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**TRADE, LABOR SHARE, AND PRODUCTIVITY
IN INDIA'S INDUSTRIES**

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Abstract

This paper explores whether trade can explain a part of the sharp decline in the labor share of Indian formal industries from around 30% in 1980 to less than 10% in 2014. Decline in strikes and lockouts, reduced labor time lost from disputes per factory and increased use of contract workers in all major states in India are signs of reduced bargaining power. In order to estimate the influence of trade, the mark-up and bargaining power affecting the labor share and resultant productivity is derived. A semi-parametric approach is applied on a 3-digit level of industrial data over major states during 1998–2014 to regress Solow residual (the proxy for productivity) on trade share along with its interaction terms capturing market imperfections. The results confirm that trade, by dampening the bargaining power of labor, reduces labor share and hence raises productivity. It is argued that the joint effects of market size and competition arising out of trade cannot dominate the adverse effect of specialization in the presence of unions. The degree of specialization or comparative advantage that appears due to the increased market share of the most productive firms, who require fewer workers, thereby reducing the demand for workers with the trade. The drop in demand weakens bargaining power and shifts away distributive share from workers. But the competitive policy encouraging entry can negate such adverse effects of trade, to a large extent.

Keywords: trade, market imperfections, labor share and productivity growth

JEL Classification: D24, F16, L11

Contents

1.	INTRODUCTION	1
2.	INDIAN ECONOMY AND PRODUCTIVITY GROWTH.....	5
3.	TRADE AND LABOR SHARE	7
4.	EMPIRICAL ANALYSIS	9
4.1	Descriptive.....	9
4.2	Empirical Framework.....	15
4.3	Estimation Method.....	17
4.4	Results	18
5.	CONCLUDING REMARKS.....	20
	REFERENCES	22

1. INTRODUCTION

While trade is assumed to affect the labor and product market conditions through the effects of market size, competition, and specialization as per the contemporary literature (see Neary, 2016), this paper attempts to investigate whether it influences the labor share and the resultant productivity growth of the industrial sector. During the first four decades after independence, India could not grow at a decent rate in spite of its potential, due to the presence of various inefficiencies and rigidities faced by the economy. The industrial sector was highly monopolized by a limited number of firms and the formal labor market engaged in the industrial sector was fairly rigid. These two problems have been highlighted by a large group of scholars and practitioners as inefficiencies that were critically affecting the industrial growth of the economy during this period. When the economy started facing problems of high inflation, low foreign reserves, and slow growth, along with high unemployment, India was forced to liberalize its economy vigorously from the early 1990s. In the process, the licensing system was gradually removed, trade barriers were slowly phased down, public investment was withdrawn from many core economic and productive activities, the exchange rates were gradually pegged out, and so on. These reform measures were undertaken on the assumption that they would encourage trade and thereby improve competition, raise transparency, and remove rigidities and inefficiencies in the product and labor markets. In other words, the trade reform was expected to affect the product market competition and labor market rigidity, leading to a change in labor share and resultant productivity growth.

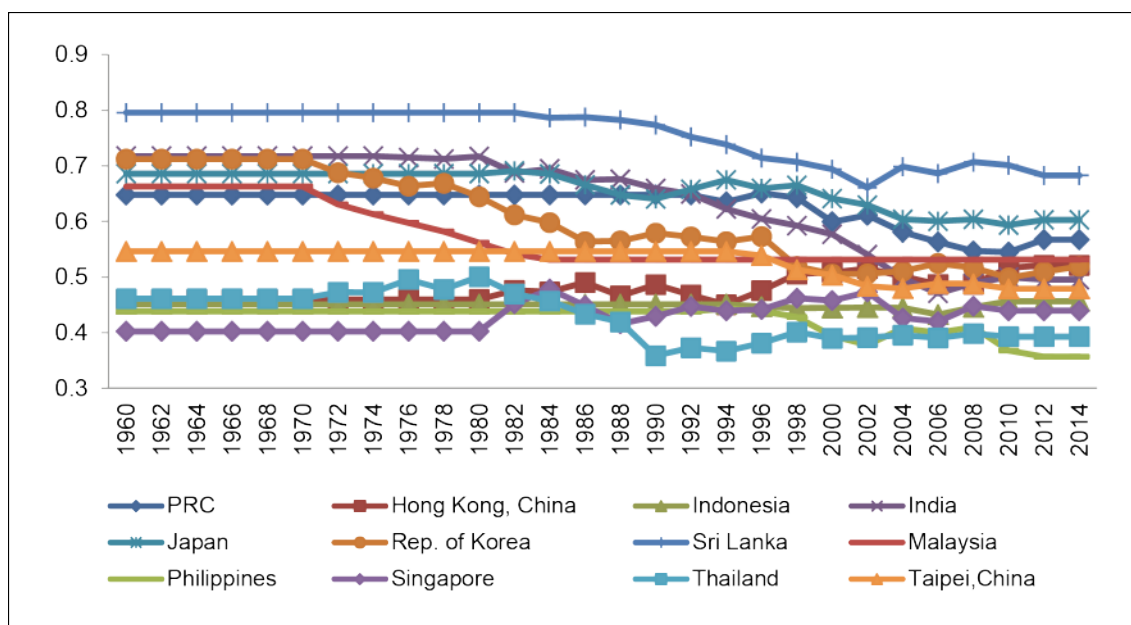
When we look at the trend of a sample of developed and developing economies in Asia for the period from 1960 to 2015 (Figure 1), the labor share begins to fall in all economies systemically from around the late 1980s to early 1990s. This is the period when trade grew at a faster rate. No doubt, trade redistributes the allocation of resources and thereby changes the resultant factor payments in such a way that must affect the distributive share of labor, specifically when the markets are imperfect. This is because the market conditions in both product and factor markets are expected to be influenced by trade. Using cross-country analysis, recent theoretical works (Neary, 2016; Maiti, 2018) have showed that trade weakens the bargaining power of workers when the specialization effect arising out of international trade under heterogeneous productivity distributions between the trading partners dominates over the joint effects of market size and competition in a setting of heterogeneous firms. Now, the question is whether it explains the trend of labor share and the resultant productivity growth.

Of course, if labor share declines, the productivity, measured as Solow residual, is supposed to thrive. This paper attempts to investigate this conjecture in the Indian context using disaggregated level of industrial data by estimating parameters that show the degree of product and labor market powers and further examine its resultant effects on the productivity. The Indian formal labor market is considered to be highly rigid, alongside being one of the largest informal sectors in the world. The favorable labor regulations that encourage this rigidity are subjected to be investigated for their tolerance with the trade exposure. Recently, the policy makers have begun the process of bringing flexibility in the labor regulations by removing the clauses encouraging rigidity (Bhattacharjea, 2018). This work aims to investigate any justification for such additional reform measures.

It is evident that the labor share of workers working in the industrial sector has been declining sharply in most countries, including in the developed world. Many of these countries had rigid labor laws. A recent study conducted by IMF shows a downward trend

in labor share in most of the countries, which has led to the recognition that it appears to be a major economic and social issue at the present time. In the advanced economies, labor income shares began to trend down from the 1980s, reaching their lowest level in the entire past half century prior to the global financial crisis of 2008–2009, and have not recovered materially since then (Dao et al., 2017). According to an ILO (2017) study, the share of national income, defined by total earnings for all employees and self-employed, has declined in Europe from 75% of national income in the 1970s to 65%. OECD countries have also experienced a sharp fall from 64% to 59% during this period (Sweeney, 2017). In a sample of 54 emerging market and developing economies, the labor share declined in 32 economies, which accounted for about 70% of their GDPs. It was also observed that the sharpest decline in the labor share was in manufacturing, followed by transportation and communication. Some sectors (food and accommodation, agriculture) witnessed an increase. However, the sharpest decline was observed in agriculture among the emerging market and developing economies (Dao et al., 2017). The declining labor share of national income is, of course, accompanied by the huge rise in the share going to the owners of capital and a small elite number of employees within the labor force. After the global financial crisis, when unemployment shot up substantially all over the world, it became a growing concern to investigate the driving forces working behind it. Several explanations have been put forward to explain this decline. They are technological progress, global integration, offshoring, fiscal and market reforms, etc. These factors are not strictly disjointed from each other, as the effect of technological progress is at the core of the analysis.

Figure 1: Labor Share in Selected Asian Economies, 1960–2014
(%)



Source: Penn World Table Version 9.0.

The distributive conflict between labor and capital is an age-old debate in the subject. Arrow et al. (1961) argue that if capital is highly substitutable for labor and the elasticity of substitution between them is larger than one, a decline in the relative cost of capital drives firms to substitute capital in place of labor to such a high degree that, despite the lower cost of capital, the labor share of income declines. Technological progress led by information and telecommunications innovations and automations, in addition, seems to be doing the same thing in the current phase of development. Even when the capital goods price declines due to these technological innovations, such technology substitutes workers disproportionately so that the labor share falls faster (Karabarbounis and Neiman, 2014). Piketty (2014) offers an accumulation view, suggesting that an increase in aggregate savings relative to national incomes, for a variety of reasons, has raised capital-to-output ratios. Acemoglu and Restrepo (2018) point out that automation of some tasks that were previously performed by labor causes a permanent reduction in the labor share. Autor et al. (2017) and Kehrig and Vincent (2017) further argue that the rising industry concentration and the growing dominance of superstar firms are responsible for the fall. Various measures of fiscal reform (like tax concessions) also encourage industrial activities and hence raise inter-country competition to attract capital in a globalized world (Rodrik, 1998). The increased offshoring and participation in global value chain, on the other hand, have fueled the declining trend (Feenstra and Hanson, 1997).

As far as the issues relating to international trade are concerned, views on how trade affects the labor market are quite mixed. One set of scholars suggests that unionization rates and laborers' bargaining power might have declined as a result of trade integration (Rodrik, 1997; Elsby et al., 2013) and this essentially causes a drop in labor share. However, the empirical evidence from cross-country analysis does not accept this view unambiguously. Slaughter (2001) finds very mixed evidence using four-digit industry-level data from the US. Similar results are also found by Brock and Dobbelaerre (2006) and Arbache (2004) respectively for Belgium and Brazil. But, Dumont et al. (2006) find substantial bargaining power of workers in five European countries.

If we specifically look at the Indian case, the dominant view of existing research seems to suggest that the presence of labor market rigidity in the concerned region and industry is critical for the resultant labor share. Using the three-digit level industry data from India, Ahsan and Mitra (2014) suggest that trade liberalization led to an increase in the share of wages in total revenue for small on average, labor-intensive firms, but a reduction in this share in the case of larger, less labor-intensive firms. On the other hand, Dutta (2007) showed that workers employed in industries with high tariffs received higher wages than apparently identical workers in low-tariff industries during 1983-2000. Moreover, Gupta and Helble (2018) observed that import tariff reductions have reduced labor share only in labor-rigid regions.

Therefore, the Indian growth and productivity debate is very much centered on how the industrial regulations have evolved across regions. In spite of significant growth of the Indian economy, it has been largely argued that the economy could not reap the potential benefits due to the presence of labor market rigidity. Some regions have been left behind the others for the same reason. Rigid labor legislation in Indian economy has been criticized by a number of scholars as one of the responsible factors behind the slow employment growth of manufacturing sector even in the post-reform period. The Industrial Disputes Act, 1947, has been the key in this regard. According to this act, the central government has designed the general guidelines of labor relations in the country and placed them in the hands of state governments for the effective implementation and necessary amendments in a federal democratic setting. This framework has resulted in

significant variation of labor regulations and/or their enforcement across Indian states (Besley and Burgess, 2004 and Hasan et al., 2007). Some states have gradually amended the Act in such a way that they favor workers, while others did that favored employers. Besley and Burgess (2004) looked at the way the states have amended and coded them to provide a proxy for labor market rigidity. Based on this, they classified the Indian states into pro-workers, neutral, and pro-employer by looking at the direction of the amendment made in the labor legislation by each state government. The study found that the states that amended the regulations in favor of employers have grown faster than others. Similarly, the effect of delicensing (from capacity utilization, new plants and products, known as License Raj in India) has been found favorable for accelerating industrial growth of the economy, but unequal across regions due to the variation in the labor market rigidity (Aghion et al., 2008).

This work was extremely influential among academic scholars as well as policy makers. A large amount of works have been undertaken thereafter that applied the Besley and Burgess index to investigate the differential impact of various economic and social outcomes across the regions. For example, Hasan et al. (2007) showed that trade has successfully reduced poverty at a higher rate in the pro-employer states than in pro-worker states. On the other hand, Topalova (2007) observed that the economic integration leads to further growth in income inequality and an increase in the number of poor people in developing economies (specially in India), and therefore the benefits of liberalization may be realized at a substantial social cost unless additional policies are devised to redistribute some of the gains from the winners to the losers.

However, they further assumed that the regulatory systems of each regional government are so effective that the labor market rigidity is highly regulated by 'de-jury' measure of the legislative amendments and does not depend on any other market condition and 'de facto' measure. Several scholars have criticized such methods of coding and indexation of legislative reforms by simply looking at the direction of legislative amendments. It is criticized that they have been confined into a narrow area of legislative measures affecting labor market outcomes. They could not even capture the number of other important legislations affecting Indian labor market conditions; rather what they considered are not relevant for labor regulation, to a large extent (Bhattacharjea, 2009). Following this criticism, Ahsan and Pages (2009) attempted to modify the index by limiting themselves within the relevant area of legislations concerning labor relations and implementations. Even then, they could not overcome this problem. In an alternative work, Dougherty (2009) also attempted to construct an index taking the responses from state government officials on a schedule of 50 questions. However, they face a different problem by depending upon subjective judgment of labour market functioning. One of the major limitations of the existing literature, therefore, is that the form of labor legislation is over-emphasized, but its functioning, which underlies the local social, economic, and political institutions, has been grossly neglected. Recently, Bhattacharjea (2018) looked at all of them and argued that none of their works is able to capture the actual degree of labor relations effectively. He investigated the actual status of regulations, which were coded by Besley and Burgess (2004) and others. Strikingly, he finds that a number of regulations passed by a state government were put on hold or stayed in the court for several years. Hence, effectively one should not count a change in the coding from the date of legislative approval, rather it should be from the date when it was officially implemented. After correcting all of them as per the date of effective implementation, Bhattacharjea (2018) finds that there is not much variation in the labor rigidity index that can explain the difference in regional growth across states. This opens up some room to find out an alternative way of measuring the rigidity to understand the industrial dynamics across regions using actual industrial statistics. With this backdrop, the current paper attempts to explicitly show how the dynamics of product and labor markets conditions

affected the organized industrial sector in India during the period from 1998 to 2014 in response to trade.

The rest of the paper is organized as follows. Section 2 provides an account of productivity growth in India. Section 3 summarizes the theoretical literature on trade and labor share. Then, the empirical framework of estimation of mark-up and bargaining power of the labor share are discussed in Section 4. Section 5 ends with concluding remarks.

2. INDIAN ECONOMY AND PRODUCTIVITY GROWTH

During the last two and a half decades, the Indian economy has maintained a significant growth rate and often exceeded the growth rate of the Chinese economy, in spite of the Global Economic Crisis in the late 2000s. According to the World Bank Development Indicators, while GDP grew roughly at 5% during the latter half of the 1980s, it reached up to 9.7% in 2010, and India still maintained a growth rate of around 7%–8% during 2010–2017. The share of the manufacturing sector's contribution remained between 14%–18% in this period. The high growth in recent years has encouraged scholars to investigate the role of productivity growth in the country. For a long time, the economy could not achieve a decent growth rate. The contribution of secondary sectors in GDP has gone up from 20% in 1970 to 28.4% in 2010. After independence in 1947, the country emphasized the achievement of self-reliance through import substitution along with large-scale industrialization driven by direct and indirect public sector participation. But, this approach and strategy for industrialization, by protecting the national economy from the outside world, could not lift up the economic growth much during the four decades after independence. Rather, it was responsible for the industrial deceleration during the mid-1960s to the late 1970s. This approach has been severely criticized by many scholars and hence believed to be the root cause for the poor economic growth during this period after independence (e.g., Bhagwati and Srinivasan, 1975; Bhalotra, 1998). Gradually, India started adopting liberalized industrial, trade, and development policies since mid-1985. When the foreign exchange reserves gradually fell to an abnormally low level, a crisis hit the economy badly in the early 1990s and inflation crossed over into double-digits. The economy was forced to liberalize overall economic policies on all fronts, including financial and external sectors, considering that the gradual reduction of trade barriers, dis-investment in public sector, de-reservation of small-scale industries, delicensing of industrial activities, private sector expansion, reduction of the barriers on foreign capital, financial sector autonomy, exchange rate convertibility, etc. would bring the economy out of these problems permanently. The principal philosophy behind such reform policies was laid on the promotion of competitiveness so that it could reduce market imperfections and encourage optimal use of labor and other resources that are essentially required to accelerate productivity growth. The market forces without much government intervention are assumed to be playing a pivotal role in overcoming problems to achieve higher growth rates. It can be argued that the increased international competition raises domestic production for export and pushes up the incentive to invest more on productivity improvement.

In the post-1991 period, India moved away from the regime of trade protection to that of liberalization. The average tariff rate started to decline since the mid-1980s. The rate registers an upward rising trend in the early-1980s up to 1985 and then declines sharply. The tariff rates were very high pre-1991, reaching the highest of over 100% in the year 1985, followed by a gradual decline thereafter. The average tariff rate has sharply dropped from 79.2% in 1991 to 12.5% in 2006 and to less than 10% in the next 7–8 years. On the other hand, the pre-1991 FDI inflow figures are almost negligible in terms of total capital formation in the country. But, FDI inflow started to rise thereafter with certain degree of ups and bounce. It was around \$0.07 billion during 1980–1990 and then reached \$20.3 billion in 2006. After the crisis there was a drop and now it has stagnated in recent years, according to World Development Indicators figures. However, total FDI accounts for still nearly 1% of GDP. Therefore, the impact of tariff reduction on the economy would be more powerful than that of FDI flows during the period of study.

The arguments behind changes in productivity growth and its contribution to the economic growth of India after economic reform are distinctively divided into two groups. One group suggests that the reform has encouraged productivity growth, while other holds the opposite view. However, the results are influenced by the methods used and the factors applied for decomposition. Isaksson (2007) derives total factor productivity growth applying data envelope analysis and compares it for 112 countries (including India) over the span of 1960–2000. According to the estimate, TFP growth does not show an encouraging improvement for Indian economy. It grew at 0.7% during 1960–2000 when output rose by 4.97% per year. According to a more recent study, undertaken by Li and Treichel (2012), it increased from around 1% growth in 1980 to 1.5% in 2010. Substantial improvement has taken place in the productivity growth in the country.

However, the result of productivity growth is highly sensitive to the method used in the estimation. Earlier, Ahluwalia (1991) showed that the productivity growth was very slow before 1980 and turned around thereafter. Balakrishnan and Pushpangadan (1994) criticized this further, arguing that the productivity growth was slow even during the 1980s. According to them, productivity, being estimated by deflating respective prices (i.e., double deflation method) rather than using single deflator, provides a right and unbiased estimate. Since the study undertaken by Ahluwalia (1991) was based on the single deflation method, the estimate provided therein was biased. But none of these studies could show any impact of trade reform after 1990s. A number of studies find that productivity surged in the manufacturing sector in India after the 1980s (Unel, 2003). In particular, Unel (2003) argues that productivity has grown at a rate higher in the post-reform period than that in 1980s. Kumar (2006) and Balakrishnan et al. (2006) find that the productivity has improved in the post-reform period. The improvement in technical efficiency as well as technical progress, in response to competitiveness, has been playing a responsible role behind the productivity growth. Milner et al., (2007) also find an increase in productivity growth on average and for the majority of manufacturing industries. A rise of competitiveness is directly and indirectly found to be the most influential factor behind the increase in productivity growth. According to Madsen et al. (2009), the productivity growth rate increased annually by 1.1 percentage points during 1960–2005 in India. A marginal improvement was further observed in some other works during the 2000s (Sehgal and Sharma, 2010; Kathuria et al., 2010).

At the same time, there are other studies which do not find an encouraging figure of productivity growth in the post-reform period. The estimates of productivity growth reported in the study of others (e.g., Goldar, 2003; Goldar and Kumari, 2003) indicate a fall, and this is during the period when the economy has grown consistently at a higher rate. Suboptimal use of capacity and decreasing returns to technology have been a few responsible factors noted for this. Two issues have emerged as being important in recent years – the inability of the manufacturing sector to contribute substantially to the overall growth and the service sector-led-growth acceleration during 1990s (Eichengreen and Gupta, 2011; Eichengreen and Gupta, 2013). There are studies that draw upon sectoral perspectives, in particular, the sub-sectors of manufacturing, that find evidence of factor accumulation rather than productivity growth in growth accounting (Das, 2004). However, all these studies have ignored the issues of market imperfection on the dynamics of productivity and its estimation. At first, Balakrishnan et al. (2006) have accounted for the influence of product market competition in the productivity estimation for the Indian manufacturing sector and attempted to eliminate product market conditions from the derivation in the Indian context. The study found an improvement in the productivity growth in response to a rise in the competition after trade reforms. Maiti (2013) finds that the trade reform improves productivity once market imperfections are eliminated. Hence, the literature holds diverse opinions, but the issue of market imperfection becomes an integral part in the discussion of production growth. If trade affects product and factor markets significantly, the present paper aims to see its implication for labor share and the resultant productivity change.

3. TRADE AND LABOR SHARE

A large volume of theoretical literature related to the effect of trade on the distributive share holds a favorable view for the workers. The Ricardian framework is ill-suited to address this question. This is because all national income accrues to labor under the competitive environment. However, under a similar market environment the Heckscher-Ohlin trade theory argues that the degree of comparative advantage due to factor abundance favors the workers after trade if the labor is the abundant factor of the economy. Heckscher and Ohlin believed that the benefits are mutually conflictive between the factor owners and between the trading partners and depend on the degree of factor abundance (i.e., comparative advantage) in a perfectly competitive environment (Jones, 1965). The second generation is of the view that, even if trade takes place between two countries under similar conditions it could still improve the distributive share of workers (in real terms) if the joint effect of market size and competition reduce the price level sufficiently as compared to that of autarky. Krugman (1980) offers a pioneering framework, using Dixit-Stiglitz utility setting of differentiated goods in a monopolistically competitive environment, to analyze such gains from trade between similar countries that occurs through these two effects. The worker is expected to be better off in real terms after trade, as the competitive force depresses the product price. According to the third generation of trade theories, Krugman framework was criticized in that it either relies on partial equilibrium analysis or assumes homogeneity to a large extent. If the firms are assumed to be heterogeneous in terms of productivities, the Krugman effects of competition and scale seem to be absent in the gains from trade (Melitz, 2003). This leads us to incorporate variable mark-ups across industries (McMalman, 2018). Melitz (2003) and Yeaple (2005) elegantly adopted the framework of monopolistic competition (Dixit and Stiglitz, 1977) to show the selection effect of productive firms, heterogeneity in terms of productivities. In the presence of heterogeneous firms in terms of productivities as well as labor market imperfection, such favorable impact of trade on the wage and distributive share of workers has not been

uniform across all sectors and types of labor, and becomes ambiguous at the aggregate level. It depends not only on the relative strength of market size and competition effects, but also on the extent of labor reallocation within and across industries (Melitz and Ottaviano, 2008). Unlike the conventional argument, the contemporary research believes that trade makes differential impacts on the mark-up across industries and the resultant demand from workers. More importantly, this further allows us to capture variable mark-up of pro-competition effects. Broadly, there are two forces of pro-competitive effects. At the firm level, trade liberalization intensifies foreign competition, reducing the market power of local producers and forcing them to decrease their mark-ups (Melitz and Ottaviano, 2008; Arkolakis et al., 2015). Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) provided empirical supports for lowering mark-up dispersion associated with less extensive distortion across firms. On the other hand, Edmond et al. (2015) and Arkolakis et al. (2015) point out the negative possibility of pro-competitive effects of trade liberalization that occurs through reallocation of labor toward more productive exporting firms. This could allow the firms to internalize a drop in trade costs and charge higher mark-ups. As a result, whether trade liberalization leads to a rise in welfare gains or losses depends on the joint movement of labor reallocation and mark-up distribution. The opening of trade leads to a larger increase in the zero-profit cutoff in this tradition and this results in a rise of average productivity in the comparative advantage sector than in the disadvantage sector. This influences the real reward of each factor by changing product variety (as in Helpman and Krugman, 1985) and the reward may rise with average productivity in each sector (Melitz and Redding, 2014). Hence, it is quite possible that trade liberalization can raise rather than reduce the real reward of the scarce factor (as seen in the Stolper-Samuelson model). In a setting of variable mark-ups, Melitz and Ottaviano (2008) argue that sectors with tougher competition have a downward shift in distribution of mark-ups across firms. In parallel, there are other frameworks that attempted to show the effect of trade using heterogeneity and variable mark-up. Contemporary research by those who model labor market frictions is engaged in explaining why the wage would vary across firms using heterogeneity. They tried with workforce composition (Yeaple, 2005), search and matching frictions (Davidson et al., 2008), and efficiency wages (Amiti and Davis, 2012). In an interesting study, Helpman and Itskhoki (2010) show that the differences in labor market institutions across countries and industries providing a source of comparative advantage and this shapes the impact of trade liberalization on aggregate unemployment. A reduction in labor market rigidity increases the gains from trade. However, these models are silent on the effect of trade on labor share in the presence of unemployment.

The fourth generation of theories believe that firm heterogeneity under a monopolistically competitive environment, although it becomes the workhorse for modern trade theories to find answers to various questions arising out of trade, fails to accommodate strategic competition that exists in oligopolistic markets (Neary, 2016). When trade takes place between two countries, the strategic competition raises the market size but reduces the share in the domestic market. These two forces could go against each other. On top of this, the outputs of most productive firms would be selected by the competition (comparative advantage effects) and this leads to shrinking of the market share for labor-intensive industries. This competition effect, along with comparative advantage, could dominate the market size effect in determining the net demand from labor and hence wage can rise. The wage rise could be so high that it may improve the distributive share of workers. Neary (2016) demonstrates in a generalized oligopoly structure that if the competition and comparative advantage effects dominate the market size effect of trade under identical situation between trading partners, the net effect could lead to a rise in the share. Maiti (2018) introduces labor market imperfection in this framework and finds that trade can reduce the bargaining power of workers, along with the increased

competition that explains a drop in labor share. However, a competitive domestic policy encouraging entry could improve the labor share and negate the adverse effect of pure trade effects.

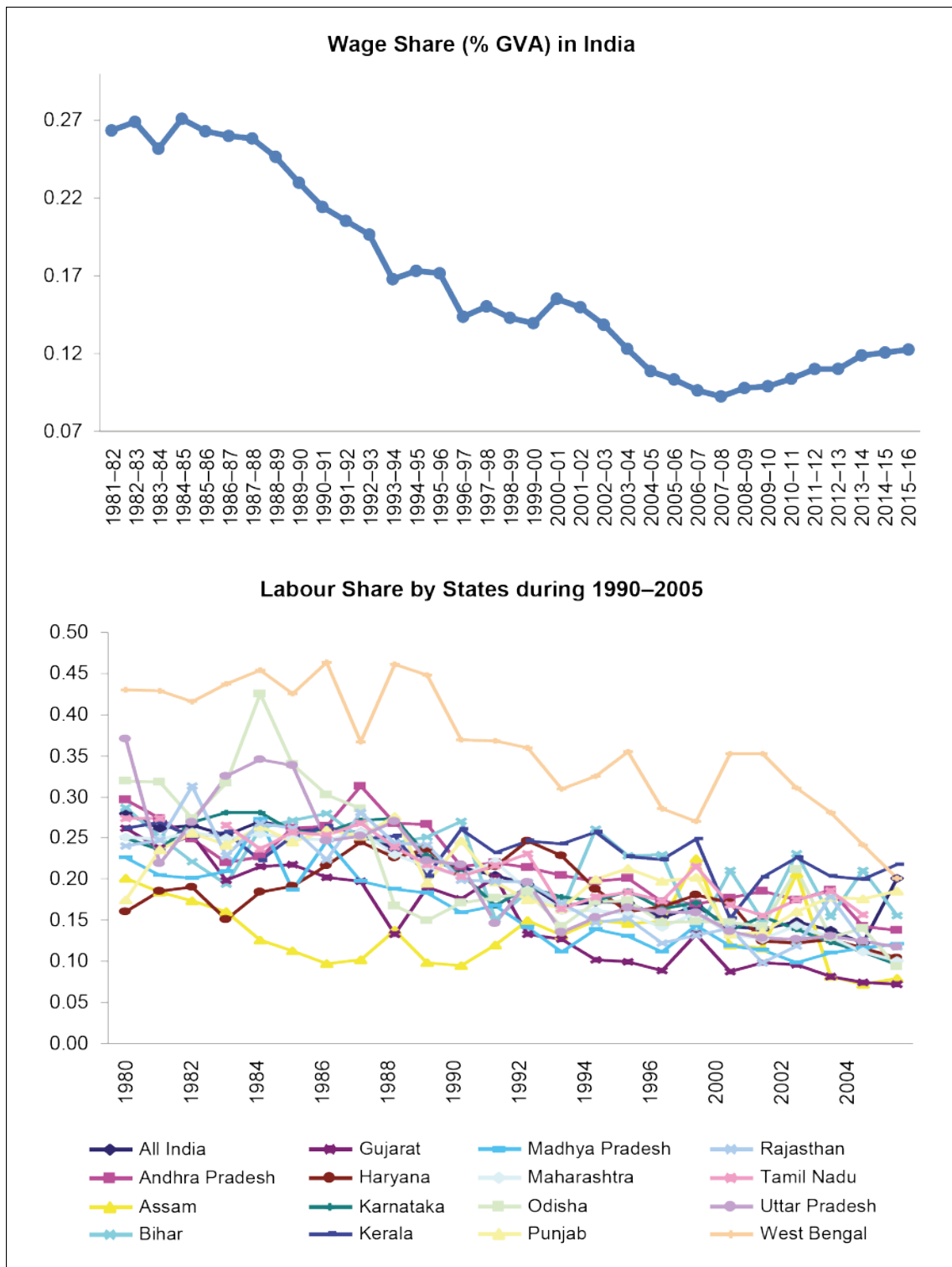
4. EMPIRICAL ANALYSIS

4.1 Descriptive

Let us now look at the industrial and labor market dynamics in response to international trade during the last two decades of the Indian economy. The dynamics of labor markets must have been reflected in the distributive share of industrial workers. Indian labor legislation is argued to be quite rigid and has received criticism from a group of scholars (discussed above). According to them, it is one of the most important factors responsible for the slow employment growth experienced in the manufacturing sector during the period of study. Without any substantial amendments to the central regulation along with the presence of variations in the state legislation, there are signs of declining bargaining power in all types of states—neutral, pro-workers and pro-employer states (as defined by Besley and Burgess, 2004).

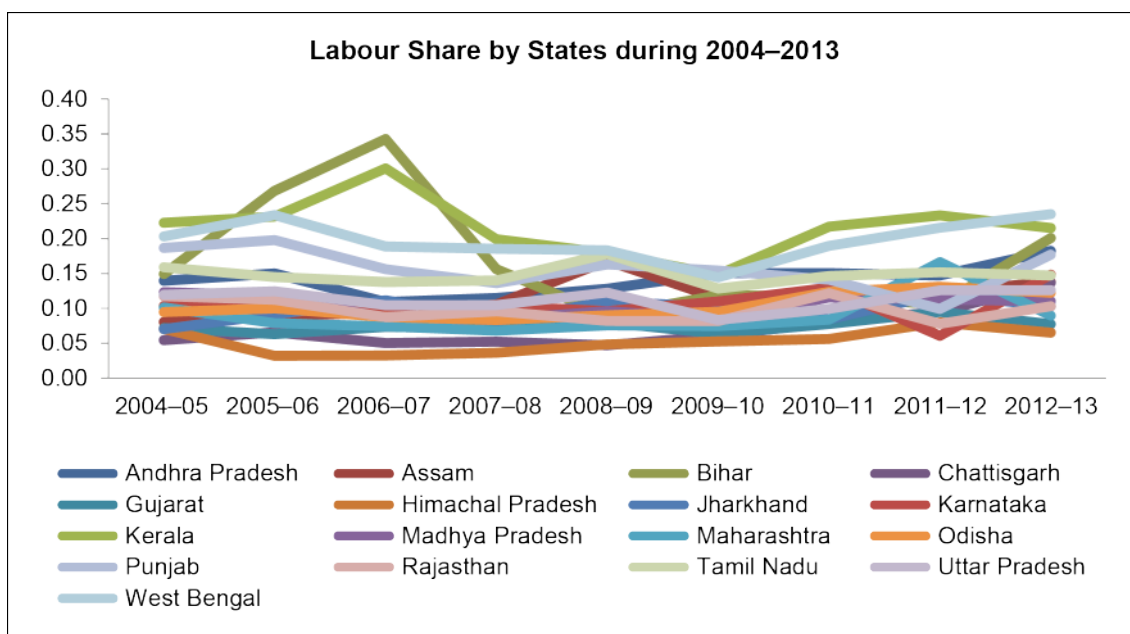
Labor share, measured as a percentage of gross value addition (GVA), drastically dropped from 28.0% in 1980 to 10% in 2007-08 in the industrial sector and then marginally increased to 12% during 2015–2016 (see Figure 2). The decline of wage share could be due to either a drop in wage and rise in market price, or a rise in productivity. Whatever may be the reason, the drop itself seems to represent the weakening bargaining position of workers, who are engaged in the industrial sector because the drop encourages the residual surplus. The share has been presented state-wise for two periods, 1999–2004 and 2005–2014 (see Figure 2). It accounts for a sharp decline in all the major states, including the so-called pro-employer and pro-employee states. The rate of decline was faster during 1999–2004. Labor share seems to have converged during this period across states. West Bengal, the state famously known as a labor-rigid state according to the Besley Burgess measure, also shows a sharp declining trend and has registered a fall to a level lower than some other pro-employer states in 2004–2005. Andhra Pradesh has an unsettling graph, but shows a decreasing secular trend after 2002–2003. However, the trend after 2008 shows a bit of improvement for some states. The drop in price due to economic recession and international oil price might have raised the wage in real terms.

Figure 2: Labor Share in Indian Industries, 1980–2016



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Figure 2 continued

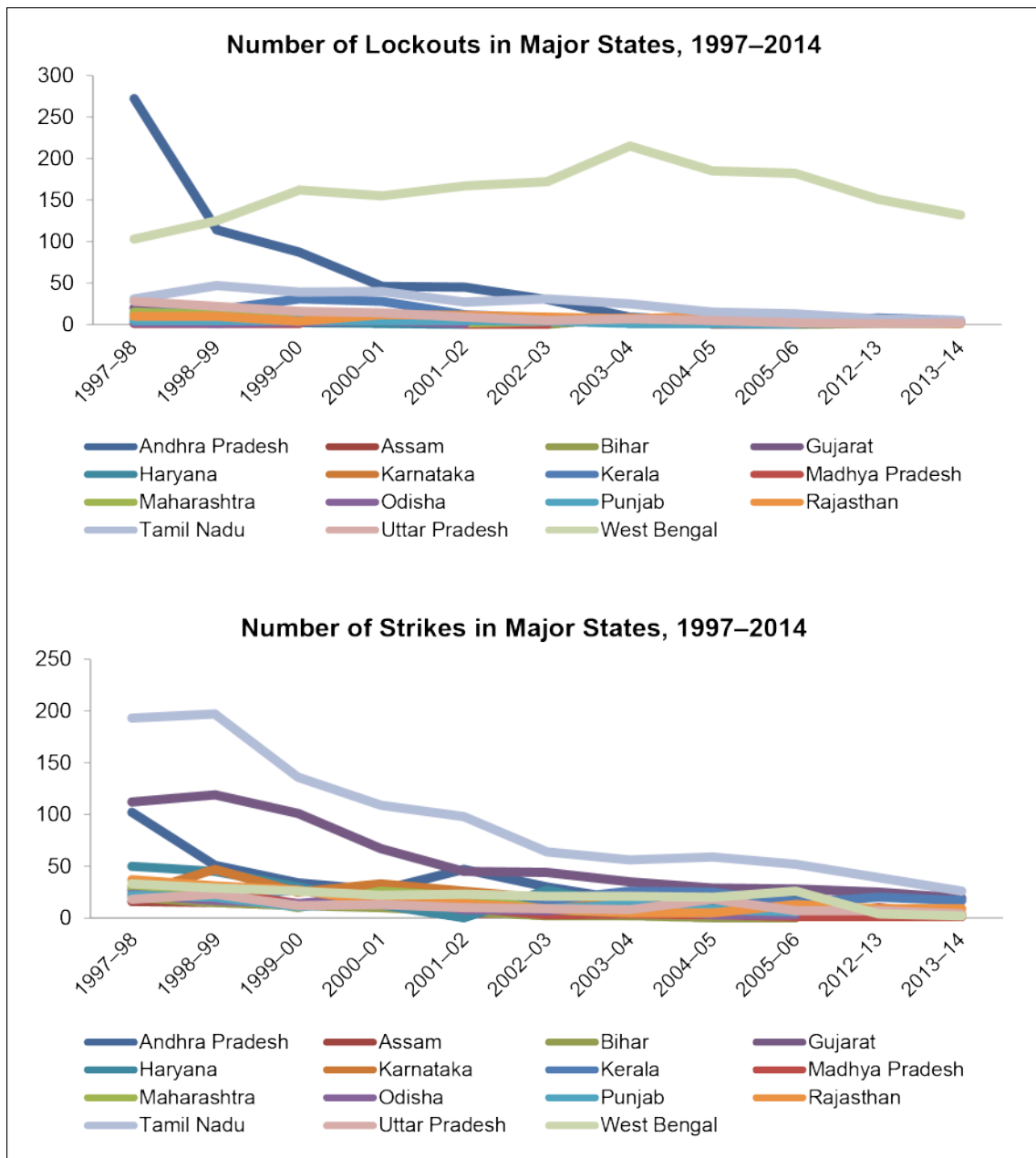


Source: Maiti (2014); Annual Survey of Industries, CSO, Government of India.

When we look at the ‘de facto’ measure of labor rigidity, there is a clear trend of its decline. The number of lockouts by states has registered a decline during this period (see Figure 3). West Bengal registers a rise in number of lockouts from 1997 up to 2004–05 and shows a gradual decline thereafter. The other pro-worker regions like Kerala and West Bengal have experienced a drop in the frequency of strikes and hence offered a scope to readjust labor and factor uses (Maiti, 2013). Strikes happen to be the dominant factor behind lockouts. It is evident that the number of disputes arising due to workers’ strikes registers a declining trend in most of the Indian states. Moreover, the number of man-days lost per factory in India due to such strikes has declined in 2013 to one-fourth of the number seen in the early 2000s (see Figure 4).

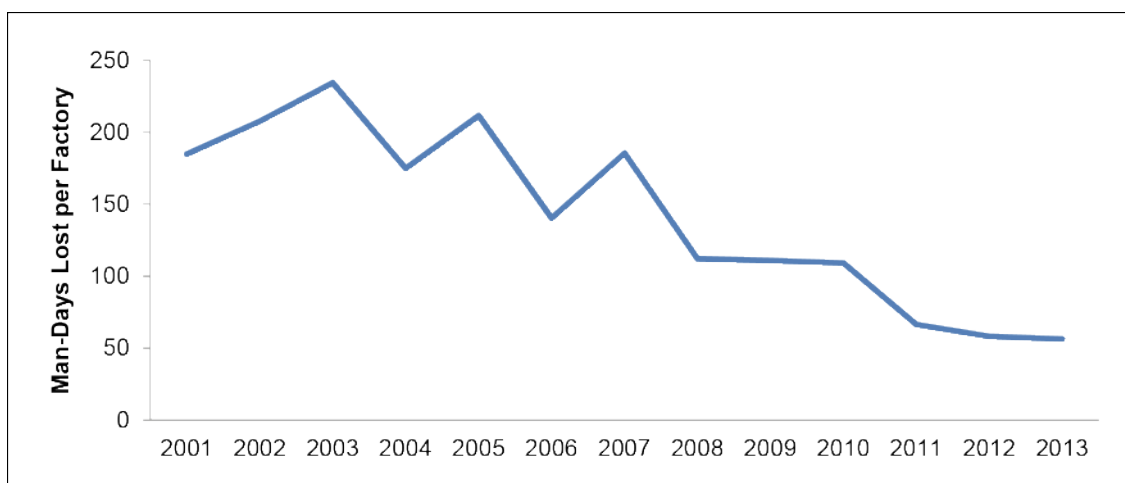
This decline is further reflected in the growing use of contract workers. The proportion of contract workers in total workers has increased in all major states during 1998–2005 (see Figure 5). Andhra Pradesh, Bihar, Gujarat, Haryana, and Maharashtra are the largest employers of contract labor as a proportion of total workers, implying that they register a lower density of labor unions in these states. The absolute increase in the proportion of contract labor in total workers has been the highest in Andhra Pradesh, followed by Kerala and Madhya Pradesh. Interestingly, most of them are known as pro-employer or flexible states as per the definition offered by Besley and Burgess (2004). However, there has been significant variation in the use of contract labor across states. These trend graphs support the inference of a decline in workers’ bargaining power during the study period.

Figure 3: Number of Lockout and Strikes in Major States of India, 1997–2014



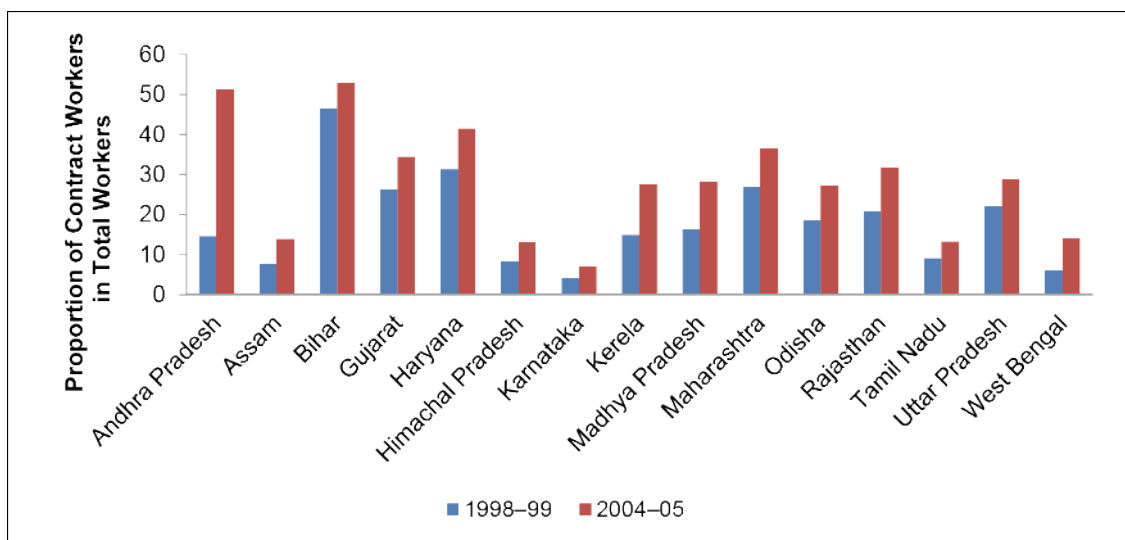
Source: Indian Labour Year Books (Government of India, Ministry of Labour and Employment).

Figure 4: Number of Man-Days Lost per Factory in India, 2001–2013



Source: Annual Survey of Industries, CSO, Government of India.

Figure 5: Contract Workers as a Proportion of Total Workers in Major States, 1998–1999 and 2004–2005 (%)



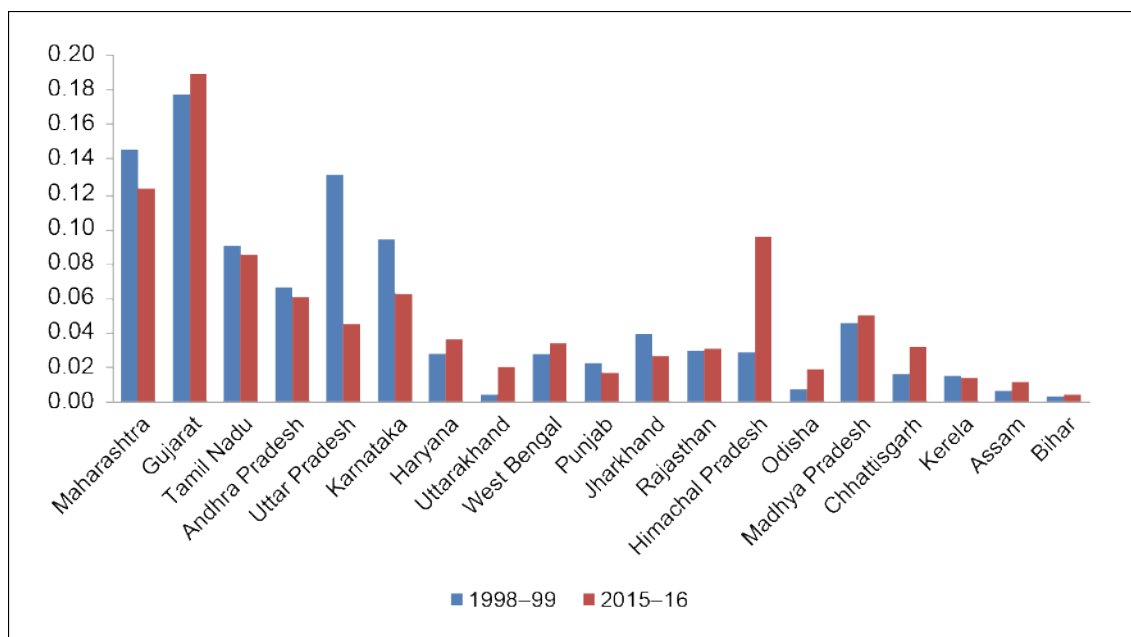
Source: Annual Survey of Industries, CSO, Government of India.

Now, the most important question here is whether the existing legislative framework in India is conducive for such changes in employment and allows substitutions between factors of production in practice. The existing legislative set-up in India still provides ways for the firms to change factor composition gradually. When the labor turnover rate tends to rise under more competition, workers prefer to change the workplace frequently for better opportunities. In such situations, it may be difficult for a firm to change the wage, technology, and employment combination. Moreover, since the probability of getting employment in another firm with the entry of new firms in the post-reform period seems to rise (especially for skilled and formal workers), they would be less rigid. The existing labor laws in India also provide some autonomy to firms to retrench labor under changed market conditions. For example, the Industrial Disputes Acts (1951) in India do not put any binding conditions on retrenchment of labor on a firm

that hires less than 100 workers. Similarly, the Factory Act (1947) in India is not applicable to a firm which hires less than ten workers. These laws allow the firms to transfer the competitive pressure on in-house workers either by firing them or by contracting outside instantaneously.

Mere existence of strong legislation is not sufficient for a higher order of rigidity in the labor market, especially in India with the current socio-political environment. It is not just legislation, but also enforcement which is crucial to see the extent to which firms are deterred by labor legislation. A field-level study by Maiti (2009) has shown that a firm easily finds ways to by-pass the labor laws and regulations applicable to the formal sector. A formal sector firm also enjoys legislative support for the use of flexible laborers on a contractual basis as per the Contract Labor Regulations Acts (1970) in India. In the presence of such a legislative framework, a firm can change the employment compositions, at least in the medium-run. Moreover, one of the arguments, made by Besley and Burgess (2004), is that capital moves out of the rigid states to the flexible states as per their explanation. It is also evident that the share of state capital has not changed much during 1998–2016, except in a few states (Figure 6). Maharashtra and Gujarat have retained the top two positions for the largest capital shares as a percentage of total capital in the country among major states during this period. Uttar Pradesh has experienced the largest drop even though it is defined as a pro-employer state. Orissa, belonging to the group of rigid states as per their measure, showed substantial accumulation of capital. This suggests that mere existence of legislation does not matter much for labor rigidity. Market dynamics also seem to play a role when the efficacy of implementing legislations is weak. Even though the above-mentioned figures indicate some informative trends, the degree of market imperfections is estimated econometrically from the disaggregated industrial statistics to obtain conclusive results.

Figure 6: State Capital Share as a Percentage of Total Capital (%)



Source: Shares calculated using fixed capital figures from the Annual Survey of Industries, CSO, Government of India.

4.2 Empirical Framework

Let us now turn to the econometric estimation of the model using Indian disaggregated industry-level information. It is not straightforward to demonstrate the effect of each channel originating from trade on labor share. The theory deals with how trade affects wages and distributive shares at the aggregate level through market size, competition, and specialization effects. This has to be estimated at the aggregate level. The main empirical question that needs to be answered is whether trade affects the labor share through the change in product and labor market imperfections. We confine ourselves to the Cobb-Douglas form of production function as it has the specific property that relates the factor elasticities with its shares, accommodating the terms containing market imperfections. Essentially, this helps to include the parameters influencing market imperfections that establish the relationship between actual labor share and labor elasticity along with bargaining power and mark-up. One can also derive the link between the residue (i.e., productivity) and the labor share.

Using the Cobb-Douglas specification, one can easily estimate productivity growth by simply deriving residual change after subtracting factor contributions from output change. While subtracting factor contribution, factor shares are used in practice with the assumption that perfect competition prevails in both product and labor markets. Under perfect competition, the factor share is exactly equal to factor elasticity. However, they would differ from each other by the presence of market imperfections. Note that the higher the factor share, the lower the residue would be. Since labor share is assumed to be driven by the degree of bargaining power and mark-up, one can estimate their changes in response to trade and the effect of trade on labor share, and the resultant productivity growth can be demonstrated with a bit of modification. A general form of industry-level production function is assumed to find an expression for labor share affecting the residue and then two market imperfection terms with the interaction of trade are added to this. We assume an industry-level production function of i -th industry at t -th period with a mix of factors for s -th state as follows (using log Cobb-Douglas form):

$$\ln Q_{ist} = q_{ist} = a_{ist} + \alpha_L l_{ist} + \alpha_K k_{ist} \quad (1)$$

The smaller letter represents logarithmic form. Here, α_L and α_K are respectively capital and labor elasticities. Taking derivative with respect to l_{ist} , we get labor elasticity as follows (ignoring subscript):

$$\frac{\partial q}{\partial l} = \alpha_L \quad (2)$$

This expression of labor elasticity represents labor share when there is no market imperfection, where $\alpha_L = \frac{wL}{PQ} = s_L$ assuming wage is paid according to their value of marginal products and P being price of final goods. If the production function is assumed to be homogeneous of degree λ for all factors (or, $\alpha_L + \alpha_K = \lambda$), we can express the Solow Residue, by taking logarithmic value and totally differentiating, as follows:

$$(q - k) - \alpha_L(l - k) = \lambda k + a \quad (3)$$

Note that the residual change is the sum of capital accumulation explaining returns to scale (λ) and an unexplained random term (a). This term can be considered as a proxy for productivity or residual growth.

If market imperfections prevail only in the product market, the wage is not paid according to the value of marginal physical product, rather is equal to the value of revenue product.

Then, the factor share would be different from the elasticity. If the price over marginal cost is defined by μ then $s_L = \mu s_L^M$. Here, s_L represents the labor share where the product market is imperfect. Since the firm tends to raise the price over the marginal cost having greater power, the labor share would be lower than that under perfect competition, depending on the degree of market power.

When the imperfections prevail both in the product and labor markets, a rise in bargaining power of workers tends to reduce the labor share. The union derives a relatively higher wage than that in the competitive market depending on their bargaining power. Formally, we can derive the relationship between them. Let us assume that \bar{L} is the total number of workers available in the economy, w_0 is the alternative wage of workers outside the firm and θ is the bargaining power of the union, the wage can be derived from the following Nash bargaining power. Let us assume that L is the total number of workers available in the economy, w_0 is the alternative wage of workers outside the firm and θ is the bargaining power of the union, the union wage can be derived from the following Nash bargaining equation

$$\max_{w,L} \Omega = (Lw + (\bar{L} - L)w_0 - \bar{L}w_0)^\theta (PQ - wL)^{1-\theta}$$

Differentiating with respect to wage and employment, substituting $\frac{\partial(PQ)}{\partial L} = \frac{P \partial Q}{\mu \partial L}$, where

$\mu = \frac{e}{e-1}$ and $e = \frac{P}{Q} \frac{dQ}{dP}$, then rearranging the terms, we get:

$$s_L = \mu \left[s_L^U + \frac{1-\theta}{\theta} (s_L^U - 1) \right]$$

Where s_L^U represents actual labor share in the presence of both product and labor market imperfections. Note that when $\theta = 0$ and $\mu = 1$, then $s_L^U = s_L$. The difference between them would essentially be captured by the values of θ and μ . This is expressed as follows (see Dobbelaere, 2004 and Maiti, 2013):

$$s_L^U = \theta + \frac{1-\theta}{\mu} \alpha_L$$

Note that when $\theta = 0$ and $\mu = 1$, then $s_L^U = s_L$ and when $\theta = 0$ and when $\mu > 1$, then $\mu s_L^M = s_L$. The first term on the left-hand side captures the extent of deviation due to labor market rigidity and the last term represents the same due to the mark-up. The higher the value of μ , the greater the deviation would be and the higher the value of θ , the lower the difference. Replacing α_L by s_L^U in order to capture the influence of degree of market imperfections, we find the revised expression for the residual growth as follows:

$$(q - k) - s_L^U(l - k) = \left(1 - \frac{1}{\mu}\right) (q - k) + \frac{\lambda}{\mu} k + \frac{\theta}{1-\theta} (s_L^U - 1)(l - k) + \frac{a}{\mu}$$

Let us define the residue used in the above expression as $SR = (q - k) - s_L^U(l - k)$. The change of this expression can be considered as the proxy for productivity growth. If the degree of product market power is expressed as $\beta = \frac{P-MC}{P}$ (known as Lerner Index), then $\beta = 1 - \frac{1}{\mu}$. We also define $LR = q - k$ and $BR = (s_L^U - 1)(l - k)$. Here, $(l - k)$ shows the labor demand for each unit of capital, and $(s_L^U - 1)$ shows the wage bill or cost of labor as a proportion of total costs. Hence this definition of BR captures the effective bargaining

power of labor. Using these specifications, we can express this equation in such a way so this could be estimated econometrically.

$$SR_{ist} = \beta LR_{ist} + \frac{\lambda}{\mu} k_{ist} + \frac{\theta}{1 - \theta} BR_{ist} + (1 - \beta) a_{ist}$$

Note that the parameters from this expression using disaggregate level of industrial statistics can be estimated easily. The higher the value of LR , the higher SR would be, and the higher the value of BR , the lower SR would be. Hence, β and θ can be treated as the degrees of market and labor bargaining powers respectively. This is the most efficient way to derive the effect of market imperfection affecting the residue or productivity. It is also interesting to report that these powers can easily be estimated without considering actual price and wage information, which is quite difficult to get. Here, a captures level of technology. Since only a part of the technology effect can be observed, it creates an endogeneity problem in the estimation. Hence, this problem needs to be address while estimating the model econometrically.

4.3 Estimation Method

Since a firm usually observes a part of productivity before selecting the factors of production, the simple regression results would be misleading. Therefore, the simple pooled and fixed effect panel regression techniques also cannot be applied here. Olley and Pakes (1996) suggest using investment (or gross fixed capital formation) as a proxy for the unobserved technology shock. However, this is further criticized by Levinsohn and Petrin (2003) on several grounds. This investment proxy is only valid for non-zero observations. Pronounced adjustment costs force most firms in developing countries like India, Turkey, Colombia, Mexico, and Indonesia to report zero-investment. With the zero-investment figure, it violates the invertibility condition required in the estimation process. Therefore, they recommend using intermediate inputs to avoid such problems. Moreover, the adjustment costs generate kink points in the investment demand function, leaving the possibility of high correlation between the regressors and error term. If it is less costly to adjust intermediate inputs, it would respond more fully to the technology term. This apart, since intermediate inputs are state variables, it serves as an excellent link between the estimation strategy and economic theory. In the present study, we apply the methodology offered by Levinshon and Petrin (2003, referred as LP hereafter) for robustness checking with a bit of modification. The intermediate inputs are represented by material costs and fuel usages as better proxies. These two components, in fact, are equal to the total intermediate inputs of production, and we checked that the actual estimate with the use of total inputs is almost identical to that of our proxy variables.

With the use of these proxies, the derivation of the parameters from the regression model may not be straightforward. The estimation procedure involves two steps to deal with the simultaneity problem. Firstly, the disturbance term of equation is broken into two parts i.e. the observed and unobserved terms. ω is the observed part and u is the random disturbance term. The expectation of future productivity (i.e., observed term) increases in its contemporaneous values of stock (log-capital) and proxy variables (gross fixed capital formation or material costs and fuels, denoted as m). In other words, we can write the unknown function for optimal decision as $m = m(k, \omega)$. Inverting this function, we write further as $\omega = h(k, m)$ and therefore, $\phi = \frac{\lambda}{\mu} + h(k, m)$. Here, a third order polynomial ϕ in m and k including a constant term has been used to define this unknown function. Once this is estimated as $\tilde{\phi}$, we write the modified expression of Solow residual as follows:

$$SR_{ist} = \beta LR_{ist} + \frac{\theta}{1-\theta} BR_{ist} + \tilde{\vartheta}_{ist} + u_{ist}$$

This expression is slightly different from the forms used in Levinshion-Petrin (Maiti, 2013). First, this estimates the coefficients of LR and BR . Then, the coefficients of k can be recovered from the residuals, defined as $V_{ist} = SR_{ist} - \tilde{\beta} LR_{ist} - \frac{\tilde{\theta}}{1-\tilde{\theta}} BR_{ist}$. After the estimation of the first stage and deriving the residue, the following expression:

$$V_{ist} = \frac{\lambda}{\mu} k_{ist} + g\left(\tilde{\vartheta}_{ist-1} - \frac{\lambda}{\mu} k_{ist-1}\right) + v_{ist} + u_{ist}$$

Again, g is an unknown function and approximated to a third order polynomial for its estimation. Note that the above-method of estimation from unknown non-linear specification relies on an iteration process through bootstrapping with an initially specified distribution. Usually, the number iterations in this literature is 50. But, the number of iterations has been raised to 250 here. The estimation of this stage suggests that the contribution of k and instruments are eliminated from the residue derived in the first stage and the rest is influenced by technology. Applying this two-stage method, one can estimate the residual growth influenced by market conditions along with the change in technology and returns to scale. Note that we can add the interaction terms of trade share (tr_sh) with LR and BR in order to see the effects of trade on the labor share and its resultant implication on residual or productivity change.

4.4 Results

Disaggregated information at three-digit level of industries for fifteen major states during 1998-2014 was obtained from the Annual Survey of Industries, Government of India. Since a major change in industrial classification has taken place between 1998 and 2008, a perfect matching of industrial codes between those revisions with HS codes has been really difficult. Moreover, matching of HS codes with Indian industrial codes is also quite challenging. However, such matching was done for the study period. Hence, our sample has been confined to the period of 1998-2008 for running the regressions. In order to estimate the mark-up and labor bargaining power affecting the residual, we use the method proposed by Levinsohn and Petrin (2003) and applied by Maiti (2013) in a similar context. When material costs and fuels were used as instruments, we find that the coefficient of LR is statistically significant and positive (see Table 1). This suggests that the industries holding sufficient market power contribute more to the surplus. On the other hand, the coefficient of BR is statistically significant but negative. It indicates that the workers' bargaining power is taking away a part from SR .

Now, a new variable called 'flex' is created in order to see the difference in the parameters between flexible and rigid states. We define, 'flex'=1 for pro-employer and neutral states and zero otherwise (using Besley and Burgess, 2004 definition). The coefficient of the interaction term between BR and 'flex' is statistically significant and negative, indicating that the residue is lower in the flexible states due to higher bargaining power. When the bargaining power or labor demand (BR) is high in a state in response to the increased demand in those states, workers negotiate for higher wages. So, wage share will rise, leading to a fall in Solow residual. When the same regression is run separately for both types of states, the coefficient of BR turns out to be higher in the case of flexible states. The same result is found in this case as well. This suggests that the labor market rigidity does not depend only on the legislation, but also on the effective implementation of legislation as well as the actual market

conditions. Moreover, the definition of flexible states could also be wrong (as commented by Bhattacharjea, 2018).

Table 1: Effect of Mark-Up and Labor Bargaining on Productivity

Variables	(1) SR	(2) SR	(3) SR (flex=1)	(4) SR (flex=0)	(5) SR
LR	0.683*** (0.024)	0.705*** (0.019)	0.646*** (0.033)	0.722*** (0.035)	0.726*** (0.026)
BR	-0.747*** (0.008)	-0.747*** (0.007)	-0.762*** (0.011)	-0.733*** (0.012)	-0.737*** (0.008)
BR*flex					-0.018* (0.010)
LR*flex					-0.092** (0.037)
K	0.045*** (0.013)	0.047*** (0.015)	0.019 (0.018)	0.066*** (0.023)	0.043*** (0.014)
Instruments	Materials, Fuel	GFCF	Materials, Fuel	Materials, Fuel	Materials, Fuel
Observations	4,482	4,250	1,990	2,492	4,482

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; SR – Solow Residual, LR – lerner term, BR – bargaining term, flex – flexible states.

Source: Author.

In order to investigate the effect of trade on the degree of market imperfections and the resultant Solow residual, we have added interaction terms of trade share (*tr_sh*) with *LR* and *BR* (see Table 2). The trade share variable is defined as the ratio of the volume of exports and imports to the real value of output. The coefficient of interaction term between *BR* and trade share is positive and significant, suggesting that trade reduces the bargaining power and hence raises the residue or productivity. Moreover, the interaction terms of *BR* with trade share and 'flex' is insignificant. This indicates that the effect of trade in the flexible states is not different from the effect in rigid states. This is different from what Gupta and Helble (2018) claimed. The coefficient of the interaction term of trade share with *LR* is also positive and significant, indicating that trade reinforces the effect of *LR* on the residue. This further suggests that a rise in competitiveness in the production essentially reduces mark-up and thereby improves labor share. Moreover, the interaction terms of *LR* with trade share and 'flex' is insignificant. Several other controls like FDI, Development Expenditure, Literacy Rate, Road Density, etc. are included in the final regression to account for the infrastructure, education, and development scenario of the states, but all our results still hold. Therefore, we can safely conclude that trade weakens the bargaining power of workers in India and it does not depend much on the legislative form of the state.

Table 2: Effect of Trade with Mark-Up and Labor Bargaining on Productivity

Variables	(1) SR	(2) SR	(3) SR	(4) SR	(5) SR
LR	0.251** (0.127)	0.248* (0.127)	0.682*** (0.035)	0.251** (0.128)	0.248* (0.128)
BR	-0.799*** (0.012)	-0.799*** (0.012)	-0.787*** (0.012)	-0.799*** (0.014)	-0.799*** (0.013)
LR*Trade Share	0.040*** (0.011)	0.040*** (0.010)		0.040*** (0.011)	0.040*** (0.011)
BR*Trade Share	0.006*** (0.001)	0.006*** (0.001)	0.004*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
FDI				0.000** (0.000)	0.000** (0.000)
Development Expenditure				0.001 (0.003)	0.001 (0.004)
Literacy Rate				0.003 (0.002)	0.003 (0.002)
Road Density				-0.004 (0.009)	-0.004 (0.011)
Capital (K)	0.049*** (0.015)	0.049*** (0.016)	0.050*** (0.011)	0.048*** (0.016)	0.049*** (0.016)
LR*Trade Share*Flex		0.001 (0.003)	0.003 (0.004)		0.001 (0.003)
BR*Trade Share*Flex		0.000 (0.001)	0.001 (0.001)		-0.000 (0.001)
Model	LP	LP	LP	LP	LP
Observations	3,791	3,791	3,791	3,791	3,791

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1, Model – method suggested by Levinshon and Petrin (2003), same as previous table.

Source: Authors.

5. CONCLUDING REMARKS

By changing both product and labor market conditions, the international trade affects the distributive share of labor. This paper investigates whether trade significantly redistributed the cost-price margin between workers and firms in the Indian economy during the last one and a half decades and explains the declining labor share. India experienced almost a 20% drop in labor share during the last two decades. Scholars argue that the share declines more in the states which hold pro-workers labor legislation than those with pro-employer legislations. In other works, the degree of labor rigidity depends heavily on the labor legislation and the market conditions do not affect it much. In contrast to those arguments, we find that the number of strikes and lockouts, as well as man-days lost per factory from such lockouts have declined substantially during this period in all the major states. Moreover, the share of contract labor has increased in all the major states in India irrespective of their degree of labor legislations. These are signs of a gradual decline in labor bargaining power over time in India. Note that such changes in the so-called pro-employer states are not different from pro-employee states. Therefore, we rely on econometric methods to estimate the degree of mark-up and labor bargaining power attached to the actual labor share from the disaggregated level of industrial statistics and see how they have changed with exposure to trade. The

approach, suggested by Levinsohn and Petrin (2003), has been applied to regress trade share along with their interaction terms capturing labor and product market imperfections on the Solow Residue (the proxy for productivity). We find a drop in labor bargaining power with the interaction of trade. This is more in the so-called pro-employer states than that in others, suggesting that the labor legislation does not matter unless it is effective enough. Moreover, the term capturing the mark-up seems to have increased with the trade. Hence, a drop in bargaining power, along with a rise in mark-up explain the gradual decline in labor share. The lower labor share raises the residual or productivity. We argue that the specialization effect, arising out of heterogeneity in productivity distribution between trading partners out-weights the joint effects of market size and competition, depressing the demand for labor and hence their bargaining power. So, the market conditions play a greater role than the existence of labor legislation. This suggests that legislative reform is not necessary for the workers' welfare. Rather, competitive policies that encourage entry can both benefit workers and increase economic growth.

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