

Contractualisation and Productivity Growth in Formal Sector: Theory and Evidence from Indian Manufacturing

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Abstract

The paper investigates whether the provision of contract labour use in India has been conducive for productivity improvement in the formal industrial sector. The law allowed Indian firms to hire workers through contractors (i.e., contract workers), limited to use on peripheral activities. Theoretical speaking, such provision, though increases production and contractual employment, does not necessarily improve productivity growth. The use of such workers to bypass union workers leads to a reduction in competitive pressure from R&D efforts and thereby reduces productivity growth. A modified approach of productivity estimation, by controlling market distortions and simultaneity problems, using three-digit industrial data over major fifteen Indian states for the period 1998-2005, suggests that the increase in contractual employment share has an ambiguous impact on total productivity factor growth.

Key words: Productivity Growth, Labour Market Rigidity, Contract workers, India

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1. Introduction:

The most economies in the contemporary world, both developed and developing countries, have been witnessing contractualisation employment relation even in a formal and organised setting in a dynamic economic environment instigated by various reform policies designed towards competitiveness (Stone, 2006). The productivity growth has been the principle determinant of economic growth in the modern literature and the current paper attempts to investigate whether such changes have made any improvement in the productivity gain on the industrial sector with a special focus on Indian economy.

While Washington Consensus did not work effectively in the process of economic development uniformly across the countries, identification of critical and binding constraints for economic growth of any country lying within the economy has been thriving interest among the policy makers so that suitable policy changes can be targeted to unlock those to boost the growth by overcoming such constraints (Rodrik et al., 2005). Labour market rigidity has been identified one of the critical constraints in many developing countries in the world. The presence of high rigidity does not allow the producers to appropriate actual return from the resultant low productivity from investment made in the economy. This has led to a recommendation for substantial labour market reform in the concerned economies. Scholars have, therefore, prescribed to design policy for more labour market flexibility on the industrial activities of the developing world, including India (Besley and Burgess, 2004; Dougerthy et al. 2011; Golder, 2012). For example, Besley and Burgues (2004) argue that labour friendly states in India have been growth at higher rate than that of labour rigid state. Hasan et al. (2007) showed an improvement of labour demand elasticity in response to the amendment in the labour legislation. However, the structural transformation since 1990s in the developing world brought many changes in the economy relation and it has indirect implication on labour market flexibility even when no substantial change is adopted on the labour legislation. The existing literature has shown the ongoing change of labour relation in many ways by referring casual, flexible and precarious employment. Whatever may be the term, more important is that it provides a greater autonomy to the employer on hiring and firing at minimum costs. By employing the workers under such flexible contracts, their propensity to participate in the trade union or to shirk team production (Alchian and Demstz, 1972) could be highly restrained and this may enhance the residual surplus and productivity growth. But, the question remains how the contractualisation improves

productivity. An increase in capital formation due to flexibility in the labour market might raise industrial production as well as employment, but does not necessarily improve productivity growth. According to the modern endogenous growth theory, the productivity growth depends on the level of R&D and such R&D level would further depend on the degree of product market competition (Romer, 2003; Agghion et al, 2007). A drop in wage, in the response to labour market flexibility, would definitely raise the demand for workers but, at the same time, could reduce the pressure from investing more on R&D activities. If so, this could expand employment and industrial output, by bringing flexibility in the labour market, but does not necessarily improve the productivity level. The paper attempts to build this argument looking at the specific characteristics of the Indian formal labour market.

Labour market rigidity has been remained at the heart of the theoretical discussion on the effectiveness of macroeconomic policies. It is considered to be the principal factor for the existence of involuntary unemployment in Keynesian framework and provides a room for government policies to act on it. Even, a real business cycle fluctuation, originating from slow relocation of labour between sectors within an economy, not for external shocks, has been the central area of discussion around the efficacy of a policy in modern macroeconomics. The nature of relationship between employment and inflation, shown in Philips Curve, is built on labour market conditions and has, therefore, become the basis of such discussion in the recent past. It is argued that the non-market clearing conditions due to labour market rigidity led to the existence of involuntary unemployment and thereby raised concerns for policy maker to plan effectively to curve such unemployment. The flexibility sets not only to change the extent of relationship between inflation and unemployment but also its implication on productivity growth. While a vast literature has therefore addresses how the flexibility promotes growth and employment, its effect on the productivity growth, the basis for long-run growth, has been under-researched.

It is observed that industries increasingly tend to employ workers on contractual terms and conditions (often known as 'flexible' or 'contract' workers). They are largely hired for short-term contracts with a commitment of offering limited benefits and often supplied/monitored by the outside agents (NCEUS, 2007). India has not only experienced substantial changes in the employment relations in the labour market and but also maintained a decent economic growth rate in recent years. The current paper plans to investigate whether the increased contractualisation of the work-force in India may have

impacted on the productivity growth. A number of scholars defined the labour market flexibility as growth enhancing structural change (McMillan and Rodrik, 2011). The rigidity of factor market rigidity creates a distortion between wage and productivity leading to an efficiency loss in any productivity change (Petrin and Sivadasan, 2006). Hsieh and Klenow (2009) use plant level information from Chinese and Indian economies and show that the distortions are correlated to the revenue and residual surplus of the concerned firms. Still, the effect of labour market flexibility on productivity growth is not understood clearly. Because, these studies deal with the issues of labour market neither looking at the specific labour regulations nor the actual productivity growth by addressing the market imperfection and simultaneity problems in the estimation.

During the last two decades, India witnessed gradual removal of trade and industrial policy restrictions. Severe crisis of foreign exchange reserves coupled with high inflation during late 1980s and the early 1990s forced to undertake massive measures of economic reforms in the economy. The reforms were intended to improve the efficiency and productivity through the increased competition in the Indian industry. The economy started showing an improvement in growth sooner after that and the per capita output growth rate has moved from a low level to a level close to two digits. According to the World Bank Development Indicators, while GDP grew roughly at 5% during the latter half of 1980s, it reached upto 9.7% in 2010. The contribution of secondary sector in the GDP has gone up from 20% in 1970 to 28.4% in 2010. At the same time, contractual employment has increased by more than 10 percent of total workforce engaged in the formal industrial sector from 1998 to 2006. The existing researches establish a number of factors that are contributing to the productivity in post-reform period in the economy. Economic reforms (Ahluwalia, 1991; Ray, 2002; Unel, 2003; RBI, 2004; Milner et al., 2007; Madsen et al., 2009), trade openness (Maiti, 2013) and infrastructure (Mitra et al., 2011) have been found to be major contributory factors to the same. At the same time, it is observed a substantial impact of trade reform on labour market and labour demand elasticities (Hasan et al, 2003). But, none of the existing studies, however, looks at the implication of changing labour relations on productivity growth so far. A study of Kleinknecht et al. (2006) in the Dutch economy observes a sharp rise of flexible employment during 1980s and 1990s. This yields substantial savings on a firm's wage bill and the savings lead to higher job growth, but do not translate into higher sales growth. This happens at the expense of labour productivity growth, raising

serious doubts about the long-run sustainability of a low-productivity–high-employment growth path. Even this study fails to provide institutive explanation behind the ambiguity in the productivity improvement.

The case of India is somewhat different from the Dutch case. One of the reasons behind the difference would obviously be the prevalence of large informal sector in Indian economy. Since the existence of informal sector provides substantial autonomy to the producer to bypass the rigid labour in the formal sector by subcontracting outside, the expansion of contractual employment within the formal set up has been theoretically ambiguous. Workers who do not find employment in the formal sector crowd informal sector for their survival and it includes more than 90% of working population in the country. The annual employment growth in formal sector (organised sector) has come down from 2.77% in 1981 to 0.16% in 2007. Initially, the employment in organized public sector has posted a growth sharply from 18.65 million in 1971 to 26.74 million in 1991 and thereafter has not improved much, with a miniscule increase of 0.77 million during the last 16 years from 1991 to 2007. This is quite expected, because the liberalisation includes public sector reform along with disinvestment and retrenchment strategies started in early 1990s. Although Hasan et al. (2003) find a positive impact of trade liberalization on labour-demand elasticities in the Indian manufacturing sector, the pace of overall employment in the private organised sector has not improved much either. It has gone up from 6.96 million in 1971 to 7.68 million in 1991 and then 9.84 million in 2007. In contrast, the informal employment has gone up from 396.76 million in 1999-2000 to 457.46 million, roughly by 50 million workers within five years at 3.1% annual growth rate.

It is noteworthy to mention that Indian labour laws are known to be highly rigid and, therefore, may not be conducive for productivity enhancement (e.g., Besley and Burgess, 2004). India is one of the founding members of the ILO and has endorsed the following four out of the eight Core Conventions: ILO Forced Labour Convention, Abolition of Forced Labour Convention, Equal Remuneration Convention, and Discrimination (Employment Occupation) Convention. As a result, the labour laws have been union friendly and do not allow employers easily to retrench them without prior approval. The protection of workers from awful exploitation was the principle motivation of the planners behind in bringing such laws. The placement of labour issues in the Indian constitution suggests variation in labour regulations and/or their enforcement across India's states on Industrial Dispute Act 1947.

The laws have made formal labour markets rigid in the sense of placing serious constraints on the ability of firms to hire and fire workers (Besley and Burgess, 2004 and reference therein). This act¹ specifies the exact distribution of powers in federal settings between state and central government, courts and tribunals, unions and workers and the exact procedures to be followed in resolving industrial disputes and leaves partial autonomy to the state for its amendment. Although the Act (IDA) allow firms in seeking layoffs and retrenchments, but governments have often been unwilling to grant permission to retrench (Datta-Chaudhuri and Bhattacharjee, 1994).² Such unintended interventions have been created a strong disincentive to hire additional workers, and to substitute labour with capital, thereby leading to low investment and productivity growth. Similar arguments have been made for other elements of labour regulations, including specific provisions of the Industrial Employment Act and the Trade Union Act³.

Looking at the increasing use of contract workers, the government passed the Contract Labour (Regulation and Abolition) Act in 1970 in order to protect their interests in the organised sector. Contract workers are those who hired through contractors and are outside the purview of the IDA. Under section 10 of this Act, the state can prohibit the use of contract labourers in any production activities in a factory. The relevant authority takes into account the nature of work and comparative practice when deciding whether to prohibit the use of contract labour. Central and state governments have issued periodic notifications prohibiting the use of contract labourers in specific processes and activities. They can be employed in non-core activities like cleaning and maintenance, packing, welding, painting and warehouse activities, not in core activities of the production unit.

Moreover, the Act seeks to promote the health and other welfare of contract labourers. Canteens, rest rooms, drinking water, toilets, washing facilities and first aid facilities have to

¹For example, the Chapter VB of the Industrial Disputes Act (IDA) makes compulsory for employers with more than 100 workers to seek the prior approval of the government before workers can be dismissed (Besley and Burgess, 2004).

² The term layoff refers to a temporary or seasonal dismissal of a group of workers due to slackness of current demand. Retrenchments, on the other hand, denote permanent dismissals of a group of workers.

³ As per the Standing Orders Act, an employer can modify job descriptions or move workers from one plant to another with the consent of workers. Rigidities can creep in on account of how one defines or establishes worker consent. With the Trade Union Act allowing multiple unions within the same establishment and rivalries common across unions, a requirement of worker consent for enacting changes can become one of consensus amongst all unions and groups, a virtual impossibility (Anant, 2000; pp. 251).

be provided for them. The contractor should pay wages to the workers on time. The rights of contract workers are covered in the Minimum Wages Act, Employee Provident Fund Act and Employees' State Insurance Act. Employers cannot claim that a bonus or gratuity constitute 'wages' under the Act as it does not consider a bonus or a gratuity to be a part of wages. Although the use of contract labour involves flexibility, the law also provides some benefits and rights to those workers. As per this regulation, industrial officers should make regular visits to the plants/manufacturing units in the organised sector to enforce the law, but this enforcement mechanism is not clear.

As far as the bargaining power of labour union is concerned in the face of contractualisation, many scholars have observed a declining trend, both in *de jure* and *de facto* measures, as an indirect impact of globalization and liberalisation in recent years (Rodrik, 2008). Moreover, an important counter-argument to the views expressed above is that Indian firms still enjoy sufficient flexibility and autonomy to bypass the formal labour laws. The poor labour regulations in India have resulted into job-insecurity (Nagaraj, 2004) or an increased usage of temporary or contract labour (Datt, 2003 and Ramaswamy, 2003). According to Sen et al., (2010), the share of such contract labours in Indian industries has been almost doubled within a period of seven years from 1998 to 2005. The distinction between 'direct' and 'contract' workers lies on whether they are hired directly or through contractors. Since the workers hired directly have a tendency to join in the labour unions, a firm encounters a pressure in regularising them and faces huge moral hazard problems, leading to a rise of wage and transaction costs. This has been the experience of Indian industries during 1950s to 1970s.

We argue in this paper that a firm can now easily avoid such costs by hiring them through labour contractors and outside agents. Such contracts would obviously restrict them in joining union and thus help the producer to save a part of their wage bills. An increase of the wage bill might lead to an improvement in the productivity growth depending upon how this is spent. If the additional saving is used to improve core technology under more competitive pressure, the firm would attain a productivity gain. On the other hand, if this saving is spent on hiring more contract workers, the productivity improvement may not be attained. Because, they cannot be used in core activities of the production process, and perhaps this would preclude them in deriving productivity gain from technology changes made in core activities, if any. Therefore, the contractualisation in India would definitely

raise residual growth of Indian industries by reducing bargaining power of the workers, but its effect on productivity growth would be ambiguous.

The recognition of product market distortion in the productivity growth estimation (Hall, 1988; Domowitz, 1988; Harrison, 1994; Konings et al. 2001; Dobbelaere, 2004) has been no longer a new in the theoretical and empirical literature of other countries. Rather, the elimination of labour market imperfections has become an upcoming concern in recent literature (Abraham et al., 2009). According to these studies, the productivity growth, using the methodology invented by Solow (1957), has been influenced by both product and labour market imperfections. Abraham et al. (2009) find that, on average in Belgium, firms set prices about 30% above marginal costs, but there is substantial variation across sectors, with the lowest mark-up around 19% and the highest around 52% during 1996-2004. In addition, they estimate an index of bargaining power, reflecting the fraction of profits that is passed on to workers in form of higher wages. Depending on the sector, this fraction varies between 6% and 18%. Therefore, the changes in market conditions can be potential source of residual growth. Such empirical studies are almost non-existence in the Indian context.

The present study uses three digits industrial data, taken from Annual Survey Industries (Central Statistical Organisation, Government of India), for the estimation of productivity growth. While estimating the productivity growth, most of the existing empirical studies assume that the perfect competition is prevailing in the product and labour markets. This seems to be an unrealistic assumption, particularly for the organised or formal manufacturing sector. For example, when a firm enjoys a market power in the product markets the residual surplus would be higher simply because of higher market power, for a given level of union power in the labour market. Besides, workers in the organised manufacturing have a strong tendency to form a union and bargain their wage over and above the competitive one. The higher union power would reduce the residual surplus. Simple residual surplus based on factor shares and simple production function approach would account for a bias in the productivity growth estimation and the extent of bias would depend definitely on relative strength of market power of producers and bargaining power of workers. Therefore, it is important to derive an unbiased estimate of productivity growth, after eliminating distortions due to market imperfections, in the economy. This has been shown in Maiti (2013), with some modification of approach undertaken by Olley and Pakes (1996) and Levinsohn and Patrin (2003), and the present paper uses the same framework of

productivity growth for the impact analysis. Therefore, the study employs modified methods of productivity estimation to eliminate distortions from the pure productivity growth as well as to deal with the endogeneity issues of input selection and the contractualisation has been regressed on the modified productivity growth. Interestingly, as we will show in this paper, eliminating product and labour market distortions from the residual growth (Solow residual) would essentially provide a basis to account for the impact of contractualisation on the bargaining power and the resultant productivity growth. The rest of the will be as follows. Section 2 provides a foundation for empirical analysis and Section 3 deals with the empirical analysis. Section 4 concludes.

2. Theoretical Framework

We start with a simple set up of an economy where a single producer is producing with the use of two forms of workers (direct and contractual). If the economy consists of a firm who produces a good q , where a part of it (i.e., s) is produced at core sector (i.e., main manufacturing activities) with the help of direct workers and the rest is undertaken at the peripheral sector (i.e., finishing, warehousing, packaging, distributing etc.). Here, s is technologically fixed. The return from producing the output follows: $R = \sqrt{q}$. For simplicity, we assume that one unit of output at the peripheral sector requires one unit of contract workers, whereas α unit of workers in core sector. Here, α is the number of labour required to produce one unit of output in the core sector. Essentially, the inverse of α (or, $1/\alpha$; where $\alpha < 1$) can be termed as the labour productivity. Since, the core sector employs better technology, the labour productivity of this sector would ultimately determine overall productivity of the firm. Here, α would depend on R&D level and an improvement in R&D would drop in α , leading to a reduction in the cost of production. This has been assumed in number of theoretical literature to model the effect of R&D. For simplicity, we further assume that $\alpha = 1 - F$, where F is defined as R&D effort (normalised to vary between zero to one) and this condition ensures higher productivity of workers in core sector than those in peripheral sector. Similar specification is also seen in recent literature (e.g., Marjit and Mukherjee (2007); Maiti and Marjit (2012)). R&D is the level of augmenting technology which would essentially enable to save direct labour per unit of output. This reduces the requirement of labour per unit of output in the formal sector. Further, the R&D initiative is assumed to be possible only in the core sector. There is another side of R&D initiative in the firm.

There is other side of R&D. For any level of successful R&D or innovation, the firm needs to incur certain cost. It engages a set of proper personnel with appropriate laboratory who would work through a trial and error process to get the desired level of innovation (or, R&D) in the firm

successfully. These essentially register a cost for a certain level of technological improvement in the firm, i.e., $Z(F)$. One would also expect that higher the cost higher would be the level of R&D. For simplicity, we assume that z unit of money is needed to spend for each of R&D level. Therefore, $Z(F) = zF$ where $z > 0$.

Directly workers are hired for relatively longer terms in compliance with a rigid labour legislation and receive hired institutional wage (i.e., w). We are not going to solve union wage here, because we assume the wage would always higher than the market wage in presence of rigid labour laws. This assumption would essentially allow us to investigate the effect reform in labour market by changing the market wage rate. While the core workers are hired directly and paid the institutionally fixed wage rate, the non-core workers can be hired through contracts in order to save wage. Therefore, looking at the workers engaged in the peripheral jobs with different possible wages, there could be three difference situations. (i) If both types of workers are hired directly, the producer might be forced pay instructionally fixed wage, in compliance with the rigid labour legislation and central union. (ii) When workers are hired directly for core activities and indirectly through contracts for peripheral activities, the wage paid to them could be different. Since, the contract find such workers from a large pool of informal labour market, they would be paid at the minimum wage rate (i.e., w_0), even if the informal wage rate could be lower than the minimum. The existing regulation of using contract workers does not allow to use them at a lower than the minimum. (iii) The producer could use contract workers for core activities and this could be subjected to violation of the existing contract laws. We can compare R&D level and resultant productivity in the above three situations. Intuitively, we assume labour augmenting productivity growth in the production.

Lemma 1: The level of R&D (F) and productivity ($1/\alpha$) are monotonically related.

Proof: $\frac{d\left(\frac{1}{\alpha}\right)}{dF} = \frac{1}{(1-F)^2} > 0$. In other words, when F rises, it raises labour productivity.

Lemma 2: For an increase in q due to R&D, the demand for direct workers to be used in core activities may not rise, but for contract workers to be used for peripheral activities must go up.

Proof: If workers used in core activities are hired directly and in peripheral activities through contractors, the demand for direct and contract workers are respectively $L_D = (1-F)sq$ and $L_C = (1-s)q$. Total workers engaged in the firms is $L = [(1-F)s + (1-s)]q$. In response to an increase in F , the change in demand for labour would be: $\frac{\Delta L}{\Delta F} = -sq + [(1-F)s + (1-s)]\frac{\Delta q}{\Delta F}$. An increase in F leads to a drop in demand for direct workers by sq , as a substitution effect, but raises

the demand, by $[(1 - F)s] \frac{\Delta q}{\Delta F}$, if $\frac{\Delta q}{\Delta F} > 0$, as a scale effect. On the other hand, the demand for contract workers is increased by $(1 - s) \frac{\Delta q}{\Delta F}$. In case, $\frac{\Delta q}{\Delta F} < 0$, the demand for total workers as well as both types of workers will decline. However, this may not be feasible option for the producer and hence we shall rule out this possibility from our discussion in the rest of the chapter.

Proposition 1: R&D improvement raises contractual employment, but not necessarily total employment.

Proof: It is shown in the previous section, the effect of R&D improvement on total employment is uncertain due to its substitution effect on direct workers. Now, the shares of direct and contract workers are respectively:

$$r_D = \frac{(1 - F)s}{(1 - F)s + (1 - s)} \text{ and } r_C = \frac{(1 - s)}{(1 - F)s + (1 - s)}. \text{ Here, } r_D \text{ refers to}$$

the share of direct workers and r_C refers to the share of contract workers, i.e., contractualisation.

The effect of R&D improvement on those share are as follows: $\frac{\Delta r_D}{\Delta F} = - \frac{(1 - s)s}{[(1 - F)s + (1 - s)]^2}$ and

$$\frac{\Delta r_C}{\Delta F} = \frac{(1 - s)s}{[(1 - F)s + (1 - s)]^2}. \text{ If R\&D raises the production of the firm, there is no substitution effect}$$

on the contract worker and hence raises the demand for contract workers due to scale effect, leading to an improvement in contractualisation.

Let us now investigate the effect of labour market reform on contractualisation and resultant productivity.

Case 1: Uniform Wage

If the output is produced by using direct workers, both for core and peripheral activities, they must be paid a relatively higher wage, following institutional rules, influenced by either the trade unions or the government, or both (i.e., w). The cost of hiring workers would be $[(1 - F)s + (1 - s)]wq$.

The profit of the firm can be expressed as follows:

$$\pi = \sqrt{q} - [(1 - F)s + (1 - s)]wq - zF \quad (1)$$

F is determined at first and q is decided thereafter. This can be solved using backward induction method.

$$F_1 = 1 + \frac{1 - s}{s} - \frac{1}{2(swz)^{1/2}} \quad (2)$$

$$q_1 = \frac{z}{sw} \quad (3)$$

Proposition 2: When both workers are hired directly, a drop in w leads to an increase in demand for workers both for core and peripheral activities, but a reduction in R&D and productivity.

Proof: Differentiating (2) and (3) respectively, we find that $\frac{\partial q_1}{\partial w} = -\frac{z}{sw^2} < 0$ and

$$\frac{\partial F_1}{\partial w} = \frac{1}{4w(swz)^{1/2}} > 0$$

In response to a drop in institutional wage, the demand for workers raises. Moreover,

$$\frac{dL_D}{dw} = -sq \frac{dF}{dw} + (1-F)s \frac{dq}{dw} < 0 \text{ and } \frac{dL_C}{dw} = (1-s) \frac{dq}{dw} < 0.$$

In other words, the demand for workers, for both core and peripheral activities, has increased and this crowds out R&D initiative. Lower R&D results in a decline in productivity.

Case 2: Different Wages

It is mentioned in the previous section that worker engaged in core activities are hired directly and receives a higher wage rate than the minimum. On the other hand, the workers hired through contractor would essentially receive lower. Let us assume that they get minimum wage (i.e., w^0), where $w > w^0$ (often power than official minimum wage) The existing law has given flexibility to employ workers for peripheral activities through contractor. The cost of hiring workers would be $[(1-F)sw + (1-s)w^0]q$. The profit of the firm can be expressed as follows:

$$\pi = \sqrt{q} - [(1-F)sw + (1-s)w^0]q - zF \quad (4)$$

As in the previous case, F is determined at first and q is decided thereafter. This can be solved using backward induction method. Therefore, the equilibrium R&D level and output produced by the firm are:

$$F_2 = 1 + \frac{(1-s)w^0}{sw} - \frac{1}{2(swz)^{1/2}} \quad (5)$$

$$q_2 = \frac{z}{sw} \quad (6)$$

Proposition 3: Labour market flexibility would lead to a drop in productivity; i.e., $F_1 - F_2 > 0$.

Proof: Comparing R&D level between (2) and (5), we find that $F_1 - F_2 = \frac{(1-s)}{s} \left(\frac{w - w^0}{w} \right) > 0$

In other words, the provision of hiring workers for peripheral activities through contractors at minimum wage leads to a decline in R&D level.

Proposition 4: A drop in wage rate for direct workers would lead to an increase in demand for both direct and contract workers, its effect on R&D is uncertain.

Proof:

$$\frac{\partial q_1}{\partial w} = -\frac{z}{sw^2} < 0$$

$$\frac{\partial F_1}{\partial w} = \frac{1}{4w(swz)^{1/2}} - \frac{(1-s)w^0}{w^2}$$

Proposition 5: An increase in minimum wage leads to a rise in R&D and contractualisation simultaneously without affecting total production.

Proof:

$$\frac{\partial q_1}{\partial w^0} = 0$$

$$\frac{\partial F_1}{\partial w^0} = \frac{(1-s)}{w} > 0$$

Case 3: Minimum Wages with Enforcement

Provision of using contract workers allows producer to use them on core activities at the minimum wage. Since this is illegal the firm would be charged a fine, if it is observed. Let p is the probability of being not detected by the existing enforcement mechanism and β is amount of fine for each unit of labour used for core activities at lower wage. So, the expected cost of hiring contract workers for core activities is $(1-F)s[1+(1-p)\beta]w^0q$ and the total cost of hiring workers would be $[(1-F)s\{1+(1-p)\beta\} + (1-s)]w^0q$. The profit of the firm can be expressed as follows:

$$\pi = \sqrt{q} - [(1-F)s\{1+(1-p)\beta\} + (1-s)]w^0q - zF \quad (7)$$

As in the previous case, F is determined at first and q is decided thereafter. This can be solved using backward induction method. Therefore, the equilibrium R&D level and output produced by the firm are:

$$F_3 = 1 + \frac{(1-s)}{s\{1+(1-p)\beta\}} - \frac{1}{2[sw^0z\{1+(1-p)\beta\}]^{1/2}} \quad (8)$$

$$q_3 = \frac{z}{s\{1+(1-p)\beta\}w^0} \quad (9)$$

Proposition 6: Labour market flexibility, in the presence of weak enforcement system, does not necessarily improve R&D level and labour productivity, but raise contractual employment.

Proof:

$$F_1 - F_3 = \frac{1}{2(sz)^{1/2}} \left[\frac{1}{[w^0 \{1 + (1-p)\beta\}]^{1/2}} - \frac{1}{w^{1/2}} \right] + \left(\frac{1-s}{s} \right) \left(\frac{(1-p)\beta}{1 + (1-p)\beta} \right)$$

The second term has been always positive. This would be positive if the figure within third bracket of the first term is positive. The first would also be positive when the enforcement of wage regulation is weak, i.e., $\frac{w - w^o}{w^o} > (1-p)\beta$. In other word, when wage gain is higher than fine paid, the term

would be positive. As a result, $q_3 > q_1$ if $\frac{w - w^o}{w^o} > (1-p)\beta$

Proposition 7: An increase in minimum wage leads to a rise in R&D with a decline in contractual employment and total production.

Proof:

$$\frac{\partial q_3}{\partial w^o} = - \frac{z}{s\{1 + (1-p)\beta\}(w^o)^2} < 0$$

$$\frac{\partial F_3}{\partial w^o} = \frac{1}{4[sz\{1 + (1-p)\beta\}]^{1/2} (w^o)^{3/2}} > 0$$

An increase in wage leads to raise R&D effects to save labour costs. This would definitely improve productivity growth, but not employment.

3. Empirical Framework

A standard benchmark model with two production factors, labour and capital, is widely used in the literature. Let us consider a production function where value added Q_{ijt} of firm i in j -th region and year t is produced using two inputs, namely labour L and capital K . Ignoring subscript, it can be written as follows :

$$Q = AF(L, K) \tag{10}$$

If the production function follows homogeneous of degree $1 + \lambda$ for all input factors, the returns to scale would be $1 + \lambda$. It would then exhibit respectively decreasing ($\lambda < 0$), constant ($\lambda = 0$) or increasing ($\lambda > 0$) returns to scale. By taking a total differential of (10) and logarithmic values, we get:

$$(q - k) - \varepsilon_L(l - k) = \lambda k + a \tag{11}$$

The left-hand expression in (11) represents the change in output-capital ratio minus the product of labour elasticity and change in labour capital ratio. This expression essentially

captures the residual growth which depends on capital growth in explaining returns to scale (λk) and unexplained random term (a). Therefore, the unexplained term can be used as a proxy for productivity growth. Again, two practical problems arise in the estimation of true TFPG using this equation - the estimation of factor elasticity (i.e., labour) under imperfect market conditions and endogeneity issue between input choice and productivity. In practice, the factor share is widely used as proxy of factor elasticity.

If the trade union determines wage in the labour market, it must be higher than the competitive one and the labour share would be different from its elasticity. Let us assume that the product market imperfection exists as before and in addition, a trade union would work in the labour market now.

Let us assume that \bar{L} is the total 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 equation,

$$\max_{w,L} \Omega = (Lw + (\bar{L} - L)w_a - \bar{L}w_a)^\theta (PQ - wL)^{1-\theta} \quad (12)$$

Solving (12) with respect to w and L , and after some manipulation, we find

$$\varepsilon_L = \mu s_L + \mu(s_L - 1)\theta / (1 - \theta) \quad (13)$$

It is interesting to note that in the presence of trade union the labour elasticity would consist of an additional term in order to relate with factor share. The first term in the right-hand side capture the product market imperfection only and the second term captures additional rent drawn from the surplus by the union. Higher the θ , the higher would be wage bills and the labour share. In other words, residual will be lower with the higher wage rent and wage bills in the presence of labour union. Therefore, we find that

$$(q - k) - s_L(l - k) = \beta(q - k) + \frac{\lambda}{\mu}k + \frac{\theta}{1 - \theta}(s_L - 1)(l - k) + (1 - \beta)a \quad (14)$$

Or, $SR = \beta LR + \frac{\lambda}{\mu}k + \frac{\theta}{1 - \theta}BR + (1 - \beta)a$, where $BR = (s_L - 1)(l - k)$ and it rises with an

increase of either the labour share or employment or both. The expression (14) is our basic equation to be used in the further analysis and allows us to estimate market and union

powers simultaneously without using the information on market price and the alternative wage.

Following the expression (14), our basic regression equation for i -th industry, j -th states and t -th years could be written as below:

$$SR_{ijt} = \beta LER_{ijt} + \gamma k_{ijt} + \eta BAR_{ijt} + w_{ijt} + u_{ijt} \quad (15)$$

$$\text{Where, } \gamma = \frac{\lambda}{\mu} \text{ and } \eta = \frac{\theta}{1 - \theta}$$

Where, w_{ijt} is the modified TFP and u_{ijt} is the random disturbance term. We define that the modified total factor productivity will be free from all market imperfections and one can easily estimate the extent of market distortions.

The estimation of the parameters in the above equation would not be straight-forward. In principle, both pooled and fixed effect panel regressions can be applied to estimate the parameters, but they are often criticised on endogeneity problem. Firms usually observe a part of productivity before hand and hence adjust the factor of production accordingly. The residual term and the variable factor inputs seem to be highly correlated and this is a typical problem of simultaneity. Hence, it violates the basic requirement of Ordinary Least Square method. At first, Olley and Pakes (1996) raised these issues and offered alternative method of estimation. Then Levinsohn and Petrin (2003) revised this further. Maiti (2013) uses these method to control such market imperfections.

The estimation procedure of productivity growth using both approaches involves two steps to deal with the simultaneity problem and market distortions. In (15), w_{ijt} is the observed part and u_{ijt} is the random disturbance term. The expectation of future realisation of productivity growth (i.e., observed term) increases in its contemporaneous values of stock (log-capital) and proxy variables (material costs and fuels in Levinsohn-Petrin method and gross capital formation in Olley-Pakes method, denoted as m_{ijt}). In other words, an unknown function for optimal decision of m_{ijt} can be written as $m_{ijt} = m_t(w_{ijt}, k_{ijt})$. Inverting this function, we write further as $w_{ijt} = h_t(m_{ijt}, k_{ijt})$ and therefore, $\phi_{ijt} = \lambda k_{ijt} + h_t(m_{ijt}, k_{ijt})$ where third order polynomials in m and k including constant term have been used to define this unknown function. Denoting the estimated variables as $\tilde{\phi}_{ijt}$ and substituting this into (15), we find

$$SR_{ijt} = \beta LR_{ijt} + \eta BR_{ijt} + \tilde{\phi}_{ijt} + u_{ijt} \quad (16)$$

Note that this equation is slightly different from the original forms used in both approaches. At first stage, this equation will be estimated and in order to go to the second stage, we define another variable as $V_{ijt} = SR_{ijt} - \hat{\beta}LR_{ijt} - \hat{\eta}BR_{ijt}$. Alternatively, this equation can be written as follows:

$$V_{ijt} = \gamma k_{ijt} + g(\tilde{\phi}_{ijt-1} - \gamma k_{ijt-1})_{ijt} + v_{ijt} + u_{ijt} \quad (17)$$

Again, g appears to be an unknown function and is approximated to third order polynomials for the estimation. This would be bit more cumbersome than the first-stage estimation and the estimated v_{ijt} provides our modified figures of TFP. We have simulated the regressions by 250 times. Since this two-stage estimation technique would enable us to decompose the market distortions from the productivity growth, one could use an interaction term of BR with contract workers to capture its effect on bargaining power. This would essentially capture the change in wage share with an increase of contract workers. If we add the interaction term of BR with contract workers as a free variable, it will be estimated at the first stage. This has also given opportunity to add several other variables which affect market conditions. One may argue that the estimates from above-two stages would be influenced by the industry and regional effects. Although the way variables are constructed and steps are followed through subtraction in the productivity estimation, it would reduce the influences of fixed effects to some extent, but not fully. Still one need to check the robustness of results after controlling fixed effects.

Third step is undertaken to regress a set of explanatory variables (X_{ijt}) to indentifying the determinants of productivity growth controlling the fixed effects. The equation is written as follows:

$$v_{ijt} = a + bX_{ijt} + \kappa_i + \varphi_j + \varepsilon_{ijt} \quad (18)$$

Where, κ , φ and ε are respectively industry specific error, regional specific error and normal disturbance term. Now, X_{ijt} is set of independent variables which would essentially determine the productivity growth. The contract labour is one of the main variables of our interest in this exercise and an interaction term with BAR is added to capture the effect of contract workers on bargaining power or wage bills. Then, a few other explanatory variables

(like openness, share of delicensed industries, government development expenditure shares) including contract workers have been regressed on the productivity growth. This would not only check robustness of our result but also helps to understand the effect of addition wage bill savings released from the use of contract worker on the productivity growth.

We gather information of three digits industries for fifteen major states and for seven years during 1998-2005. All together total observations in the study are approximately 4536. This information has been collected from *Annual Survey of Industries*, Government of India. The database includes capital stocks, investments, factor uses, outputs and types of workers. It is noteworthy to mention that a new definition of industrial classification has been taken place 1998 onward. Accurate matching has been really difficult to arrange them at the three digits level with previous classification. Moreover, the variable of our interest, i.e., contract workers, is available at the three-digits level from 1998 onward.

We derive import and export figures from the trade and industrial output data of the *World Bank Trade Data-base* (Nicita and Olarreaga, 2007). This provides the data at the ISIC 3 digits level of classification, and we match the data to the NIC 3 digit classification of the *Annual Survey of Industries*. Thus, our import and export variables vary across industries and over time (but not across states).

4. Contract Workers and Productivity Growth

Our empirical analysis begins by presenting the summary statistics, followed by a description of estimated values of mark-up, bargaining power and productivity growth. We then present the econometric results. At the three digits level, average industrial output has increased from Rs. 5.71 billion in 1998 to Rs. 8.43 billion in 2005 and average value added has also increased from Rs. 1.45 billion in 1998 to Rs. 1.84 billion. Average number of workers at the industry level has also increased from 8078 in 1998 to 8170 in 2005. Of which, 15.5% are found to be contract workers in 1998 and this has sharply increased to 26.8% in 2005.

Now, we shall investigate whether the use of contract workers promote productivity in the Indian industry. As discussed in the previous section, the use of contract workers would reduce the bargaining power of the union, and thereby saves wage bills, leading to a rise of the residual growth. And, the actual productivity growth of the industries would depend

whether this additional saving of wage bills derived from the use of contract workers has impacted on the productivity growth. This would definitely depend on how this would be spent. In order to capture the first effect, the interaction term of *BAR* with contract workers has been added into the regression model in (15) which appears as a free variable in the regression. The results have been reported in (2) and (4) in Table 2 respectively for Olley-Pakes and Levishon-Petrin approaches. The coefficient of the interaction term has turned out to be positive and statistically significant in both regressions. Since a lower bargaining power increases residue, the interaction term contributes to the residue positively. In other words, it suggests that the use of contract workers reduces the bargaining power of union and thus promotes the residual surplus by saving wage bills.

Moreover, it is often argued that trade would also change market conditions both in the product and labour markets depending on its intensity (Abraham et al., 2009; Maiti, 2012). Therefore, two sets of interaction terms of exports and imports with lerner and bargaining terms have been added to the same model in order to control trade effects. The results are reported in col. (3) and (5) in Table 2. Even then, the effect of contract workers is similar to the previous result after controlling the effects of trade on the markets. Therefore, one can safely conclude that the use of contract workers reduces bargaining power of union, saves wage bills and thereby promotes residual growth in Indian industries. This result would essentially invite two criticisms. The estimated parameters could be influenced by the fixed effects⁴ of industries and regions. Then, one needs to control these fixed effects. Moreover, the positive effect of contract workers with the bargaining term has promoted the residual growth but does not ensure the productivity growth.

For the identification of determinants, one needs to regress a set of variables on the residuals, derived after controlling distortions, along with fixed effects. We estimate residuals from (15) and few factors have been regressed on the residuals, controlling industry and region effects (see equation 18). The regression results have been reported in Table 4, after three stages estimation. Similar to the previous results, the regression coefficients of the interaction term of contract workers with bargaining factor has been positive and statistically significant. This confirms our earlier result. Now, the question is how the savings derived from the use of contract workers is spent. The producer would be

⁴It should be mentioned that the way variables are generated and estimated in initial the two-stages by subtraction, the problem of fixed effects would be minimised to some extent.

forced to invest on technology upgradation under more foreign competition and the trade openness (measured as the share of trade on total outputs) would essentially capture this effect. Moreover, Indian government has gradually delicensed the permission requirements for any industrial setup or new product or relocation of exiting plants or increase of capacity utilisation from 1983. This also exposes the firms to more competition and enables them to optimise the capacity of production (Aghion et al, 2008). These two variables have been added to the regressions with the assumption that the competition would lead to an investment on technology upgradation from the addition surplus derived from contractualisation. Other option is that the firm could invest on the use of more contract workers and this has also been added into the regressions. We further add the share of development expenditure of government as an additional control variable which includes government spending on infrastructure and social welfare. Note that openness and share of delicensed industries vary with time and industry, but development expenditure share varies with time and region. While the contract workers have been included as a separate variable, it has turned out to be statistically insignificant in all regressions. On the other hand, the estimated parameters of openness and share of delicensed outputs have been consistently positive and statistically significant. In other words, the pressure under more foreign competition and delicensing leads the producers to spend surplus wage bills on innovation and this helps to improve productivity growth. However, if this is used to hire more contract workers, the productivity growth might fall. This is more visible when we use contract workers in percentage term (see column 6 in Table 3). In the last regression, we use labour-capital ratio⁵, in place of contract workers, the results remain same. When a producer uses more labour, they prefer more contract workers to avoid union and by doing so, though the surplus would be improved but the productivity may not be raised. Because, the contract workers are limited to be used only on the peripheral activities where the productivity would be lower and they would not be directly benefited from any technological upgradation that would take place in the core activities of the industries.

These results further confirm that the use of contract workers definitely helps the producer in saving the wage bills. Therefore, it promotes the growth of residual surplus by lowering

⁵The labour-capital ratio is expected to be higher in presence of contract workers.

the bargaining power of union. Actual productivity impact from such labour use has been ambiguous and depends on how the savings from wage bills would be used. If it is spent on technology upgradation due to increasing foreign competition or other industrial reforms, the productivity would be improved. If this is used in hiring more contract workers, the productivity might decline. Because, the contract workers are employed only on peripheral activities and their actual productivity would definitely be lower than the workers engaged in core activities of the production process. Therefore, even if a technological shift has been taken place due to the increased competition, the use of contract workers could act negatively on it. Our result is similar to the findings of Kleinknecht et al. (2006). Therefore, we conclude that the use of contract workers raises growth of residual surplus, but not necessarily the productivity growth.

5. Conclusion

In recent years, the industries have been experiencing the use of contract workers. The present study investigates the impact of contract workers on productivity growth with a particular focus on Indian industries. According to the recent studies, India labour laws are found to be highly rigid and have been identified a major constraining factor in accelerating the industrialisation in the country. Recognising the use of contract workers, Indian government allowed the producer to employ them only on peripheral and non-core activities of the production process. Therefore, the workers hired through the outside agents or labour contracts on peripheral activities are defined as contract workers. The use of such workers in Indian industries has been increased by more than 10% during 1998-2005. The present paper tries to understand whether such shifting has made any positive impact on productivity improvement in the industrial sector using three-dimensional panel data of three digit industries, for fifteen major states during the period 1998-2005. We employ an elimination technique of the market distortions, seen both in the product and input markets, from the usual Solow residuals and derive modified productivity growth. This provides us an empirical foundation to capture the effect of contract workers on the bargaining power and its resultant effect on residual growth in the Indian context. We use a modified approach of Olley-Pakes and Levinsohn-Petrin methods to eliminate the market distortions from productivity growth. The regression results clearly show that the use of contract workers has made a positive impact on the residual growth in the Indian industries.

Using contract workers, the producer avoids the union and saves wage bills, leading to a rise of residual growth. Now, whether this would improve the productivity growth depends on how the savings from wage bills are spent. If the savings are spent on technology under foreign and other competitions, the productivity would definitely improve. If this is used to hire more contract workers, the productivity improvement would be uncertain. Because, the contract workers are limited to be used in peripheral and non-core activities where the labour productivity would be lower than the workers engaged in core activities. Therefore, even if the technology has been upgraded in core activities of the firm, the contract workers would not be directly benefited and cannot improve their productivities. It appears that the contract workers should be allowed to employ in core activities of the production process. This would essentially enable the firm to deal with union effectively as well as contract workers to derive direct benefits from the improved technology in core activities. However, the issue of incentive problems of contractualisation should be investigated further before going to draw final policy recommendation.

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Tables

Table 1: Summary Statistics

Variables	1998		2005	
	Mean	SD	Mean	SD
Value of Output (Rs. billion)	5.71	1260.6	8.43	1776.7
Gross value added (Rs., Cr.)	1.45	387.8	1.84	415.0
Fixed Capital (Rs., Cr.)	3.39	1054.3	3.19	793.9
Workers (nos.)	8078	21741.3	8170	20524.5
Contract workers (nos.)	1253	3746.2	2189	9736.2
Share of Contract workers (%)	15.5	0.2	26.8	0.2

Source: Author's calculation

Table 2: Contract Workers, Bargaining Power and residual growth in Indian Manufacturing during 1998-2005

Variable	Olley-Pakes Method		Levinsohn- Petrin Method	
	(2)	(3)	(4)	(5)
(1)				
Lerner	0.829***	0.082	0.720***	-0.071
Bargaining	-0.968***	-1.014***	-0.959***	-1.018***
Fixed Capital	0.545***	0.713***	0.736***	0.800***
Export*Bargaining	---	-0.009***	---	0.009***
Export*Lerner	---	0.0339***	---	0.035
Import*Bargaining	---	0.014***	---	0.014***
Import*Lerner	---	0.045**	---	0.039***
Contract Labours*bar	0.008***	0.009***	0.01***	0.007**
Model	Two-Stage	Two-Stage	Two-Stage	Two-Stage
Wald statistic	---	---	34.46	22.21
Number of observations	4246	4246	3729	3183

Note: *** represents significant at 1%, ** represent significant at 5% and * represent significant at 10%;

Table 3: Contract Workers and Productivity growth in Indian Manufacturing during 1998-2005

(1)	(2)	(3)	(4)	(5)	(6)	(7)
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Lerner	0.688	0.688	0.688	0.688	0.688	0.688
Bargaining	-0.993***	-0.993***	-0.993***	-0.993***	-0.993***	-0.993***
Fixed Capital	0.705***	0.705***	0.705***	0.705***	0.705***	0.705***
Contract Worker (log)	-20.9		-0.009	-0.003		
Contract workers (%)					-1248***	
Labour-Capital ratio (log)						-436***
Openness	0.05***	0.05***	0.05***	0.02***	0.02***	0.03***
Delicensed output share	4011**	3579**	179	3574**	3253*	-46
Dev exp	2.3	25.3	45.4**	24.7**		16.4
Contract Workers*Bargaining		13.3***	12.5**	13.3***	14.9***	14.1***
Model	Three-Stage	Three-Stage	Three-Stage	Three-Stage	Three-Stage	Three-Stage
R-squared (last stage)	0.36	0.46	0.47	0.30	0.47	0.51
Industry effect	Yes	Yes	No	Yes	Yes	Yes
State effect	Yes	Yes	No	Yes	Yes	Yes
Number of observations	3183	3183	3183	3183	3183	3183

Note: *** represents significant at 1%, ** represent significant at 5% and * represent significant at 10%,Levinsohn-Petrin method has been applied here.