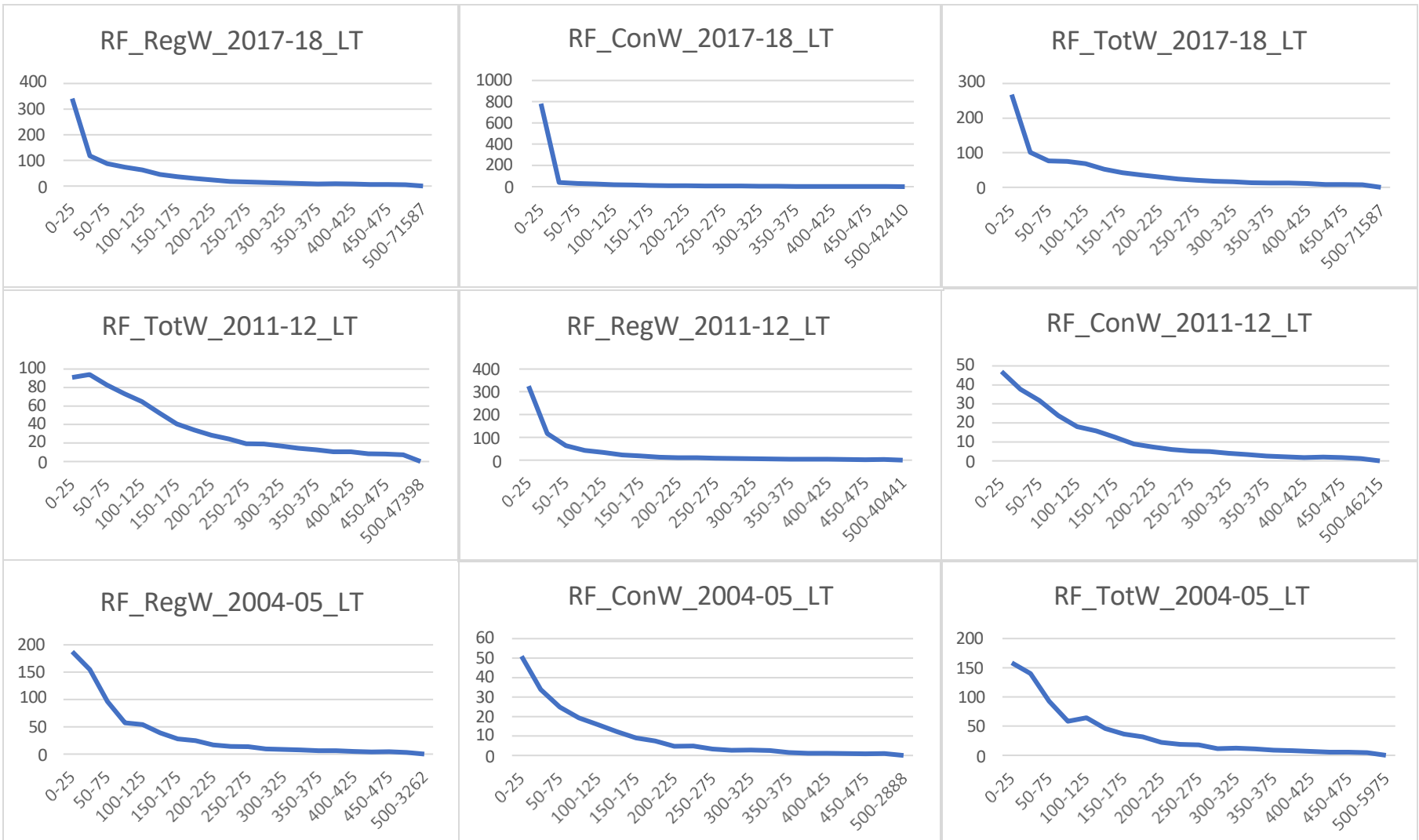
Source: Authors' Tabulation

Figures A3.3 – Technology wise parametric estimates across different levels of workers for Medium Low Technology sector.



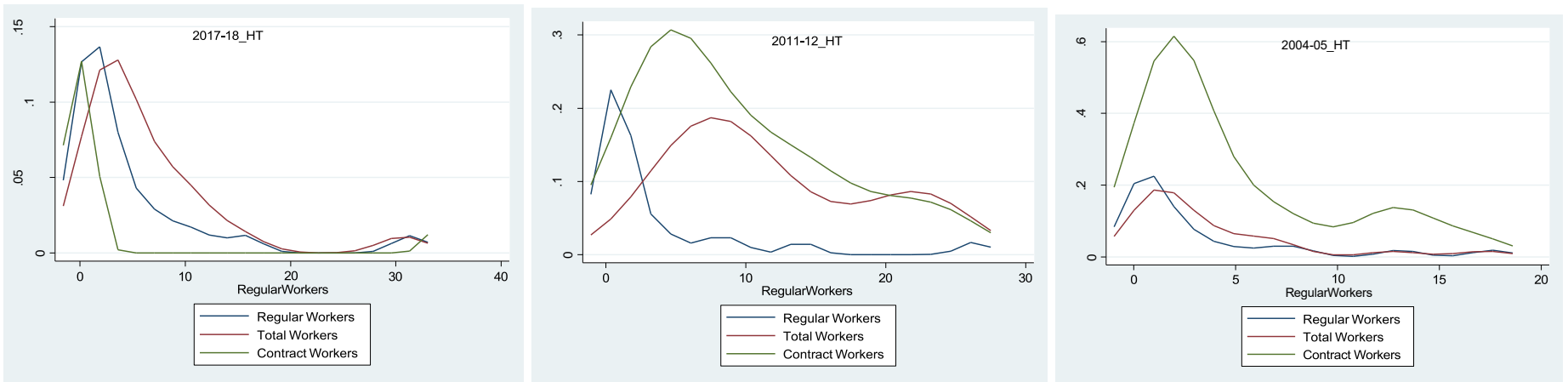
Source: Authors' Tabulation

Figures A3.4 – Technology wise parametric estimates across different levels of workers for Low Technology sector.



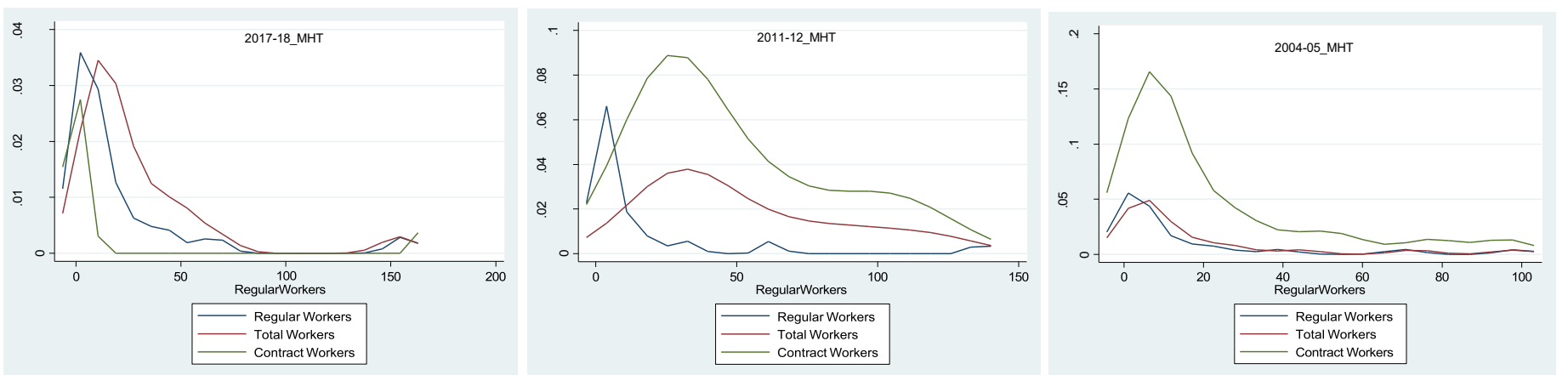
Source: Authors' Tabulation

Figures A3.5 – Technology wise non-parametric estimates across different levels of workers for High Technology sector.



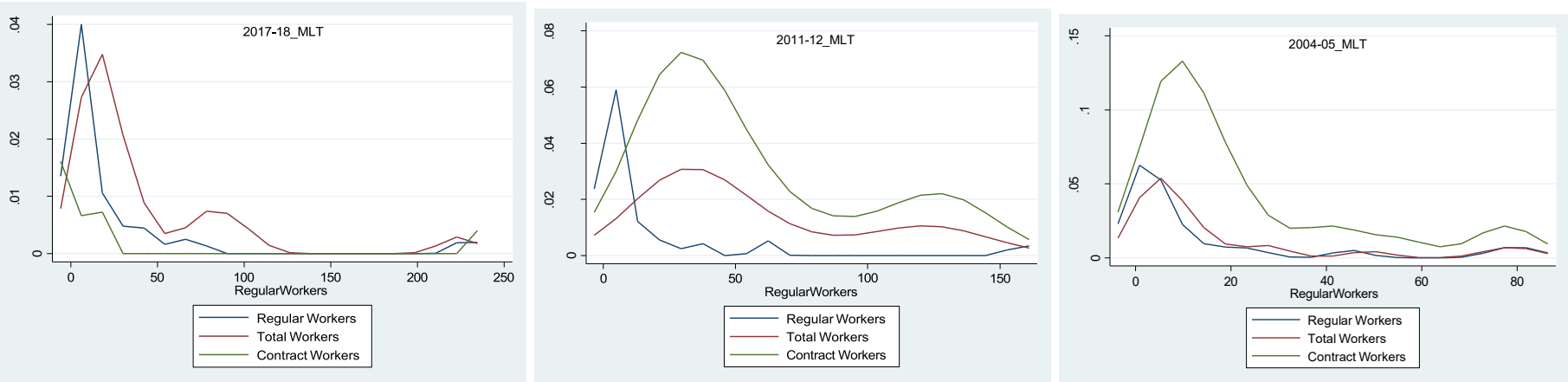
Source: Authors' Tabulation

Figures A3.6 – Technology wise non-parametric estimates across different levels of workers for Medium High Technology sector.



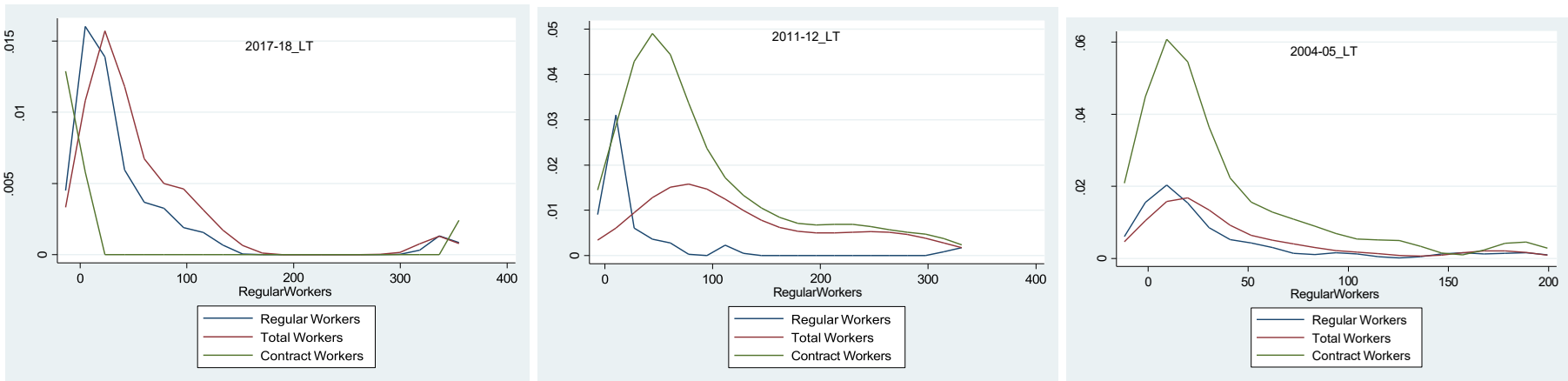
Source: Authors' Tabulation

Figures A3.7 – Technology wise non-parametric estimates across different levels of workers for Medium Low Technology sector.



Source: Authors' Tabulation

Figures A3.8 – Technology wise non-parametric estimates across different levels of workers for Low Technology sector.



Source: Authors' Tabulation

CHAPTER 4

FACTORS DETERMINING THE "MISSING MIDDLE": *An Investigation*

4.1. Prelude

This chapter investigates into the factors underlying the (non)existence of missing middle in Indian manufacturing. The previous two chapters examine the existence of missing middle or shrinking middle at national and sub-national levels for aggregate manufacturing as well as across different manufacturing industries in India by using plant level information. The empirical investigation in these chapters have inferred the very existence of bi-modality depends on the type of workers, definition of bins, method used, state-level characteristics, and industry level characteristics over time.

The presence of missing middle has been confirmed as observed in chapter 2. This finding of existence of missing middle is in tandem with those of Tybout (2000), Mazumder & Sarkar (2009b), Krueger (2013) and Ramaswamy (2013, 2015). Further, at the industry level, high-technology and high medium-technology sectors reveal the presence of shrinking middle phenomenon in sharp contrast to the low-technology sectors. The existing literature shows that constraints in the labour market and consequent regulatory hurdles faced by large firms can be one of the major reasons underlying the existence of missing middle (Besley& Burgess, 2004; Hasan & Jandoc, 2013; Amirapu & Getcher, 2014). The role of contract workers in shaping the distribution of manufacturing employment also highlights the importance of labour market restrictions (Ramaswamy, 2013,2015). The evidence in the earlier chapters point to the fact that labour legislation is not the sole factor determining existing of missing middle, nuanced evidence at the disaggregated point to the impact of firm and industry specific characteristics including technology adoption, state level attributes also impact on the size distribution of firms.

In this context it is important to delve into various factors that determine the (non) existence of missing middle. In Section 4.2, some more stylized facts are presented on the incidence of labour legislation across states in addition to a brief description of changing labour legislation across states. The section that follows, based on the existing literature, discusses the factors including labour market (non)restrictiveness affecting missing middle. The next section discusses the data and econometric method for the empirical investigation. Section 4.4 presents and analyses the econometric results. Section 4.5 summarises the major findings.

4.2 Some More Stylised Facts

The existing literature, as has been discussed in Chapter 1 as well as later in this chapter, that labour legislation plays a crucial role in determining the relative absence of mid-sized firms. This necessitates an understanding of the changes in labour legislation in India.

As per the Constitution of India, Labour Regulations are subject of the "Concurrent List", implying that the Central Government as well the State Governments of respective State have the authority to amend the Labour Laws. The Industrial Disputes Act, 1947 (IDA), is a prime constituent of the labour regulatory framework. This act provides the guidelines and clauses behind protection to employees such as in redundancy or retrenchment. It is mandatory for employers to comply with the IDA in order to conduct business. The engagement and laying off of employees are undertaken in due compliance of the IDA. The jurisdiction of IDA extends only to those of "workmen", which includes workers who are not linked to any managerial or administrative capacity and to supervisory workers who earn less than INR 10000. A section of the IDA sets the cutoff for the requirement of Government nod in order to retrench a worker, the cutoff being set at 100 workers, now is being raised to 300 workers. The IDA along with the Trade Unions Act 1926 (TUA) govern the industrial relations scenario in India. The IDA on one hand provides for a detailed mechanism for dispute resolution whereas the TUA talks

of legalizing the formation of trade unions and provides safeguards to workers through trade unions.

Apart from the IDA, the labour regulatory framework in India is also governed by the Equal Remuneration Act 1976 which prohibits discrimination in remuneration on grounds of gender; the Rights of Persons with Disability Act 2016 which prohibits discrimination on grounds of disability; the Maternity Benefit Act 1961 which prohibits the discrimination based on the maternity status of female employees along with the provision for paid maternity leave[10]. The Prevention and Control Act 2017 which prohibits discrimination based on HIV and AIDS; the Protection of Rights Act 2019 which prohibits discrimination against a transgender person; the Prevention, Prohibition and Redressal Act 2013 which prohibits sexual harassment of women in workplaces. To safeguard the privacy of employees the regulatory guidelines are set as per the Information Technology Act 2000 which deals with safeguarding personal and sensitive data of employees. Employment contracts (via the Industrial Employment (Standing Orders) Act, 1946 and Contract Labour (Regulation and Abolition) Act 1970), notice entitlement (via the IDA and State specific Shops and Establishments Act), leave entitlement (via the Maternity Benefit Act and State specific Shops and Establishment Act), entitlement towards Employees Provident Fund (via the Employee Provident Fund, Miscellaneous Provisions Act, 1952 and the Unorganised Worker's Social Security Act 2008.), Wage regulation (via Payment of Wages Act 1936, Minimum Wages Act 1948, the Payment of Gratuity Act 1972, payment of Bonus Act 1965), inter-state migration of workers (via the Inter-State Migrant Workers Act 1979), provision of health and safety (via the Workmen's Compensation Act 1923, Factories Act 1948 and Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act 2013, of are significant areas which govern the labour regulatory scenario.

[10] However, the provision of Paternity Leave has been disposed at the discretion of the employer.

There have been some developments in the regulatory scenario, where the Government of India has proposed for consolidation of the existing labour laws in four codes. The four codes are-

(i) The Code on Wages 2019 has proposed to replace the existing Minimum Wages Act 1948, Payment of Wages Act 1936, Payment of Bonus Act, 1965 and Equal Remuneration Act 1976.

(ii) The Occupational Safety, Health and Working Conditions Code 2019 replaces the existing 13 labour laws which relates to the working condition of workers including the Factories Act 1948, the Mines Act 1952, the Dock Workers Act 1986, the Contract Labour Act 1970 and the Inter-State Migrant Workers Act 1979.

(iii) The Industrial Relations Code 2019 which has been targeted at replacing the IDA, TUA and Industrial Employment (Standing Order) Act 1946.

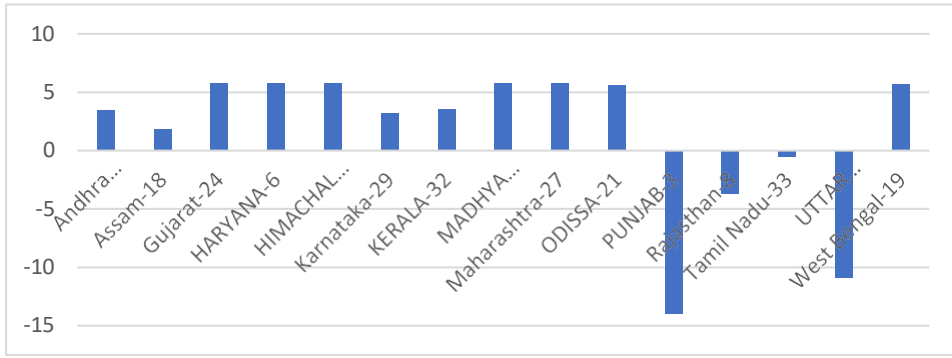
(iv) The Code on Social Security 2019 replaces the then existing nine laws on labour security in India, namely the EPF Act, the Maternity Benefit Act and the Unorganised Worker's Social Security Act 2008.

A move towards creation of a simpler structure for Labour Regulation in India is distinctly evident, however the codes have not been put to practice as of now. Very recently, the Government has raised the ceiling on the number of workers needed in a firm to seek Government approval before retrenchment or closure from 100 workers to 300, however the States Governments were given a free hand to tweak the threshold as per their will. The Government has also proposed to include the gig workers (workers who work for online delivery etc.) in the purview of the four labour codes. The codes have been designed in a way so that the Government has the power to tweak hiring, retrench and fix working hours in factories and establishment, at the same time restricting powers to workers in the formation of labour union.

For the purpose of a quantitative measure of labour legislation, a new labour legislation index (LLI), an alternate to the existing indices, has been developed. A detailed discussion on the existing indices, their advantages and disadvantages, and the need for a new index along with its methodology is provided in in Annexure to Chapter 4. The amendments in labour intensity and industry for each of the 15 major states in India have been identified and classified according to four different time points: amendments till 1991 have been classified in group 1, amendments between 1991 and 2001 have been classified in group 2, amendments between 2001 and 2011 have been classified in group 3 and amendments post 2011 have been classified in group 4. The variations in labour legislation index (LLI) across states are evident (see table A4.4 in the Annexure to Chapter 4). Even the extent of labour regulation and ranking thereof vary from that in existing studies.

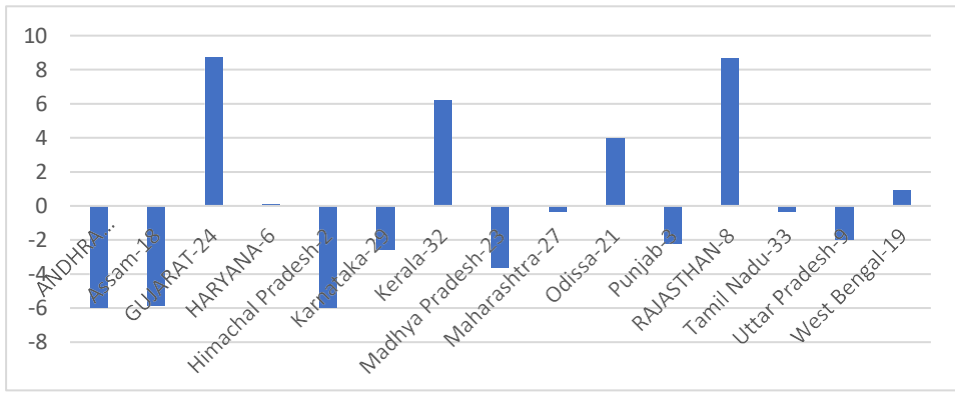
Higher value of the new index, LLI, shows that a state is pro-labour while lower index value implies that the state is more pro-employer. The variations in LLI across the 15 major states in India are shown in Figures 4.1a, 4.1b and 4.1c. The states where missing middle is observed are named in caps. Over the three time points, namely 2000-01, 2009-10 and 2017-18, the plots show a changing pattern of labour regulations across these states. While the existing literature suggests that in Indian context, labour legislation plays a critical role in determining employment practices, the plots do not necessarily reveal a one-to-one association between labour regulation and existence of missing middle.

Figure 4.1a: Labour Legislation Index across states:2000-01



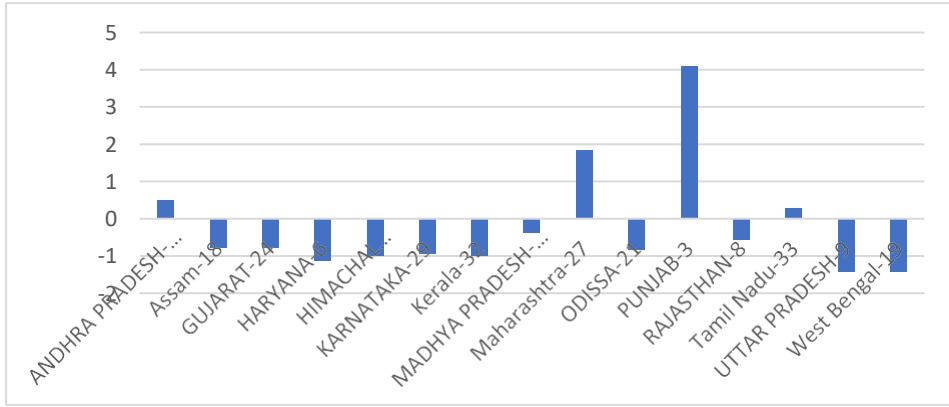
Source: Author's tabulation

Figure 4.1b: Labour Legislation Index across states: 2009-10



Source: Author's tabulation

Figure 4.1c: Labour Legislation Index across states: 2017-18



Source: Author's tabulation

The invariant LLI of a state, being invariant across firms, does not however reveal the nuanced association. Instead of using the LLI for gauging the impact on missing middle, the contract worker intensity in production workers can be used. It is important to note that labour legislation status of a state affects the use of contract workers by the firms located in that state. The plant-wise contract worker intensity will be a more appropriate variable to be used in finding out such micro-econometric relationship. The rationale behind using the ratio of contract to production workers can be traced from the existing literature (Ramaswamy, 2013; Saha et al., 2013; Nagar, 2018) where the authors argue that firms resort to use of contract labour in order to bypass the regulatory thresholds imposed by such legislations. The LLI is found to have a positive significant correlation with the ratio of contract to production workers (see Table 4.1).

Table 4.1: Correlation between LLI and Contract Worker-to- Production Worker ratio

Years	Correlation between LLI and Contract Worker/ Production Worker
2000-01	0.0645***
2009-10	0.0690***
2017-18	0.0799***
Overall	0.0467***

Source: Author's Tabulation; *** denotes significance at 1% level.

4.3. Factors affecting Missing Middle in Organised Manufacturing Sector

4.3.1 Labour Legislation and Missing Middle

There is an emerging literature on labour regulation and size distribution of firms. As has been observed earlier in Chapter 1, despite nuances in observations, labour regulations have often been cited as one of the prime reasons behind the size distribution of firms (Besley & Burgess, 2004; Hasan et. al., 2007; Mitra & Ural, 2008; Aghion et. al., 2008; Ahsan & Pages, 2009; Dougherty, 2011; Gupta et. al., 2009; Topalova, 2010; Topalova & Khandelwal, 2011, Goldar & Aggarwal, 2012; Hasan & Jandoc, 2013; Saha et. al., 2013; Sean et. al., 2014; Ghani

et. al., 2014; Ramaswamy, 2015; Sofi & Sharma, 2015; Goldar& Suresh, 2017; Ahluwalia et. al., 2018).

The initial push towards liberalization aimed towards reducing the rigidities in labour market were initiated in the 1990s when states began amending the labour laws ensuring greater flexibility in the labour market. This was partly driven by the need to attract foreign investment as well. The process of labour reforms continued in the 2000s, with states aiming for different approaches and leading to variations in the labour regulation across the economy. The Central Government has made significant changes to consolidate and simplify labour laws through introduction of four labour codes in 2020. However, the study ends in 2018. On the basis of these changes, it can be observed that labour market flexibility varies across states. The variations in labour legislation index across states are evident state (see construction of labour legislation index in Table A4.1 in annexure to chapter 4). Even the extent of flexibility and ranking thereof vary from that in existing studies. Literature suggests that in Indian context, labour legislation plays a critical role in determining employment practices.

Higher degrees of legal protection for permanent employees have led firms to adopt contractual arrangements as a cost-cutting and flexibility-enhancing strategy (Ramaswamy, 2013; Saha et al., 2013; Nagar, 2018). It has been observed that there happens to be a causal relationship between the stringency of labour legislation and the increasing reliance on contractual workers in India. For example, Saha et al. (2013) demonstrate that as formal labour laws become more stringent, employers in India's formal sector have increasingly resorted to hiring temporary workers through contractors in order to circumvent the legal protections and costs associated with permanent employment. This phenomenon reflects an attempt by firms to retain flexibility in a rapidly globalizing economy while minimizing the constraints imposed by established labour institutions. Complementary insights have been provided by Nagar (2018), where the authors find that labour market reforms in India are closely intertwined with

the paradox of generating both more and higher-quality employment. In his analysis, Nagar stresses that the significant increase in the share of contract workers within the organised sector is not merely a consequence of market liberalization but is also a response to rigidities embedded in labour legislation. These rigidities create an incentive for employers to outsource their workforce, thereby increasing the contractualisation of labour to sidestep the obligations associated with the protection of permanent employees. The increases contractualization in effect paves way for a scenario where the small firms choose to remain small bypassing the labour legislation and escaping the regulatory threshold measures (Ramaswamy, 2013).

To reiterate, the bin where missing middle is observed varies across different states, the labour legislations as well vary across states. This brings in variability in the strength of association between legislation and missing middle. Apart from labour legislations, there are firm and industry specific factors as well which explains missing middle in Indian manufacturing. A detailed review of studies on quantification of labour market flexibility is presented in the Annexure to Chapter 4.

4.3.2 Firm specific characteristics influencing missing middle

Apart from labour legislation index, firm specific characteristics also influence the economic dynamics of firms and are important in explaining the (non)existence of missing middle. Age of firms, skill level of workers, type of worker employment, working capital, sales, output and export intensity are the important firm specific factors which can affect the growth of firms especially in the context of missing middle.

Age of firms

The age of firms is a crucial characteristic that influences adaptability, innovation capacity and overall performance of firms. Saravanan & Rao (2007) suggests that as a firm gains experience, the operational performance improves over time. On the other hand, Rastogi & Kumar (2024) highlight that there might be negative impact on performance of firms as they

age, the authors are of the view that older firms perform poorly compared to newer firms which impedes their capacity for adaptability and innovation. While older firms can face challenges with regards to performance, younger firms are more prone to adapt and innovate.

Skilled and unskilled workers

The skill level of worker is an important aspect of firm specific characteristics. Skilled workers are important in driving innovation and productivity, in the context of export-oriented firms the role of skilled workers is unequivocal (Brambilla et al., 2023). As firms tend to technologically upgrade, they tend to employ more skilled workers, however it leads to a widening gap in wages between skilled and unskilled workers (Egger et al., 2020). While employing skilled workers might seem highly desirable, it is to be noted that the unskilled workers also play a significant role as they are less expensive compared to skilled workers. While employing too many unskilled workers may hinder the overall competence of firms in the long run, a firm must maintain a healthy balance between skilled and unskilled workers in order to strengthen competitiveness, growth, and competition (Tomiura et al., 2013).

Regular and Contractual workers

Employment type viz., regular or permanent and contractual is important in the context of missing middle. While the regular workers come under the purview of labour legislations, contract workers do not. Literature is filled with evidences suggesting that firms tend to shift focus from regular workers to contractual workers in respect of two aspect- firstly to reduces costs and secondly to bypass the regulatory compliances (Ramaswamy, 2013, 2015). This evidently provides a link between missing middle and use of contract workers through the channel of labour legislations which prevents firms from hiring regular workers beyond regulatory thresholds. In recent years, the reliance on contract workers has increased significantly (Bertrand, 2021). Firms in order to retain the bargaining power and wage demand in check tend to hire more contract workers (Kapoor & Krishnapriya, 2019).

Labour Intensity

Among other firm specific characteristics, the ratio of labour cost to total cost or labour intensity is vital in explaining the missing middle phenomena. High labour cost not only prevents small firms to grow but further hinders growth of large firms which do not achieve desired productivity levels Hsieh & Olken (2014). In short, high labour costs if not matched by productivity increases significantly hinder growth of firms especially the small firms (Erdogan, 2023).

Electricity

Among other infrastructural needs, the usage of electricity is pivotal in ensuring the scale of operation of firms. The Annual Survey of Industries (ASI) enumerates firms which employ 10 or more workers with electricity in line with section 2m (ii) which highlights the importance of electricity in the production process of firms. The cost of electricity is an important characteristic explaining growth of firms, high cost of electricity adversely affects firm output, machine intensity and labour productivity impacting the overall growth (Abeberese, 2013). Mid-sized firms are not better placed compared to large firms as they lack the financial leverage to adjust to operational costs (Alby et al., 2012). Further, disparities in access of reliable power supply create an uneven landscape whereby the mid-sized firms are disadvantaged (Parida et al., 2021).

Working capital

Managing working capital is an important because firms need to meet their short-term obligations and simultaneously position themselves for the long run. An optimal balance needs to be maintained between current assets and current liabilities in order to mitigate the risk associated with liquidity shortages. Working capital needs must be aligned with profitability in order to ensure financial sustainability (Moussa, 2019). Firms with strong working capital management are better suited to survive economic challenges and have better operational success (Arachchi et al., 2018). In the context of SMEs managing working capital is crucial as

they are usually crunched with financial leverage and which risks the operational capabilities and growth opportunities of firms (Tjandra, 2022).

Size of the firm

Sales performance of firms is a significant factor for firm growth. Growth in sales is necessary for increased revenue generation of firm, which can further have a positive impact on operational efficiency and expansion of market share of firms (Buzzell et al., 1975; Rust et al., 2002). Strong sales also have a positive influence on investor confidence which can be a prime factor driving investment in firms (Purba et al., 2025). Growth in output on the other hand is linked to firm's ability to meet market demand, with increase in output a firm can reap the benefits of economies of scale, improve productivity, reduce costs and effectively utilize resources (Park & Kim, 1995; Carlino, 2012). Output and sales form a crucial loop for firm, increased sales drive increased output and increased output drive increased sales.

Export Intensity

The ability of a firm to export has significant implications for firms, exports lead to access of larger markets, can significantly improve the firm's financial performance and capital structure, further increase the ROI in investments (Akeem et al., 2014; Vătavu, 2015; Pascucci et al., 2022). Export intensity influences firm level performance in terms of firm growth, productivity gains, innovation and impact financial sustainability of firms (Hao et al., 2016).

4.3.3 Industry specific characteristic influencing missing middle

Among industry specific characteristics, the level of technology is an important aspect impacting the size distribution of firms. The chapter 3 of this thesis revealed a link between the level of technology and the presence of missing middle in the sense that industries with high technology intensity are found to have a greater likelihood of a missing middle. Industries adapting technologies, experiencing rapid labour productivity growth are more prone to have a missing middle. The requirement of substantial capital to enter a technologically intensive

industry creates entry barriers for firms, and limiting smaller firms to grow (Soete, 1998; Barber et al., 2016). The micro and small firms often lack the necessary investible resources required for firm growth and are thus constrained to remain small. On the other hand, larger firms possess the financial resources to adapt new technology, reap the benefits of economies of scale and grow (Hoffman, 1998; Baumann & Kritikos, 2016).

The above discussion shows that labour legislation in the presence of technological adoption by firms, age, size, skill level of worker, type of worker, labour intensity, electricity usage, working capital, output, and export intensity are key factors in determining the (non) existence of mid-sized firms in the firm size distribution of organised manufacturing sector in India.

4.4 The Econometric Model and Dataset used

4.4.1 Construction of ordered pooled dataset

An ordered pooled dataset has been tabulated for the years 2000-01, 2009-10 and 2017-18. For each year, only those states which showed the presence of missing middle were considered in the pooled dataset. For example, in 2000-01, the missing middle has been observed in the states of Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Odisha, Punjab and Uttar Pradesh only, so the pooled dataset has only the observations of Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Odisha, Punjab and Uttar Pradesh for the year 2000-01. For the year 2009-10, the following states were taken in the study- Himachal Pradesh, Haryana, Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Kerala. For the year 2017-18 the following states were considered- Himachal Pradesh, Punjab, Haryana, Rajasthan, Uttar Pradesh, Odisha, Madhya Pradesh, Gujarat, Andhra Pradesh and Karnataka.

Further, instead of a binary dummy [0,1] specifying presence of absence of missing middle, an ordered dependent variable has been taken into consideration to preserve the ordinal

information, to generate more efficient estimation and have improved interpretability. At the state level, with bin width of 25 workers, the frequency densities were calculated and the same has been used to generate a kernel density plot in attempt to identify the bins where missing middle is observed. The firms in the bin, where the missing middle has been observed, are assigned the dummy 2, the firms in the bin below the missing middle are assigned the dummy 1 and the firms in the bin above the missing middle are assigned the dummy 3. For example, in 2000-01, for Haryana, the missing middle has been observed in the 100-125 worker bin, so every manufacturing unit in Haryana employing regular workers in the range of 100-125 were assigned the dummy 2, manufacturing plants employing less than 100 regular workers in Haryana were assigned the dummy 1 and manufacturing plants employing more than 125 regular workers were assigned the dummy 3, in this manner the ordered limited dependent variable is created.

The specification of ordered dependent variable and the variables of interest and control variables in place, the outliers were dropped and a total of 25875 observations are used in the econometric estimation exercise that follows.

4.4.2 Specification and estimation of Econometric Model

The ordered logistic regression is used for estimation purposes. The following model is estimated:

$$P(Bins = j|X) = Exp(V_j)/\sum Exp(V_k) \quad \text{.....(4.1)}$$

where,

'Bins' represent the categorical dependent variable (i.e. Lower, Middle, and Higher)

j is the index for the chosen employment bin category (j=1,2,3). If the value of regular worker of a firm falls in the missing middle range, then the dummy 2 is assigned. If the value of regular

workers is below the lower limits of the middle bin/range then the dummy 1 is assigned and if the number of regular workers is above the upper limit of missing middle bin/ range then the value 3 is assigned.

X is a set of variables of interest and control variables which are based on the discussion in an earlier section. The variables are described in the table below-

Table 4.2: Definition of variables

Independent Variables	Definition
Time	Denotes the time period 1,2 or 3 in which a firm is operating
Age	Denotes the time in years for which the firm is operating
Skilled/ Unskilled	Denotes the ratio of skilled to unskilled workers working in a firm
Contract W/ Production W	Denotes the ratio of contract workers to production workers in the production process
Labour Intensity	Denotes the intensity of labour used in the production process, this is calculated as the ratio of labour cost to total output.
Electricity/Output	Denotes the ratio of sum of the total electricity consumption to Ex-factory value of output.
Log Sales	The variable is the logarithmic value of Gross Sales,
Working Capital/ Output	The variable is the ratio of the total liabilities in the beginning of a financial year and ex-factory value of output.
HT Dummy	This is a dummy which takes the value 1 if the firm is operating in the High Technology sector, and 0 otherwise.
Export Intensity	Denotes the percentage share (%) of products/by-products directly exported.

Source: Author's Tabulation

Using the variables as described above two regression models are estimated. The models have further been validated by incorporating export intensity as a variable in other three separate regression models.

The explicit form of **Model 1** is provided below-

$V_{1j}$is the systematic utility of employment bin j:

$$V_{1j} = \beta_{j10} + \beta_{j11} Time + \beta_{j12} \left(\frac{Skilled}{Unskilled}\right) + \beta_{j13} \left(\frac{ConW}{ProdW}\right) + \beta_{j14} Labour\ Intensity +$$

$$\beta_{j15} \left(\frac{Electricity}{Output}\right) + \beta_{j16} \left(\frac{Working\ Capital}{Output}\right) + \beta_{j17} HTdummy + \beta_{j18} Age + \beta_{j19} sales \ldots (2)$$

The explicit form of **Model 2** is provided below-

V_{2j} is the systematic utility of employment bin j:

$$V_{2j} = \beta_{j20} + \beta_{j21} Time + \beta_{j22} \left(\frac{Skilled}{Unskilled}\right) + \beta_{j23} \left(\frac{ConW}{ProdW}\right) + \beta_{j24} Labour\ Intensity +$$

$$\beta_{j25} \left(\frac{Electricity}{Output}\right) + \beta_{j26} \left(\frac{Working\ Capital}{Output}\right) + \beta_{j27} HTdummy + \beta_{j28} Age + \beta_{j29} Age^2 +$$

$$\beta_{j210} Sales + \beta_{j211} Sales^2 \ldots\ldots (3)$$

4.5 Results and discussions

The estimated model with 25,875 observations yields a Wald chi-squared statistic of 3861.19 with 9 degrees of freedom is statistically significant with a Pseudo R-squared value of 0.1693. The log pseudo likelihood of -13566.878 provides an indication of the overall model fitting the data well. The computation of marginal effects carries much significance as it has the capacity to generate meaningful comparisons between the three bins (the lower bin denoted by 1, the missing middle/ middle bin denoted by 2 and the higher bin denoted by 3).

Table 4.3: Marginal Effects across the three bins: Model 1

Variable	Lower Bin	Middle Bin	Higher Bin
Time	-0.0460464***	0.0075851***	0.0384613***
SkilledW/UnskilledW	0.4486078***	-0.0738983***	-0.3747094***
ContractW/ProductionW	0.0448445***	-0.0073872***	-0.0374574***
Labour Intensity	-0.0181665***	0.0029925***	0.0151739***
Electricity/Output	-0.0497	0.0082	0.0415
Working Capital/Output	-0.0002	0.0000	0.0002
HTDummy	-0.0433191***	0.0068668***	0.0364523***
age	-0.0020497***	0.0003376***	0.0017121***
sales	-0.1579073***	0.0260118***	0.1318955***

Source: Author's Tabulation; *** denotes significance at 1% level.

The estimated marginal effects provide significant insights. The variable of interest is the ratio of Contract Workers to Production Workers; this ratio quantifies the extent to which firms substitute permanent production worker with contract workers in order to comply with rigidities imposed by strict labour regulations. The use of contract workers does not always happen as a stopgap but as a long-term strategy to manage wage negotiations and bargaining power against regular workers. The probability of a firm to be in the middle bin and higher bin significantly declines with the increase in the proportion of contract workers**.** As a further digression, the ratio of Contract Workers to Production Workers and the index of labour legislation has been found to have a significant positive correlation (0.047*). From this observation it can be inferred that the probability of firms to be small is relatively high if it is located in the states with pro-labour legislation (high LLI value)

A second model using the quadratic terms have been run further to second the findings of the first model. Model 2 has been estimated using 25875 observations, the value of Wald Chi square statistics at 11 d.f. is 3801.09. The model has been statistically significant at the 1% level with a log pseudo likelihood value of -13561.78 and a Pseudo R squared value of 0.1696. Marginal effects of the estimated model across the three bins have been provided in Table 4.4.

Table 4.4: Marginal Effects across the three bins: Model 2

Variable	Lower Bin	Middle Bin	Higher Bin
Time	-0.0453754***	0.007509***	0.0378664***
SkilledW/UnskilledW	0.4404459***	-0.0728876***	-0.3675583***
ContractW/ProductionW	0.0441398***	-0.0073045***	-0.0368353***
Labour Intensity	-0.0188584***	0.0031208***	0.0157376***
Electricity/Output	-0.0529428	0.0087613	0.0441816
Working Capital/Output	-0.0002649	0.0000438	0.0002211
HTDummy	-0.042428***	0.0067638***	0.0356642***
age	-0.0025939***	0.0004292***	0.0021646***
age2	0.00000801***	-0.00000133***	-0.00000668***
sales	-0.2488366***	0.041179***	0.2076576***
sales2	0.0054552***	-0.0009028***	-0.0045524***

Source: Author's Tabulation; ***denotes significance at 1% level.

The econometric framework has been adopted to find the reasons behind missing middle. Model 1 and 2 both reveal interesting findings, the signs and statistical significance of most of the important variables (Time, SkilledW/UnskilledW, ContractW/ProductionW, Labour Intensity, HTDummy) remain consistent across both models, suggesting a robust direction of their effects. The magnitudes of the marginal effects for the original variables are generally quite similar between the two models, indicating that the inclusion of the squared terms hasn't drastically altered the linear impacts of these variables. Model 2 introduces significant non-linear effects for 'age' and 'sales', as evidenced by the significant coefficients for 'age2' and 'sales2'. Both models show a significant negative effect of time on the probability of being in the Lower Bin and significant positive effects on the probabilities of being in the Middle and Higher Bins. The magnitudes are very close, suggesting a consistent trend over time regardless of the non-linear effects of age and sales. Both the models indicate a significant positive effect of skilled/unskilled ratio on the Lower Bin and significant negative effects on the Middle and Higher Bins. The magnitudes are again very similar, suggesting a stable negative relationship between a higher skilled worker ratio and higher outcome categories, even when non-linearities in age and sales are considered. Similar to the skilled worker ratio, both models show a significant positive effect of contract worker/ production worker on the Lower Bin and significant negative effects on the Middle and Higher Bins, with comparable magnitudes. The models show a significant negative effect of labour intensity on the Lower Bin and significant positive effects on the Middle and Higher Bins, with slightly larger magnitudes in Model 2. This suggests that accounting for non-linearities in age and sales might slightly strengthen the positive relationship between labour intensity and higher outcomes.

With respect to technology, both models show a significant negative effect of being a high-tech firm on the Lower Bin and significant positive effects on the Middle and Higher

Bins. In other words, high-tech firms are found to be less likely in the lower bin and more likely to be in the middle and higher bins.

Model 1 shows a significant negative linear effect of age on the Lower Bin and significant positive linear effects on the Middle and Higher Bins. Model 2 introduces 'age2' with significant coefficients. The negative coefficient for 'age' and the positive coefficient for 'age2' in the Lower Bin suggests a U-shaped relationship with age. Initially, as firms age, the probability of being in the Lower Bin decreases, but at some point, this trend might reverse. The positive coefficient for 'age' and the negative coefficient for 'age2' in the Middle and Higher Bins suggests an inverted U-shaped relationship. Initially, as firms age, the probability of being in these bins increases, but beyond a certain age, this probability might start to decrease. The inclusion of the squared term in Model 2 provides a more nuanced understanding of the relationship between firm age and the outcome categories, indicating that the effect of age is not strictly linear.

Model 1 shows a significant negative linear effect of sales on the Lower Bin and significant positive linear effects on the Middle and Higher Bins. Model 2 introduces 'sales2' with significant coefficients. The negative coefficient for 'sales' and the positive coefficient for 'sales2' in the Lower Bin suggests a U-shaped relationship. Initially, as sales increase, the probability of being in the Lower Bin decreases, but at very high sales levels, this trend might reverse. The positive coefficient for 'sales' and the negative coefficient for 'sales2' in the Middle and Higher Bins suggests an inverted U-shaped relationship. Initially, as sales increase, the probability of being in these bins increases, but beyond a certain sales level, this probability might start to decrease. Similar to age, the inclusion of the squared term for sales in Model 2 reveals a more complex, non-linear relationship between sales revenue and the outcome categories. Possible reasons behind this behaviour could be automation, economies of scale in

production technology, increases digitisation, firms also tend to be inclined towards maintaining a smaller work force in order to evade the complexities of maintaining large teams.

Robustness check

The robustness of the model estimated above have been tested using three separate models, model 3, model 4 and model 5, where a new variable namely, export intensity has been incorporated and the interaction of age and sales with contract worker to production worker has been studied to shed further light on the missing middle scenario.

The explicit form of the **Model 3** is provided below-

V_{R1j} is the systematic utility of employment bin j:

$$V_{R1j} = \beta_{jR10} + \beta_{jR11} Export\ Intensity + \beta_{jR12} \left(\frac{Skilled}{Unskilled}\right) + \beta_{jR13} \left(\frac{ConW}{ProdW}\right) + \beta_{jR14} Labour\ Intensity + \beta_{jR15} \left(\frac{Electricity}{Output}\right) + \beta_{jR16} \left(\frac{Working\ Capital}{Output}\right) + \beta_{jR17} HTdummy + \beta_{jR18} Age + \beta_{jR19} Age^2 + \beta_{jR110} Sales + \beta_{jR111} Sales^2 \ldots\ldots\ldots\ldots (4)$$

The model run using 24924 observations resulted in a log pseudo likelihood value of -12884.34, and a Wald Chi square of 3803.11 with a p value of 0. The marginal effects corresponding to the model have been provided below in Table 4.5.

Table 4.5: Marginal Effects across the three bins: Model 3

Variable	Lower Bin	Middle Bin	Higher Bin
Export Intensity	-0.0006886***	0.0001152***	0.0005734***
SkilledW/UnskilledW	0.3853835***	-0.0644648***	-0.3209186***
ContractW/ProductionW	0.0407382***	-0.0068145***	-0.0339237***
Labour Intensity	-0.0194386***	0.0032516***	0.016187***
Electricity/Output	0.01707	-0.00286	-0.01422
Working Capital/Output	-0.00131	0.00022	0.00109
HTDummy	-0.0472026***	0.007577***	0.0396255***
age	-0.0025826***	0.000432***	0.0021506***
age2	0.00000968***	-0.00000162***	-0.00000806***
sales	-0.1915189***	0.0320362***	0.1594827***
sales2	0.00244	-0.00041	-0.00203

Source: Author's Tabulation; ***denotes significance at 1% level.

A separate model using interaction terms of age and sales on the ratio of contract to production workers have been run in order to have deeper insights and check the robustness of the findings. The explicit form of the **Model 4** is provided below-

V_{R2j} is the systematic utility of employment bin j:

$$V_{R2j} = \beta_{jR20} + \beta_{jR21} Export\ Intensity + \beta_{jR22} \left(\frac{Skilled}{Unskilled}\right) + \beta_{jR23} Labour\ Intensity + \beta_{jR24} \left(\frac{Electricity}{Output}\right) + \beta_{jR25} \left(\frac{Working\ Capital}{Output}\right) + \beta_{jR26} HTdummy + \beta_{jR27} Age + \beta_{jR28} Age. \left(\frac{ConW}{ProdW}\right) \quad \text{..... (5)}$$

The estimation of model 4 resulted in a significant regression output with a log pseudo likelihood value of -14648.13and a pseudo-R square value of 0.054. The values of marginal effects have been computed in the Table 4.6 below.

Table 4.6: Marginal Effects across the three bins: Model 4

Variable	Lower Bin	Middle Bin	Higher Bin
Export Intensity	-0.0014***	0.000179***	0.001226***
Skilled Unskilled Ratio	0.552323***	-0.07024***	-0.48208***
Labour Intensity	-0.00536***	0.000682***	0.004682***
Electricity/Output	0.10648	-0.01354	-0.09294
Working Capital/Output	0.001573	-0.0002	-0.00137
HTDummy	-0.05075***	0.00612***	0.044628***
age	-0.00338***	0.00043***	0.002949***
age*contract workers	0.001683***	-0.00021***	-0.00147***

Source: Author's Tabulation; ***denotes significance at 1% level

Additionally, a separate model has been run to assess the impact of sales and contract workers.

The explicit form of **Model 5** is provided below-

V_{R3j} is the systematic utility of employment bin j:

$$V_{R3j} = \beta_{jR30} + \beta_{jR31} Export\ Intensity + \beta_{jR32} \left(\frac{Skilled}{Unskilled}\right) + \beta_{jR33} Labour\ Intensity + \beta_{jR34} \left(\frac{Electricity}{Output}\right) + \beta_{jR35} \left(\frac{Working\ Capital}{Output}\right) + \beta_{jR36} HTdummy + \beta_{jR37} Sales + \beta_{jR38} Sales. \left(\frac{ConW}{ProdW}\right) \quad (6)$$

The estimation of model 5 resulted in a significant regression output with a log pseudo likelihood value of -12957.92and a pseudo-R square value of 0.163. The values of marginal effects have been computed in Table 4.7.

Table 4.7: Marginal Effects across the three bins: Model 5

Variable	Lower Bin	Middle Bin	Higher Bin
Export Intensity	-0.0006129***	0.0001016***	0.0005112***
Skilled Unskilled Ratio	0.3813818***	-0.0632413***	-0.3181405***
Labour Intensity	-0.020095***	0.0033322***	0.0167628***
Electricity/Output	0.0256115	-0.0042469	-0.0213645
Working Capital/Output	-0.0011877	0.0001969	0.0009907
HTDummy	-0.0517568***	0.0081993***	0.0435575***
Sales	-0.1562851***	0.0259154***	0.1303697***
Sales*contract workers	0.0057723***	-0.0009572***	-0.0048151***

Source: Author's Tabulation; ***denotes significance at 1% level

The robustness checks are deemed necessary in order to verify the effect and type of association between bins and the SkilledW/UnskilledW ratio and ContractW/ProductionW ratio. The effect of SkilledW/UnskilledW ratio and ContractW/ProductionW ratio were comparable to that found in model 1 and 2, which further supports the findings. Also, the findings regarding HT Dummy indicate that high tech companies are more likely to be in the middle and higher bin, this confirms the results from model 1 and 2. Also, model 3 indicates that export intensity increase has been related to lower probability of being in the low bin, while export intensity increase is related to higher probability of being in the middle and higher bin. Model 4, however, emphasizes the influence of interactions with regard to age and contract workers. The effect of firm age depends considerably on firm size. The marginal effect of age is negative for small bin and positive for middle and large bins, this indicates older companies are less likely to fall in the smaller bin. The interaction of firm age with the use of contract workers is a complicated one across firm size groups. Older firms with higher proportions of contract employees have a high likelihood of being in the lower bin, this outcome is just the contrary for the other two bins respectively. The intuition behind these results is that older firms which rely more on the contract workers are likely to be in the lower bin, and labour legislations might be a significant cause behind such a behaviour. In order to assess the impact of sales and influence of sales on contract workers, model 5 has been estimated. The coefficient of sales is negative for the lower bin and positive for middle and higher bin, implying that firms having high sales are less likely to be in the lower bin, whereas firms having high sales are more likely to be in the middle and higher bin. The result is different for the interaction between sales and contract workers, firms with high sales and higher contract workers are more likely to be in the lower bin, this result once again implies the importance of contract workers, and one possible reason could be the evasion of labour legislation.

Three distinct features thus emerge from the econometric analysis. These include:

Incentive to Stay Small: Stringent labour laws, social security benefits, and unionization, often become more applicable as firms increase their workforce beyond certain thresholds like the 100 workers under the Industrial Disputes Act (Goldberg et. al, 2010; Gupta 2019; Kathuria & Kedia, 2015). The positive effects of 'SkilledWorkers/UnskilledWorkers' and 'ContractWorkers/ProductionWorkers' ratios on the lower bin, together with the negative impacts on the middle bin may imply that companies may deliberately select their composition of labour in order to fall below these levels and escape the full force of labour legislation. Having a higher percentage of contract workers provide more flexibility in hiring and firing and may make smaller companies more attractive. In the similar lines, it can be said that escaping the clutches of labour legislation could be the reason behind enhanced inclination towards staying small (Sakpal, 2015; Ghosh & Abraham, 2021; Kapoor & Shyamsundar, 2023).

Disincentive to Grow: The adverse effect of a higher skilled workforce ratio on the middle bin could also be attributed to labour legislations. Skilled workers generally require higher compensation and benefits, and their employment may involve stricter adherence to labour laws. Thus, the potential benefits of scaling up to a mid-sized firm with a large skilled workforce might be less appealing. As a result, firms choose to remain small (Krueger, 2013; Mehrotra, 2020; Chakraborty, 2021; Parida et al., 2021).

Dualism and Technological Choices- The econometric specification of models might be revealing dualistic nature in Indian manufacturing where a big unorganised sector coexist alongside a smaller organised sector dominated by large firms. Labour legislation is only applicable to the organised firms. In fact, within organised sector the scenario can further worsen by making it expensive and cumbersome for firms to switch from the small size to middle or large size. Labour composition namely, the ratio of skilled/ unskilled workers and contract/production workers could capture various technological alternatives and production

strategies followed by firms of varying sizes in response to these regulations. Large firms may choose more capital-intensive production with a more skilled labour force in order to benefit from economies of scale and manage labour laws, whereas smaller firms may use unskilled or contract labour to ensure flexibility and reduce costs (Sarkar & Deakin, 2011; Banerji & Jain, 2021; Kapoor & Shyamsundar, 2023).

4.6 Summary of major findings

This chapter has studied the association between the absence of mid-sized firms and labour legislations. An order pooled dataset has been created, only states which showed presence of missing middle were considered. The employment bin where missing middle was observed has been codified as 2, the bin below the missing middle bin has been assigned the value 1 and the bin above the missing middle bin has been coded as 3. The selection of bin was based entirely on the value of regular workers. The ordered pooled logit regression has been deemed fit given the objective of the study to assess the factors underlying the missing middle.

The significant positive correlation between the LLI and the ratio of contract to production worker provides a premise to interpret the missing middle scenario based on the ratio of contract to production workers. At the outset, evidence regarding the association between the missing middle phenomenon and labour legislation presents a nuanced and complex picture. The "missing middle" phenomenon, which is marked by a reduced ratio of mid-sized firms to small and large firms, is not directly "captured" by any single variable. Rather, it's an expression of the general pattern in which various factors affect the probability of being in the middle bin versus the lower and higher bins. The detrimental impact of an increased ratio of skilled-to-unskilled workers and an increased ratio of contract-to-production workers on the middle bin, along with their beneficial impact on the lower bin, may be symptomatic of forces that prevent firms from expanding to the mid-sized level. If plants find it more advantageous, maybe because of cost considerations, flexibility, or evasion of specific regulations to either stay small

with a specific composition of labour the middle range would necessarily be less crowded. While India's labour law is frequently referred to as a major reason for the missing middle in the literature (Hasan & Jandoc, 2013; Ramaswamy 2013, 2015 and Nagraj, 2018, among others), the above evidence is nuanced. Other firm specific characteristics like labour intensity has a negative significant effect for the lower bin and positive significant effect for the middle and higher bin implying that firms spending proportionately more on labour has lower chances of being in the lower bin and higher chances of being in the middle and higher bins. With respect to age of firms, older firms have a higher chance of being in the middle and higher bin compared to newer firms. Further, firms high up in the technology ladder are more probable to be in the middle and higher bin compared to the lower bin. The variables electricity/ output and working capital/ output did not return with significant results. On the whole, the econometric findings reveal factors other than labour legislations also contribute to the phenomenon of missing middle in Indian organised manufacturing.

ANNEXURE TO CHAPTER 4

A4.1. Construction of Labour Flexibility Scale

In order to develop a labour flexibility scale at sub-national level. An out of the box approach has been attempted in this research. The amendment corresponding to labour in general and industry have been identified for each of the 15 major states in India. These amendments have been classified according to four different time points- amendments till 1991 have been classified in group 1, amendments between 1991 and 2001 have been classified in group 2, amendments between 2001 and 2011 have been classified in group 3 and amendments post 2011 have been classified in group 4.

The three major Acts concerning labour in the Indian Economy were The Trade Union Act, 1926; The Industrial Disputes Act, 1947; and The Industrial Employment (Standing Orders) Act, 1946. In total there are a total of 51 Central Acts and over 200 State Acts pertaining to the labour regulation scenario in the Indian Economy. However, in recent times these three Acts have been replaced by the Industrial Relations Code 2020 in attempt to consolidate and amend the laws relating to Trade Unions and conditions of employment in the Indian Economy.

Text data were auto-coded in NVIVO and nodes were generated. These nodes were nothing but the word and phrases on which the entire texts were based on. The words/ phrases were generated for four different time points and based on subjective judgment were classified as pro-labour or anti-labour. The classification of words/ phrases as pro or anti-labour has been done keeping in mind the use of such words in the texts/ acts. These words have been further classified as per the dimensions provided by Fenwick et al. (2008), the dimensions are - (i) Fundamental rights: Freedom of association, (ii) Fundamental rights: The right to collective bargaining, (iii) Fundamental rights: The elimination of forced labour, (iv) Fundamental rights: The abolition of child labour, (v) Fundamental rights: Freedom from discrimination in the

workplace, (vi) Remuneration and working time, (vii) Job security, (viii) Social protection, (ix) Occupational health and safety, (x) Human resource development, (xi) Management and organization, (xii) Other Factors.

The words and phrases were generated for four different time points for each of the 15 major Indian States. For each state, four different sets of frequency tables were generated as per the dimensions provided by Fenwick et al. (2008). Out of the 12 dimensions provided by Fenwick et al. (2008), 5 dimensions were deemed significant based on the frequencies obtained in the study. The 5 dimensions finally selected are- (i) Fundamental rights: Freedom of association, (vi) Remuneration and working time, (vii) Job security, (viii) Social protection, (xi) Management and organization.

For each state a frequency table of words was generated and then subjected to factor analysis in an attempt to find a composite measure of labour regulation. The study has taken to consideration the time period since Independence till 2019 just before the COVID pandemic. The construction of scale has been carried out at 4 time points-

- Measure for amendments till 1991.
- Measure for amendments between 1991 and 2001.
- Measure for amendments between 2001 and 2011.
- Measure for amendments since 2011.

A4.1.2 Labour legislation index

The text data on labour legislation for 15 major States of India are collected from an online repository by the Government of India namely www.indiacode.nic.in. A search was carried out in the website for any Act which had some association with labour, or industry. The Act/ amendments were downloaded and archived for the purpose of text mining. A total of 244 State amendments were considered for the present study. The table A4.1 provides a summary

of the number of amendments corresponding to the 15 major states which have been considered for the present analysis.

Table A4.1- No of amendments taken to consideration

States	No of Acts/ Amendments
Andhra Pradesh	24
Assam	24
Gujarat	10
Haryana	2
Himachal Pradesh	6
Karnataka	6
Kerala	15
Madhya Pradesh	11
Maharashtra	12
Odissa	11
Punjab	28
Rajasthan	27
Tamil Nadu	21
Uttar Pradesh	26
West Bengal	21
Total	244

Source: Author's Tabulation

The first step in the quest to quantify the labour regulations began with the generation of nodes based on the three major Acts namely The Trade Union Act, 1926; The Industrial Disputes Act, 1947; and The Industrial Employment (Standing Orders) Act, 1946. The nodes are nothing but words/ phrases based on which an entire text is based. These nodes provided the words or phrases which formed the base of the analysis. The nodes have been provided in the appendix.

Fenwick et al. (2008) provided an understanding regarding the classification of words or phrases in 12 dimensions. The table given in the Appendix A3 provides a brief understanding of the dimensions and the words and their nature of association with labour flexibility.

'Positive' term signifies positive impact on labour, 'Negative' term implies negative impact on labour, 'Both' implies positive and negative impacts on labour. Words having both

positive and negative impact were considered because of their importance in the process of comprehensively assessing the multifaceted effects on the labour force. However, later in the study only the net of positive minus the negative word frequency was taken to account for index construction.

The frequency distribution of words is generated based on the 12 dimensions. While obtaining the frequency distribution, it is observed that dimensions 2,3,4,5,9, 10 and 12 are ruled out of consideration because of lack of data on word frequency or due to the fact that the words in these dimensions have both negative as well as positive impact on labour. Thus, out of these 12 dimensions, finally 5 dimensions are deemed suitable for construction of labour flexibility index. The table below defines these 5 dimensions selected for the purpose of scale construction.

Table A4.2- Dimensions selected for scale construction

Dimension No.	Dimensions	Words	Impact
1	Fundamental rights: Freedom of association	Trade union	Positive
6	Remuneration and working time	dearness allowance	Positive
		remuneration	Positive
		subsistence allowance	Positive
		wages	Positive
		house rent allowance	Positive
		gratuity	Positive
		compensation	Positive
		overtime	Positive
		subsistence	Positive
		basic pay	Positive
		bonus payable	Positive
		allowance	Positive
		working days	Positive
		average pay	Positive
		pension	Positive
		pay	Positive

7	Job security	discharge	Negative
		dismissal	Negative
		retrenchment	Negative
		casual	Negative
		badli	Negative
		individual disputes	Positive
		reinstatement	Positive
8	Social protection	aggrieved	Positive
		unfair labour practice	Both
		workman	Both
11	Management and organization	judicial member	Positive
		administrative	Positive
		appropriate government	Both
		commission	Both
		industry tribunal	Both
		redressal committee	Positive
		grievance redressal	Positive
		presiding officer	Positive
		conciliation officer	Positive

Source: Author's Tabulation

The amendments were classified in four different time points. The purpose of dividing the amendments in these four-time points is to understand the evolution of the labour flexibility laws over time. The frequencies of positive and negative words are created and the net of the positive frequencies, that is positive frequency minus the negative frequency were taken to consideration, as a result there were four different cross sections of the 15 states for four different time points.

A4.1.3 Index Construction

For the purpose of index construction, Principal Component Analysis (PCA) has been used. It is observed that the frequency for dimension 7 (Job Security) is negative and there are negative correlations among the 5 dimensions as a result. In order to take care of that, the frequency values are normalized to fix up the problem of negative correlation among the variables was sorted. The factor analysis used varimax rotation, and the factors were extracted

based on the criterion Eigen value being greater than unity. The factor analysis results suffice the KMO Measure of sampling adequacy and the Bartlett's test of sphericity has been found to be significant at the 1per cent level. Using the factor loadings of the components, composite score of the factors were obtained and the factor scores were aggregated as a weighted sum of the eigen value associated with the particular factor to arrive at the weights of the individual factors, as given in the tables that follows.

Table A4.3- Factors and weights for Acts and Amendments over the years for the 15 major States of India

Acts and Amendments till 1991				
Factors	**Eigen-value**	**Weight**	**Components/Variables**	**Factor loadings**
Factor1	4.402	1	Fundamental rights: Freedom of association	0.859
			Remuneration and working time	0.962
			Job security	-0.976
			Social protection	0.933
			Management and organization	0.957
Acts and Amendments between 1991 and 2001				
Factors	**Eigen-value**	**Weight**	**Components/Variables**	**Factor loadings**
Factor 1	3.299	0.65	Remuneration and working time	0.98
			Job security	-0.787
			Social protection	0.965
			Management and organization	0.883
Factor 2	1.066	0.21	Fundamental rights: Freedom of association	0.968
Acts and Amendments between 2001 and 2011				
Factors	**Eigen-value**	**Weight**	**Components/Variables**	**Factor loadings**
Factor 1	2.55	0.49	Fundamental rights: Freedom of association	0.545
			Remuneration and working time	0.868
			Job security	-0.889
			Social protection	0.814
Factor 2	1.16	0.24	Management and organization	0.905
Acts and Amendments between 2011 and 2019				
Factors	**Eigen-value**	**Weight**	**Components/Variables**	**Factor loadings**

Factor 1	2.565	0.43	Job security	-0.793
			Social protection	0.866
			Management and organization	0.851
Factor 2	1.532	0.38	Fundamental rights: Freedom of association	0.985
			Remuneration and working time	0.938

Source: Author's Tabulation

Table A4.3 provides a solid premise based on which the aggregation for scale construction has been done. The scale has been compiled across the four time points and presented in Table 4.4.

A4.1.4 The Results

The scores of the indices are obtained and presented below in Table A4.4.

Table A4.4- Score and Ranks of the States over the years across different time points

PCA Score and ranks of the States over different time points.					
	Till 1991	**1991-2001**	**2001-2011**	**2011 onwards**	**Overall**
States	**Values**	**Values**	**Values**	**Values**	**Values**
Andhra Pradesh	322.61(8)	3.42(9)	-5.98(14)	0.5(4)	322.61(8)
Assam	116.18(13)	1.86(11)	-5.82(13)	-0.77(8)	116.18(13)
Gujarat	451.97(7)	5.78(1)	8.72(1)	2.73(2)	451.97(7)
Haryana	16.32(15)	5.78(1)	0.07(6)	-1.13(13)	16.32(15)
Himachal Pradesh	164.1(12)	5.78(1)	-5.98(14)	-0.99(11)	164.1(12)
Karnataka	194.7(11)	3.18(10)	-2.58(11)	-0.95(10)	194.7(11)
Kerala	238.26(10)	3.56(8)	6.19(3)	-1.01(12)	238.26(10)
Maharashtra	2002.4(1)	5.78(1)	-0.35(7)	1.84(3)	2002.4(1)
Madhya Pradesh	277.63(9)	5.78(1)	-3.6(12)	-0.39(6)	277.63(9)
Odissa	110.55(14)	5.49(7)	3.94(4)	-0.84(9)	110.55(14)
Punjab	1989.57(2)	-13.98(15)	-2.2(10)	4.1(1)	1989.57(2)
Rajasthan	1666.46(4)	-3.67(13)	8.68(2)	-0.58(7)	1666.46(4)
Tamil Nadu	1609.58(5)	-0.59(12)	-0.35(7)	0.28(5)	1609.58(5)
Uttar Pradesh	1886.98(3)	-10.9(14)	-1.96(9)	-1.43(14)	1886.98(3)
West Bengal	480.84(6)	5.7(6)	0.89(5)	-1.43(14)	480.84(6)

Source: Author's Tabulation; *the ranks of the States are provided in parenthesis.

The PCA scores are very high for the time period till 1991 because it captures all the amendments which have been made from 1947 till 1991. The amendments post 1991 were classified in three sections 1991 to 2001, 2001 to 2011 and 2011 onwards till the initiation of the new labour codes. Since the study focuses on the post liberalization era, the decadal breakup

in analysing the differences in labour legislation provides a strong rationale. Higher value of the index implies that state has relatively more pro-labour legislation.

The pattern of labour flexibility across states with respect to labour laws across different time points bring out some important points, for example Maharashtra has been more focused towards labour welfare till the year 2001 and held the 1st rank, post 2001 the focus towards labour has declined as a result Maharashtra slipped to the 7th position but after 2011 Maharashtra improved its focus towards labour resulting in significant improvement of its rank; considering all time periods Maharashtra has been the most focused state towards labour welfare. Similar findings are observed for Gujarat as well, where it has been observed that from 1991 to 2019, Gujarat has initiated pro-labour reforms in the form of enhanced welfare towards labour. These findings are in tandem with the work of Hasan et al (2003) where the authors find that Maharashtra and Gujarat have pro-employment amendments in the 2000s. Sharma (2006) found that firms in Maharashtra and Gujarat paid higher wages to unskilled workers compared to states like West Bengal, the finding once again reaffirms the thought that amendments in Maharashtra have been inclined towards labour welfare. On the other hand, Haryana, Himachal Pradesh, Assam, Odisha, Karnataka were less flexible in terms of pro-labour reforms as compared to States like Maharashtra and Gujarat. The Besley & Burgess (2004) study has Andhra Pradesh, Karnataka, Kerala, Rajasthan, and Tamil Nadu as states which have brought in amendments which are pro-employer. The results in the paper are somewhat in lines with the findings of Besley & Burgess (2004).

A4.2 State level specification of presence of Missing Middle

Table A4.5: State Level presence of Missing Middle

States with state codes	2000-01	Bins	2009-10	Bins	2017-18	Bins
Andhra Pradesh-28	-	-	Y	50-75	Y	150-175
Assam-18	-	-	-	-	-	-
Gujarat-24	-	-	Y	50-75	Y	225-250
Haryana-6	Y	100-125	Y	50-75	Y	150-175
Himachal Pradesh-2	Y	75-100	-	-	Y	125-150
Karnataka-29	-	-	-	-	Y	175-200
Kerala-32	Y	200-225	-	-	-	-
Madhya Pradesh-23	Y	125-150	-	-	Y	175-200
Maharashtra-27	-	-	-	-	-	-
Odissa-21	Y	100-125	-	-	Y	50-75
Punjab-3	Y	150-175	-	-	Y	75-100
Rajasthan-8	-	-	Y	50-75	Y	150-175
Tamil Nadu-33	-	-	-	-	-	-
Uttar Pradesh-9	Y	175-200	-	-	Y	175-200
West Bengal-19	-	-	-	-	-	-

Source: Author's Tabulation

A4.3 Studies on Quantification of Labour Market Flexibility

The literature on quantification of labour regulation can be classified under four heads-

a. Quantification under the Besley& Burgess measure (BB) based on Besley & Burgess (2004).
b. Quantification with the OECD measure based on the OECD Economic Surveys (2007)
c. Composite measures of quantification of labour regulation- which include the GHK measure based on Gupta et al. (2009), OECD measure and BB measure.
d. Other measures- which include the AP measures based on Ahsan & Pages (2009), DL or Labour Dispute Legislation and EPL or the Employment Protection Legislation.

Besley Burgess and its derivatives

One of the foremost literatures on Labour market flexibility relates to that of Besley& Burgess (2004) where the authors construct an index called the BB Index hereafter, based on

state level amendments of the Industrial Dispute Act. While constructing the index, amendments are coded +1,0 and -1 accordingly as states being pro-worker, neutral and pro-employer in nature. The scores are cumulated and christened as 'regulatory measure'. With a year lag, state level variables including output per capita, employment, intensity of labour usage, fixed capital, the number of factories and labour productivity are used in the model using panel data from 1958-92. The study finds that regulating in a pro-worker direction is associated with lower output, employment, investment and productivity in formal manufacturing; and is accompanied by growth in informal manufacturing.

Bhattacharjea (2019) provides a critique to the BB methodology by arguing that the scoring as well as the methodology used to combine the scores seem misleading. Further issues relating to the econometric methodology are also raised. The BB method classifies a state as pro-worker or pro-employer based on a handful of amendments anywhere in the 50-year period between 1947-1997. On that basis, for instance, Gujarat and Andhra Pradesh are classified as a pro-worker state. There were problems related to aggregation of scores as well while classifying a state as pro-labour or pro-employer. Further, apart from the IDA, there are many Central Laws on labour, and the States make their own amendments as labour is a subject in the concurrent list. There were issues with the econometric methodology as well, the study uses the same set of control variables in the regression that are being treated as outcomes. Hasan et al. (2007) (HMR hereafter) introduced a modified classification of labour market flexibility, incorporating a "flex dummy" variable that assigned a value of 1 to states deemed pro-employer and 0 otherwise to analyse labour market flexibility and employment dynamics. Mitra & Ural (2008) use the HMR flex dummy to analyse the determinants of manufacturing productivity. However, the coding amendments made by HMR are being criticized by Bhattacharjea (2019), who argues that the judicial interpretations of the Industrial Disputes Act (IDA) were overlooked and raised concerns regarding the econometric methodologies employed in these

studies. Topalova (2010) and Topalova & Khandelwal (2011), also uses the BB methodology to develop an indicator variable reflecting pro-employer labour regulations to categorize states based on labour regulations. In a subsequent study, Hasan et al. (2012) analyzed data from the Employment-Unemployment Survey (EUS) spanning 1987-2005, calculating three sets of FLEX dummies based on different classifications (BB, HMR, and Gupta et al. (2009)). They concluded that trade liberalization had a more pronounced unemployment-reducing effect in states with flexible labour markets, where workers were less likely to face unemployment. Ramaswamy (2015) employed a time-invariant classification based on a modified BB index and found that the share of contract workers relative to total workers was higher in labour-intensive industries in states with less flexible labour laws, suggesting a nuanced relationship between labour regulation and employment structure. Kukreja & Bathla (2018) focused on the textile and clothing industry, making use of state-level ASI panel data and the FLEX dummy from HRM. Their findings indicate that employment of contract workers increased in factories with fewer than 100 workers, with states exhibiting flexible labour markets showing higher employment as compared to their counterparts with lesser flexible labour laws. Karak & Basu (2019) revisited the original BB index using ASI data from 1969-2005 and found that including profit rates as a predictor variable in the baseline BB regression rendered the BB index coefficient insignificant, suggesting that profit rates may play a critical role in understanding labour market dynamics. Maiti (2019) by recoding the BB classification to reflect pro-employer or neutral states and calculated the Solow residual as a proxy for productivity finds that productivity was lower in states with more flexible labour laws attributed to the higher bargaining power of labour in such environments.

The comprehensive OECD method and its derivatives

A study using comprehensive survey of the State level reforms in India was carried by the OECD Economic Surveys (2007). The index uses primary data on IDA, Shops Act,

Factories Act, Contract Labour Act, Inspectors, Regions, Filing of Returns, Union Representation. Scores are given on the basis of whether or not a given state has introduced changes. A higher score was given for changes that were deemed to be pro-employer. Aggregates of the responses on each individual item across the various regulatory and administrative categories are cumulated into an index called the OECD Index (2007) that reflects the extent to which procedural changes have reduced transaction costs vis-à-vis labour issues. Dougerty (2011) using the ASI industry level pseudo panel data from 1998-2004 and the OECD index, concludes that States with labour regulation reforms exhibit greater flexibility in the form of inter-industry job flows. Further, Goldar & Aggarwal (2012) using the same index in the context of 2004-05 EUS cross section on manufacturing find that labour market reforms have a positive impact on job creation.

Composite Methods

Gupta et al. (2009) introduce a composite index of labour regulations, and criticize the existing BB Index for its reliance on cross-state heterogeneity. Instead, the study emphasized the importance of industry-specific characteristics in arriving at labour regulation index. The authors noted inconsistencies in classifications of labour regulations for the same state across different measures. To address this, they assigned scores of 1, 0, and -1 to states based on classifications from three studies (BB, OECD, and Bhattacharjea, 2009) and applied a majority rule to create a composite index. This approach mitigated the impact of measurement errors from any single methodology. Their findings indicated that labour-intensive industries and those reliant on infrastructure experienced smaller gains from reforms, particularly in states with inflexible labour regulations. They highlighted that the availability of infrastructure and finance significantly influenced the benefits derived from reforms. Hasan & Jandoc (2013) utilized the GHK composite measure to categorize states as having flexible or inflexible labour markets and find that states with more flexible labour regulations have a higher share of

employment in larger firms, particularly within labour-intensive industries. Sundaram et al. (2012) also employ the GHK measure and finds that formal sector outsourcing positively affect informal sector activities in states with flexible labour markets. Sean et al. (2011) analyze ASI plant-level data from 1998-2008, and using various classifications of labour regulations, including a "Flexible EPL" dummy based on OECD index values, they find that firms in labour-intensive and volatile industries exhibit higher total factor productivity (TFP) in flexible states, with GHK results corroborating this finding, while BB results were insignificant. Chaurey (2015) examines the BB and GHK classifications and concludes that firms in pro-worker states tended to hire more contract workers in response to local demand shocks, particularly those with 50 or more workers. Kapoor (2015) using time-invariant labour market regulations based on GHK and OECD classifications, reveals that states with flexible regulations experienced higher growth in manufacturing employment and value added. Conversely, the increase in the share of contract labour was more pronounced in inflexible states. Ahsan et al. (2017) employed the GHK classification using NSS EUS data and found that tariff liberalization's impact on deunionization in net import industries was less pronounced in states with flexible labour markets. Hasan et al. (2017) analyze the apparel sector using ASI and NSS data, finding that states with flexible labour regulations had a larger share of formal manufacturing employment, a lower ratio of contract to regular workers, and a lower share of workers earning below the poverty line. Ahluwalia et al. (2018) using ASI panel data from 1998-2008 and the GHK index to create a new time-invariant index, find that the abolition of Multi-Fiber System (MFS) export quotas led to significant increases in employment and wages in the apparel and textile industries. Kapoor & Krishnapriya (2019) also analyze ASI plant-level data and find that industrial establishments in states with less flexible labour regulations have a higher share of contract workers, except in small plants and labour-intensive industries.

Other measures

Ahsan & Pages (2009) constructed separate indices for DL or Labour Dispute Legislation and EPL or the Employment Protection Legislation, refining the BB codes with recommendations from Bhattacharjea (2006). Their analysis suggests that both DL and EPL have a negative correlation with employment and output, indicating stringent regulations hindering economic activity. Saha et al. (2013) utilize ASI 3-digit panel data to assess the bargaining power of workers through three state-level measures: lockout/strike ratios, BB index scores, and the OECD index of union strength. Their findings reveal that industries in pro-worker states were more inclined to utilize contract labour in the context of greater import penetration, while they were less likely to do so in scenarios of higher export orientation. Ghani & O'Connell (2014) employ ASI data from 2005-06 along with NSS 3-digit industry-level data to develop a measure of labour regulation based on the framework established by Ahsan and Pages. They show that the stringency of labour laws negatively affects employment entry rates, particularly the percentage of employment in firms less than three years old, suggesting that stringent regulations may deter new firms. Sofi & Sharma (2015) conducted a series of studies using a time-invariant EPL index based on the GHK classification, which they term as the Labour Market Rigidity Index (LMR). Their research indicates a positive relationship between the share of contract workers and EPL, as well as the ratio of strikes to lockouts and industrial output volatility. Conversely, they find that LMR is negatively associated with employment, particularly in labour-intensive industries, highlighting the adverse effects of rigid labour markets on job creation. Sakpal (2016) using ASI 3-digit industry panel data from 2000-07, utilizing the EPL index and dummy variables to distinguish between pro-worker and pro-employer states based on BB scores, finds that firms in states with stricter EPL tend to hire a larger share of contract workers, particularly in regions with more stringent enforcement of labour laws. Goldar & Suresh (2017), employing the BB index to measure rigidity, dummy

variables to differentiate between flexible and non-flexible states along with the Economic Freedom Index and the OECD Index in their analysis of the 2010-11 ASI 2-digit industry cross-section, show that the use of contract workers is not primarily driven by labour market rigidities, suggesting that other factors may play a more significant role in shaping firm level employment practices.

Most studies have focused on the IDA as a prime factor leading to variations in size distribution of firms (Besley & Burgess, 2004; Hasan et. al., 2007; Topalova, 2010; Topalova & Khandelwal, 2011; Hasan et. al., 2012; Ramaswamy, 2015; Karak & Basu, 2019; Maiti, 2019). But apart from the IDA there exists other acts and judgements as well which are important determinants of labour regulatory scenario. Other measures like the AP measure (Ahsan & Pages, 2009), and measures focussing on Dispute Legislation and Employee Protection Legislation does exist, but the measures are seemingly myopic in nature.

Using an alternative method in focussing on EPL pertaining to chapter V-B of the IDA, Bhattacharjea (2009) tests hypothesis that firm adapt to EPL by subdivision, outsourcing and by employing contract labour. Capturing exit and subdivision through number of factories post 1981 (when the non-functional factories were dropped, the ratio of gross value added to output in order to capture vertical subdivision as well as output outsourcing and the ratio of contract to total labour, the study aimed to distinguish between changes that loosened EPL and those that tightened EPL for employers. The author obtained mixed outcomes but provides insightful outcomes in suggesting alternative routes to adapt EPL.

The OECD Index (OECD, 2007) provided a better reach than the IDA as it captured a wide range of dimensions, however there exists scope to study the labour regulatory scenario and quantify the same by incorporating not only the IDA but other important laws as well using advanced methodological tools.

CHAPTER 5
CONCLUSIONS

The study intended to investigate into the firm size distribution in organised manufacturing in India, specifically focussing on the absence of mid-sized firms. The absence of mid-sized firms is also referred to as "Missing Middle". The emergence of missing middle emanates from the process of growth and structural change. Following structural changes, as observed from the presentation of stylised facts, an interesting feature is said to have emerged in Indian manufacturing sector with regards to firm-size distribution in the form of "missing middle". Further, it was observed from stylised facts that apart from aggregate manufacturing, the absence of mid-sized firms are observed at the disaggregated level, across states, product groups and technology categories. The scalar distribution of firms in organised manufacturing also suggests growth of large firms along with pre-dominant share of small firms and relative stagnation of medium sized firms. The absence of mid-sized firms warranted a deeper exploration of transformation in the scalar structure firms in the Indian manufacturing sector.

The theoretical literature on missing middle dates back to the empirical illustration of Little (1987), who first pointed towards missing middle in organised manufacturing in India. The theoretical literature on missing middle has been divided in two stands, the first view talks of the institutional environment in developing countries favouring growth of large firms through preferential treatments in form of credit constraints, unequal access of resources and markets, and government biases, while the small firms struggle to get the necessary impetus to grow. The second view dates back to the dual economy view by Lewis (1954) which argued that while the medium and large firms face fixed cost and constraints, the small firms do not. These factors contribute to the absence of mid-sized firms. A more recent theoretical literature, for instance, Dasgupta (2016), shows that the bimodality in distribution of firms disappears with increases in mean knowledge of new born firms over time.

Globally, the presence of missing middle as absence of mid-sized firms had been acknowledged by Tybout (2000), Krueger (2013), Ramaswamy (2013), Landesmann & Stollinger (2018) and Agarwal (2018). However, the definition of missing middle or the mid-size class varied. In the Indian context as well, Aggarwal (2012, 2018), Mazumder & Sarkar, (2009b), Wei & Balasubramanyam (2015), among others, referred to the missing middle as absence of mid-sized firms and pointed out that labour legislation is one of the prime factors influencing the bimodal distribution of manufacturing firms. On the other hand, Hsieh & Olken (2014), Chatterjee & Kanbur (2014), Nagaraj (2018), Ghosh & Abraham (2020) do not find evidence of absence of mid-sized firms.

The existing literature has the following gaps. First, the literature does not converge on the definition of missing middle. For instance, while Krueger (2013) define the middle bin as the 200-499 worker class, while Tybout (2000) defines the middle bin to be 10-49 worker class, in short, the definition of the middle bin needs to be addressed. Second, the existing literature on missing middle is based on analyses at the aggregate level, and not at the sub-national level. Third, a study based on product level classification and technology-based classification is rare and a disaggregate analysis on the absence of mid-sized firms based on industry groups and technological categories is yet to be studied. Fourth, most studies employ parametric method and do not use frequency density as a metric even if the class width is unequal to understand firm size distribution. Moreover, the use of non-parametric method is rare in the literature deciphering missing middle. Last, even though the association of labour regulations and missing middle has been investigated in the literature, there exists ample scope to develop a better index more suitable to represent the state wise disaggregate level labour regulation scenario. Construction of labour legislation scale needs quantification of the labour regulations and is susceptible to subjective judgment. Further, even though the literature highlights the

primacy of labour legislations, it does not focus on the role of firm-specific and state specific factors, among others, in determining the missing middle in Indian manufacturing

Based on the gaps, the first objective was to study the (non)existence of missing middle at the aggregate level by suggesting methodological improvements. The methodological improvements for studying the size distribution of firms included use of frequency densities, use of different worker categories such as regular, contract and total workers, use of equal and unequal bins and the use of parametric as well as non-parametric methods for estimation. The second objective was to decode the missing middle phenomenon at the disaggregate level and the third objective was to investigate whether the (non) existence of missing middle depends on labour legislation.

The analysis of the three core essays has been done using unit level or plant level data provided by the Annual Survey of Industries (ASI) between 2000-01 to 2017-18. The missing middle has been studied based on the employment criterion, the values of which have been obtained from the variable "average persons employed" in Block E of the unit level records of the ASI. Using the multipliers provided in Block A of the unit level records, the population figures were arrived at from the sample figures. The empirical analyses were carried out using both equal spaced bins and unequal spaced bins in terms of frequency densities. Apart from parametric method, non-parametric Kernel density estimation was carried out. Further, an econometric model, a pooled ordered logit model in specific, was estimated where a set of firm and industry specific control variables were used to study the association between missing middle and labour legislations.

At the aggregate level, while the parametric analysis using frequency curve clearly rejects the presence of bimodality in the firm size distribution of regular workers and total workers, the non-parametric analysis using the Kernel density estimates for the aggregate level

data revealed that the presence of missing middle in the distribution of regular workers in 25-50 bin across most years between 2005-06 to 2016-17. However, except for the year 2016-17, the distribution of total workers did not reveal presence of bimodality in the distribution. Conversely, the national level non-parametric analysis confirms the presence of bimodality implying the existence of missing middle. At the sub-national level, the parametric and non-parametric analysis for regular and total workers using the unequal as well as equal bins revealed the nuanced presence of bimodality in the distribution of manufacturing employment around the regulatory threshold of 100 workers. The analysis revealed that bimodality is present in the distribution of regular workers, but not in the distribution of total workers. The aggregate findings are in tandem with those of Tybout (2000), Mazumder & Sarkar (2009b), Krueger (2013) and Ramaswamy (2013, 2015). Avoiding the arbitrary binning of the manufacturing employment and backed by the non-parametric analysis it can well be inferred that there exists a missing middle in the distribution of manufacturing employment and one of the causes for bimodality in the distribution may be the labour regulations. The role of contract workers in shaping the distribution of manufacturing employment also highlights its importance as a way out for evasion of stringent labour regulations.

The second objective was to explore the size distribution of firms at the disaggregate level more specifically across different product groups (following 2-digit NIC classification) and across different levels of technology adoption. The non-parametric analysis strengthens the findings of the shrinking middle phenomenon. The incidence of shrinking middle actually increases over time. By 2017-18, the analysis identifies 12 out of the 21 industries exhibiting this phenomenon. This suggests a potentially accelerating shift in the firm size landscape. Furthermore, the analysis reveals another intriguing aspect – the bin sizes where the shrinking middle is observed also exhibit variations. Unlike the specific range identified through parametric estimates, non-parametric analysis suggests that the shrinking middle phenomenon

might be impacting firms across a wider spectrum, ranging from those with as few as 50-75 employees to those with 175-200 employees. This variation underscores the complexity of the phenomenon and suggests that factors beyond a single, specific employee band size might be at play. The prevalence of shrinking middle has been more in the high-technology sectors such as electronics, pharmaceuticals and motor vehicles. The mere existence of missing middle or mid-sized firm decline, which are likely to be the key job creators, may be contributing to slower job growth or even job losses. The aggregate and disaggregate findings laid the basis for further research in terms of a detailed causal analysis of 'missing middle'.

The third core essay examined the association between labour legislation and missing middle. While the labour regulations may have a role to play, the research indicates other causes such as access to capital, competitiveness from large firms, or difficulty in coping up with new technologies. The decline of medium-sized companies may be driving some enterprises to remain small in order to escape regulations. An interesting point to note is that the plots for regular, contract and total worker evidently indicate that the intensity of contract worker is on the rise. This change is brought about by several factors including globalization, competition from imports, and the call for flexibility in the labour market (Goldar & Aggarwal, 2012; Sapkal, 2015; Saha et al., 2013; Nagar, 2018; Chakraborty et al., 2020). Indian firms have been found to opt for contract employees rather than regular employees to avoid stringent labour regulations, lower overhead expenses, and improve competitiveness (Bose & Ramaswamy, 2020; Mitra & Ghosh, 2021; Nagar, 2018; Neog & Sahoo, 2019).

The relationship between labour legislation and missing middle has been explored by highlighting the role of contract workers. The study finds that Indian firm size significantly correlates with technology adoption, impacting competitiveness and productivity. Studies (Fatema & Islam, 2021; Rhaiem, 2015; Dhanora et al., 2020; Kale & Rath, 2018) consistently

show larger firms in India exhibit greater high-technology adoption and integration, leading to enhanced performance and innovation. This advantage stems from better access to capital and resources necessary for technological advancements (Rhaiem, 2015). Consequently, larger firms can invest more in R&D and technology upgrades, improving operational efficiencies and labour utilization (Singh & Kumar, 2022). This disparity poses challenges for smaller Indian firms with resource limitations, potentially necessitating policy support for their technological advancement to ensure competitiveness in the global market.

Overall, the contrasting dynamics between the lower, middle, and higher bins underscore the complexity of labour utilization in the Indian economy. The reliance on contract workers reflects a strategic approach to managing labour costs and flexibility, while the trends observed in the middle and higher bins indicate a shift towards more stable employment practices and investment in skilled labour. These findings are critical for understanding how firms navigate labour market challenges and optimize their workforce in response to varying economic conditions.

The lack of mid-sized firms limits growth and job creation in manufacturing. In addition, missing middle may also constrain firms from participating in the global market. The absence of mid-sized firms suggests that there is need for an enabling environment so that small firms can graduate to medium-sized ones. Labour market rigidities might not be the sole factor determining relative absence of mid-sized firms. The other barriers include infrastructural bottlenecks and ineffective regulatory environment. The directed policies towards addressing the absence of the middle segment can include provision of better access to finance, facilitating access to new technology, labour training and re-skilling to remain globally competitive, apart from protection to workers in the middle segment. The disaggregated results have significant

policy implications. First, it is important to look at labour rules, as earlier studies indicate a possible correlation between labour rules and the missing middle, specifically around the 100-worker size. There is a necessity to examine particular rules that could prevent mid-size firms from expanding. Rationalizing rules or providing incentives to cross this boundary may be an option to pursue. Second, there is a need for supporting mid-sized businesses, as mid-sized firms appear to be a fragile group, certain support initiatives could be instituted. This may involve simplified access to credit, tax relief, or technology take-up assistance in order to assist them in competing with large enterprises and coping with growth issues. Third, the paper indicates a link between high-technology industries and incidence of missing middle. This might be due to big companies having a better chance of investing in advanced technologies or automation, driving out middle-level competition. Regulations might be helping the mid-size firms to adopt technology. Finally, attention might be on targeting industries, for instance, electronics industry, pharmaceuticals industry, and motor vehicles industry experiencing declining middle. Fourth, the findings have significant implications in terms of necessity of the Government to pay attention towards contract labour while framing the new labour policy.

The findings of this study provide a valuable foundation for future research on the "missing middle" phenomenon in India. Several avenues for further exploration can be identified. First, a longitudinal study could delve deeper into the dynamics of the missing middle over time, examining how the factors influencing its occurrence evolve in response to changes in the economic, technological, and regulatory landscape. Second, comparative research across different regions or industries within India could shed light on the heterogeneity in the evidence of missing middle and identify specific contexts where it is more or less prevalent. Third, exploring the impact of the missing middle on broader economic outcomes,

such as job creation, productivity, and innovation, would provide a more comprehensive understanding of its significance. Fourth, the relationship of missing middle with external factors would enhance the relevance of the study in an open economy. Fifth, it is important to understand the nexus between labour legislation and changes in political regime to arrive at a broader understanding of the phenomenon of missing middle. Last, investigating the effectiveness of policy interventions aimed at addressing missing middle, such as targeted support for SMEs or reforms in labour regulations, would be crucial for evidence-based policymaking.

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Data Appendices

Data on organised manufacturing sector at the plant level have been mined for 15 years from 2002-03 to 2016-17 from the micro data repository of Government of India. Firm size data exploration is studied at each time period to examine the existence or non-existence of bimodality or multi-modality characteristics of distribution. Panel data framework is not considered here due to data constraint, the ASI sampling frame is classified in two sectors, viz., the Census sector and the Sample Sector. The Census sector consists of large firms and the firms in the Census sector are surveyed every year by ASI. The firms in the Sample sector are chosen via Stratification and the factories in the Sample sector changes from year to year. ASI Panel data can be constructed using the firms in the Census sector, however the access to ASI Panel data is paid but the ASI Unit level data for different years are obtained from the micro data repository of the Ministry of Statistics, Government of India. It must be noted the identifiers for the surveyed factories change every year and as a result, we stick to the non-panel framework for the analysis.

The identification particulars of firms are given in Block A of the ASI survey. Data related to employment is provided in Block E of the ASI. The firm identifiers in block A are mapped with those in Block E so as to have the complete dataset. For the purpose of the study values of “average persons employed” are extracted for each of three key variables (viz. “regular workers” which includes only male and female workers under full time employee payroll, “contract workers” which depicts the number of workers employed via contracts and “total workers” which is the sum of “regular workers” and “contract workers”; “total workers” can be proxied as “production workers” as well). It must be noted that the ASI enumerates all the big registered manufacturing units which employ 100 or more workers (the threshold of 100 worker is relaxed for certain states), these units comprise the census sector and all these units are completely enumerated, the census sector has a multiplier of 1. Manufacturing units with

less than 100 workers (or the varying threshold as per different states) are sampled and the corresponding multipliers are provided by ASI so that the population figures can be derived. Adjusting for the multipliers the population figures were derived and frequency tables for each of the key variables namely “regular workers”, “contract workers” and “total workers” were generated.

Data has been mined at national as well as at sub-national level. At national level (that is for the entire country) data has been analysed from the time period 2002-03 to 2016-17. At State level, data is mined for the 20 major States of India using the state codes provided by the ASI (the states being Andhra Pradesh, Assam, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal).

With respect to chapter 3, the data on organised manufacturing has been mined for three time points, specifically 2004-05, 2011-12 and 2017-18. Alike chapter 2 the firm identifiers in Block A were mapped to that of Block E which provided the employment figures. The data on 5-digit NIC classification in Block A was also taken to account in order to arrive at the 2-digit product level specification. Further using the NIC classifications, the 4-digit classifications have been obtained at different levels of technology intensity. The concordance between NIC 2004 and NIC 2008 facilitated the comparison over time. In order to classify the firms in respect with respect to size, data on Fixed Assets were extracted from Block C and matched with the firm identifiers in Block A, post which the firms were classified as micro, small, medium and large based on the definition of MSME as per the MSMED Act 2006.

With respect to chapter 4 the data on organised manufacturing has been mined at three time points 2000-01, 2009-10 and 2017-18. Alike in chapter 2, the firm identifiers in Block A have been mapped to that of employment figures in Block E and the values of regular, contractual

and total workers were extracted. Using the state codes provided by ASI, the values of regular, contractual and total workers were classified for the different states in India. Further using advanced filtering techniques, the values of regular workers were studied and the ordered dummy was provided.

With respect to the construction of Labour Legislation Index (LLI), the details have been provided in the annexure to chapter 4.

ESSAYS ON INDIAN MANUFACTURING SECTOR: A STUDY OF MISSING MIDDLE

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