Labour Demand in the India's Textile and Apparel Industries: A Comparative Analysis of Organized and Informal Sectors

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Abstract

This paper argues the issues relating to the effects of the economic regulation on a firm's demand for labours in India. It focuses on the textile and apparel industries on the one hand which have been one of the largest industries in the Indian economy for long time and Industrial Dispute Act on the other hand which requires that any firm employing more than 100 workers must get the permission from the government in order to retrench or lay-off even a single worker. The paper provides the new estimate of the labour demand function in the textile and apparel industries by using data from CSO's *Annual Survey of Industries* and NSSO's *Informal Non-Agricultural Enterprises*.

1 Introduction

Last year international textile and apparel product markets entered into new stage toward more liberalized trade regime. So far, under the Multi-Fiber Agreement (MFA) export quote of textile and apparel product from the developing countries was allocated by the advanced countries. With the end of the MFA on December 31, 2004, India's textile and apparel industries face new challenges and chances to stimulate growth momentum.

The textile and apparel industries are one of the largest and the most important sectors in India in terms of industrial production, export earning and employment generation. Moreover, international market share of cotton yarn export from India is 20 per cent and international share of looms is 58 per cent[*1]. India's textile industry is large even in the world.

However, whether India's textile and apparel industries utilize their capability fully will depend on economic policy regime and domestic market structure. Given that textile and apparel industries can absorb a lot of labours, especially disadvantaged group and women, chronic poverty and unemployment problem in India would be alleviated by the faster growth of these industries. Thus, in this paper we study the issues relating to the effects of the economic regulation on the employment in the textile and

[*1] Government of India, *National Textile Policy - 2000*, 2000, paras. 11 and 12.

apparel industries in India.

We focus on Industrial Dispute Act as job security regulation which requires that any firm employing more than 100 workers must get the permission from the government in order to retrench or lay-off even a single worker. We provide the new estimate of the labour demand function in the textile and apparel industries in order to find the impact of job security regulation on employment in these industries.

This paper is divided into following four sections. Section 2 explains the institutional backgrounds on this subject focusing on the textile and apparel industries and the IDA as the job security regulations. Section 3 explains theoretical arguments on a profit-maximizing firm's demand for labours. Section 4 presents statistical analysis on the determinants of a firm's labour demand. Section 5 concludes with some remarks.

2 Institutional Backgrounds

2.1 Overview of India's Textile and Apparel Industries

The textile and apparel industries are quite large and important sectors in India in terms of output, export and employment. These industries produce about 12 per cent of the industrial production, about 20 per cent of total export earnings in 2003 and absorb about 8 per cent of employment in non-primary industries in 1999. Now these industries face new challenges and chances to stimulate growth momentum under post-MFA regime since 2005.

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[Table 1][Table 2]

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Table 1 shows the average annual growth rate in registered, unregistered and combined sector. Performance of these industries in registered sector is inferior to that of all manufacturing industries. However, achievement of these industries in unregistered sector is comparable with that of all industries in unregistered sector. In recent period of 1991-2003, the growth rate of registered textile and apparel industries is 4.8 per cent and that of the unregistered is 5.7 per cent. As seen in Table 2, in period for 1951-60, the output share of these industries is about 25 per cent, remarkably high. Therefore, we can see that while these industries are traditional and old, they still sustain to grow for long time. Table 2 shows that while from 1951-1960 to 1961-71 decline of share of these industries is quite large, it has been modest since then.

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[Table 3]

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Textile industries contain spinning, weaving and processing sectors. We take weaving and knitting sectors as an example for understanding the structure of textile industries. Table 3 shows the production of fabrics in different sectors, e.g. mill sector, handloom sector, powerloom sector, hosiery (knitting) sector and Khadi etc. Fabrics production of mill sector decreased from 1990 million sq. metres in 1993 to 1503 million sq. metres in 2004; Fabrics production of handloom sector increased from 5851 million

sq. metres in 1993 to 7585 million sq. metres in 2001 and then decreased to 5722 million sq. metres in 2004; Fabrics production of powerloom sector is the largest, increasing from 15994 million sq. metres in 1993 to 28325 million sq. metres in 2004; Fabrics production of hosiery sector increased remarkably from 3637 million sq. metres in 1993 to 9112 million sq. metres in 2004; Fabrics production of Khadi, wool and silk is minor, but increased in the period for 1993-2004. Looking at all sectors, it is noted that 100 % non-cotton is catching up with cotton fabrics in the period for 1993-2004. We confirm that the textile industries have been regarded as a complex of various sector and fiber user.

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[Table 4][Table 5]

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Table 4 indicates export performance of the textile and apparel industries. Export earning increased from less than 1 billion US dollar in 1970 to about 13 billion US dollar. Its export share decreased in mid-1970 and then increased to roughly more than 20 per cent since mid-1980. In Table 5, we take " cotton yarn, fabrics, made-ups, etc. " and " readymade garments " as an example of export direction of textile and apparel product. Principal countries or areas of India's export are U.S.A. and EU. It is noted that " cotton yarn etc. " increased remarkably from about 4 billion US dollar in 1998 to about 16 billion US dollar in 2004. However, " readymade garments " increased from about 2.7 billion US dollar to 3.2 billion US dollar in the same period. This implicitly suggests that global competitiveness of apparel industries is relatively lower than textile industries due to lack of modernization and reservation policy for small scale industries.

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[Table 6][Table 7]

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In Table 6, we see principal non-primary industries absorbing the labours. Textile industries are in the third rank, employing about 9.5 million in 1993 and about 8 million workers in 1999. The share of textile industries is 8.3 per cent in 1993 and 6 per cent in 1999. Apparel industries are in the eighteenth rank, employing about 1.2 million in 1993 and 2.6 million workers in 1999. The share of apparel industries is about 1 per cent in 1993 and about 2 per cent in 1999. Total number of workers in the textile and apparel industries is about ten million. Table 7 indicates major non-primary industries employing female workers. More than half of total workers are women workers in apparel industry and about 14 per cent in textile industry. The share of female employment in apparel industry to total female employment is about 12 per cent and the share in textile industry is about 16 percent. Thus, in terms of women workers, textile and apparel industries are one of the largest employment sectors. Therefore, we find the textile and apparel industries have a considerable ability for absorbing huge surplus labours including a lot of women in India.

In finishing this subsection, we can guess that the industry will be able to response more quickly to world-wide growth of international trade of the textile and apparel products under post Multi-Fiber Agreement since 2005, if the present labour laws are rationalized toward more flexible labour market. It is also noted that export-led growth in textiles and apparels will be able to happen when large investments especially in apparel industries complement with flexible labour market. In addition, progress

in textile and apparel industries will alleviate the poverty and unemployment problem and contribute social participation of a lot of women in India[*2].

2.2 Industrial Dispute Act as Job Security Regulation

According to Datta Chaudhuri (1996), the Industrial Dispute Act (IDA), 1947 is " the single most important piece of legislation that governs the relationship between the worker and his employer " and " The most onerous provisions of IDA is chapter V-B. "

The Industrial Disputes Act was enacted in 1947. IDA has provisions for investigation and settlement of industrial disputes and for giving certain protection to the workers. The IDA is comprised of seven chapters and forty sections. Chapter I contains definitions. Chapter II deals with the various authorities under the Act including Conciliation Officers, Labour Courts and Tribunals. Chapter III is relating to the reference of disputes to Labour Courts and Industrial Tribunals. Chapter IV provides the provision on the procedure, power and duties of the relating authorities. Chapter V is comprised of provisions to prohibit strikes and lock-outs, declaration of strikes and lock-outs as illegal, and provisions relating to lay-off and retrenchment and closure. Chapter VI is relating to various penalties under the Act. Chapter VII has miscellaneous provisions [*3]

Chapter V-B of the IDA is special provisions relating to lay-off, retrenchment and closure in the enterprises employing not less than 100 workers. This chapter aims to moderate the serious trouble caused by lay-off, retrenchment and closure in large scale enterprises. In this chapter, large scale enterprises were regarded as enterprises employing 300 or more than workers, when the chapter was inserted in 1976. In 1982 the criterion was reduced to 100 workers. Under the chapter, any industrial enterprises employing 100 or more than workers are required to get the prior permission of state government before laying off or retrenching any workers or closing down. In fact, this permission has seldom been given to the employers by state government. Therefore, chapter V-B provides strong job security to existing workers in large organized sector.

Needless to say, the intention behind such job security regulation is to protect employment. However, it might result in slow growth of new employment in organized sector in 1980's. Moreover, India's industrial firms have faced the strong completion from rival MNCs since the economic liberalisation started in 1991. They need flexibility for restructurings, but they can not deal with the new and much more competitive environment due to the job security regulation. The job security regulation, as several scholars blame, may make the Indian labour market highly rigid.

Recently, Government of India suggested the amendment proposals to the IDA. For example, The Montek Singh Ahluwalia Committee recommended to make the chapter V-B of IDA applicable only to units having more than 1000 employee, or more radically and preferentially to delete chapter V-B itself [*4]. In addition, in 2001-02 budget speech, minister of finance suggested as follows: " Along with these

[*2] See Roy (2004), Sastry (1984) and Uchikawa (1998) for understanding the India's textile and apparel industries more comprehensively.

[*3] Ministry of Labour web site (http://labour.nic.in/ir/Industrialdisputesacts,1947.htm). We learn about this subject from Basu (2005), Debroy and Kaushik (2005), and Zagba (1999).

[*4] Government of India, *Report of the Task Force on Employment Opportunities*, 2001, para. 7.16.

changes, it is also necessary to address the contentious issue of rigidities in our labour legislations. Some existing provisions in the Industrial Disputes Act have made it almost impossible for industrial firms to exercise any labour flexibility. The Government is now convinced that some change is necessary in this legislation. Chapter VB of the ID Act stipulates that employers in specified industrial establishments must obtain prior approval of the appropriate government authority for effecting lay-off, retrenchment and closure, after following the prescribed procedure. It is proposed that these provisions may now apply to industrial establishments employing not less than 1000 workers instead of 100 "[*5].

The Government of India constituted Second National Labour Commission. Commission reviews the IDA and suggests as follows [*6]:

(1) Enterprises should have the option to close down. The best and more honest and equitable course will be to allow closure, provide for adequate compensation to workers, and in the event of an appeal, leave it to the Labour Relations Commission to find ways of redressal through arbitration or adjudication.

(2) Prior permission is not necessary in respect of lay-off and retrenchment in an establishment of any employment size. Workers will however be entitled to two months notice or notice pay in lieu of notice, in case of retrenchment. In the case of establishment employing 300 or more workers where lay-off exceeds a period of one month, such establishment should be required to obtain post-facto approval of the appropriate government. The provisions of Chapter V-B pertaining to permission for closure should be made applicable to all the establishments to protest the interest of workers.

In this context, several scholars study the magnitude of the effect that job security regulation have had on the demand for labours. Fallon and Lucas (1993) use a dummy variable which indicates unity if the year is 1976 or after 1976, zero otherwise for investigating labour demand of the organized manufacturing industries in the period for 1959-1981. Their data is drawn from CSO's *Annual Survey of Industries*. They say " In India, the weighted average drop in long-run demand for employees, at given output levels, is estimated to be 17.5 per cent (p. 269). " Hasan, Mistra and Ramaswamy (2003) show that labour-demand elasticities are higher for states with less job security regulation and that they are also impacted to a larger extent by trade reforms. They employ the variation of state-level amendment of IDA to identify the impact of the job security regulation, whose data is drawn from the *ASI* data in period for 1980-1997. The measure of job security regulation which they use is based on the measure Besley and Burgess (2004) constructed. Besley and Burgess find that states which amended the IDA in pro-worker direction experienced lower employment in the period for 1958-1992. They use both state domestic product data and the *ASI* data. Recently, Aghion, Burgess, Redding and Zilibotti (2006) confirm the same results as Besley and Burgess (2004). Badri Narayanan (2005) covers the textile and apparel industries in the period for 1973-1997. He uses the state-level measure of the IDA and finds that job security regulation depresses demand for labours. Contrary to popular perception, Roy (2004) finds that the impact of job security regulations was minimal by using the data in period for 1960-1993. In his study, the dummy variables which indicate before-after 1976 and 1984 are employed.

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[*5] Government of India, *Finance Minister's Budget Speech 2001-02*, para. 52.

[*6] Government of India, *Report of the Second National Commission on Labour*, 2002, paras. 6.87 and 6.88.

[Table 8]

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Table 8 shows the state-level indexes of job security regulation which Besley and Burgess (2004) construct by interpreting all state level amendments to the IDA and Hasan, Mistra and Ramaswamy (2003) modify by changing the status of Gujarat, Kerala and Maharashtra in Besley and Burgess (2004) [*7]. Moreover, in this paper we adjust these indexes as seen in Table 8. We regard Gujarat and Maharashtra as flexible e.g. less regulation states, Kerala as inflexible state and Madhya Pradesh as neutral state, taking into account of two existing indexes. In later section, we use our index as main variable of job security regulation. In addition, as another index of job security regulation we will use the dummy variable which is unit if the year is 1984 or after 1984, zero otherwise, because the IDA, 1982 came into force in 1984.

3 A Model of a Firm's Demand for Labours

The main purpose of this section is to explain a profit-maximizing firm's demand for labours *a la* Blanchard and Fisher (1989: chapter 2) and Romer (1996: chapter 6). We assume a firm cannot adjust employment level without the cost. Due to the IDA, as mentioned earlier, a firm employing more than 100 workers must get the prior permission from state government before laying-off or retrenching even only one worker or closing down. For this reason, a firm must expense firing cost in restructuring own business. In addition, a firm cannot avoid disbursing hiring cost despite of the existence of surplus labours since a firm's demand for workers is usually specific in terms of required ability and skill.

We assume that a labour adjustment cost function

$$C(\dot{L}) = \bar{c}|\dot{L}| + c(\dot{L})$$

Where C is total adjustment cost, $\bar{c}$ is fixed cost per a unit change of labours, c is variable adjustment cost, $\dot{L}$ is a unit change of labours ($= dL/dt$, L is labours) so that marginal hiring (or firing) cost becomes $\bar{c} + c'(\dot{L})$. In addition we assume the second term of right hand side $c(\dot{L})$ is shaped as follows:. c is zero if there is no change of labours, otherwise positive and the more change of labours the more c ($c(0) = 0,\ c'(0) = 0,\ c'(\dot{L}) > 0,\ c''(\dot{L}) > 0$).

A firm at time t maximizes the intertemporal profit subject to transitional equations of labours as follows;

$$Max\ v_0 = \int_0^{\infty} (F(L_t) - wL_t - C(l_t))e^{-rt}dt$$
$$subject\ \ to\ \ \frac{dL_t}{dt} = l_t$$

We can deal with this dynamic profit maximization problem by Pontryjagin's Maximum Principle. The

[*7] Under the Constitution, " labour " subject is registered as " concurrent list ". Thus not only central government but also state governments have responsibility to implement labour policy. State governments are able to amend the IDA, 1947 by themselves. For this reason labour regulation regime in India varies across the states.

present value of Hamiltonian is defined as follows;

$$\begin{aligned} H_t &= [F(L_t) - wL_t - C(l_t)]e^{-rt} + \mu_t l_t \\ &= [F(L_t) - wL_t - C(l_t) + \lambda_t l_t]e^{-rt} \end{aligned}$$

where $\lambda_t = \mu_t e^{rt}$. μ_t is marginal value of labours at time t evaluted at time 0 and λ_t is the same but evaluted at time t. The first order conditions (FOC) for the miximazation are as follows;

$$\begin{aligned} H_l &= 0 \\ \frac{d\mu_t}{dt} &= -H_L \end{aligned}$$

The transversality condition is given by

$$\lim_{t\to\infty} \mu_t L_t = 0$$

From the first FOC we have

$$-e^{-rt}C'(l_t) + \mu_t = 0 \ \rightarrow \ C'(l_t) = e^{rt}\mu_t = \lambda_t$$

That is, from the specification of adjustment cost function

$$\bar{c} + c'(l_t) = \lambda_t \tag{1}$$

From the second FOC we have

$$\begin{aligned} e^{-rt}(F'_t - w) = -\dot{\mu_t} \ \rightarrow \ F' - w &= e^{rt}(e^{-rt}r\lambda_t - e^{-rt}\dot{\lambda_t}) \\ &= r\lambda_t - \dot{\lambda_t} \end{aligned} \tag{2}$$

The first FOC implies that a firm hire new workers or dismiss old workers so that shadow price of labours λ_t equate marginal cost of new employment. The second FOC is regarded as a first order linear differential equation in λ. Using the transversality condition we can solve this differential equation as follows;

$$\lambda_t = \int_{s=t}^{\infty} e^{-r(s-t)}(F'_s - w)ds \tag{3}$$

This condition implies that shadow price of labours λ_t is the same as the discounted present value of the future marginal profit stream [*8]. λ means increase in discounted preset value of future profit raised by hiring additional labours. Hence a firm hires labours when λ is high, otherwise it fires labours.

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[Figure 1]

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For understanding a firm's dynamic response to exogenous shock such as introduction of the chapter V-B into the IDA, we present the phase diagram of the dynamic system in Figure 1[*9]. From equation (1) a firm hire or fire workers in order to equate value of labour to marginal cost of labour. Since $c'(l)$

[*8] See the appendix.

[*9] It is remarkably messy to solve the simultaneous differential equation. Instead, we analyze the nature of the solution by looking at the phase diagram.

is increasing function of l, l is increasing function of λ. Given $c'(0)$ is zero, when $\lambda = \bar{c}$, l is zero. Thus, we get following relationship;

$$\dot{L} = f(\lambda),\ f(\bar{c}) = 0,\ f'(\lambda) > 0$$

where $f(\lambda) = c'^{-1}(\lambda - \bar{c})$. From above equation, when $\lambda > \bar{c}$, L increses and when $\lambda < \bar{c}$, L decreses. L is constant when $\lambda = \bar{c}$. From above reasoning, we can draw $\dot{L} = 0$ schedule in Panel A of Figure 1.

We rearrange the terms of equation (2) to get

$$\dot{\lambda} = r\lambda - [F'(L) - w]$$

From this equation we find that when $r\lambda = F'(L) - w$, or $\lambda = [F'(L) - w]/r$, λ is constant. Since $F'(L)$ is decreasing function of L, we can depict $\dot{\lambda} = 0$ schedule in Panel B of Figure 1. From equation(2) $\dot{\lambda}$ is increasing function of L. This implies that in the region in right side of $\dot{\lambda} = 0$ schedule, $\dot{\lambda} > 0$ and in the region in left side of that, $\dot{\lambda} < 0$. In Panel C of Figure 1, the point E represents long-run equilibrium point satisfying both $\dot{L} = 0$ and $\dot{\lambda} = 0$.

Now we consider the impact of (1) permanent decline of wage rate, (2) permanent rise of aggregate demand, and (3) permanent decline of labour adjustment cost on labour demand L and shadow price of labours.

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[Figure 2]

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(1) Decline of wage rate: This problem is illustrated in Panel A of Figure 2. Noting that $\lambda = [F'(L) - w]/r$, decline of wage rate shifts the $\dot{\lambda} = 0$ schedule to right side. As shadow price of labours λ is discounted present value of future profit stream, rise in λ stimulate labour demand L but with adjustment cost L cannot be instantly increased. Thus, firstly λ jumps to the saddle path and then higher λ stimulate a firm's labour demand to result in increase in L. As L is increasing, marginal productivity of labours is decreasing (e. g. marginal profit is decreasing), therefore λ is also decreasing.

(2) Permanent rise of aggregate demand: This stimulates the demand for a firm's product. Although our model does not incorporate the price of a firm's product, we can defines a firm's profit as $pF(L) - wL - C(l)$. Then, it is easy to find that $\dot{\lambda} = 0$ schedule means $\lambda = [pF'(L) - w]/r$($\dot{L} = 0$ schedule is not changed). If permanent rise of aggregate demand increases p, it shifts $\dot{\lambda} = 0$ schedule to the right side. Therefore, the dynamics in this case is the same as that of decline of wage rate.

(3) Permanent decline of labour adjustment cost: Panel B shows this case. Now we regarded decline of adjustment cost as decrease of $\bar{c}$, then it shifts $\dot{L} = 0$ schedule to lower side($\dot{\lambda} = 0$ schedule is not changed). Since marginal cost of new employment decreases, new employment increases. This implies that a firm's marginal profit decreases and then shadow price of labours declines. As L can not increase instantly, firstly λ jumps to the saddle path with decline of adjustment cost. Then, λ decreases and L increases toward new long run equilibrium point E'.

4 Empirical Evidences

4.1 Organized Sector

Table 9 shows the descriptive statistics for the variables we use in regression analysis. We use data of textile and apparel industries from EPW Research Foundation's *Annual Survey of Industries 1973-74 to 1997-98* at the 2-digit industry level in the 15 main states for the period from 1979 to 1997. The original data is from CSO's *Annual Survey of Industries* (*ASI*).

The definition of the main variables is as follows[*10]:

Labour Input (L): We use the number of employee in *ASI* as labour input.

Real Wage Rate (W): Nominal wage rate is defined as total emolument divided by the number of employees. We obtain the real wage rate by deflating nominal wage by the wholesale price of the corresponding segment of the textile and apparel industries.

Real Gross Value Added (GVA): The depreciation in *ASI* is not necessarily real one since the depreciation is linked to a firm's tax obligation and accounting practice. Then, gross term including the depreciation as the measure of value added is better than net term excluding depreciation. Computing the real value added, we employ the double-deflation method. This method suggests gross value of output should be deflated by its wholesale price and total input be done by input price. We construct the input price series of each segment of textile and apparel industries. Input price is the weighted average of fuel price, material price, and other input price and its weights are drawn from fuel consumed, material consumed, and other input in *ASI*. Fuel price, material price and other input price are also constructed by using wholesale prices, implicit deflator of national account statistics and weight from input-out table [*11].

Capital Stock (K): The fixed capital in *ASI* is evaluated at the end of reference year and does not contain value of accumulated depreciation. We employ perpetual inventory accumulation method for making the figure of capital stock. Real gross fixed capital formation (I) is defined as $I_t = \frac{(B_t - B_{t-1} + D_t)}{P_t^I}$, where D is depreciation, B is fixed capital, and P_t^I is implicit deflator of gross fixed capital formation. Then, we make time-series of real gross capital stock (K^G) as $K_t^G = K_{t-1}^G + I_t = K_0^G + \sum_{i=1}^{t} I_t$, where K_0^G is base-year capital stock and regarded as $B_0 + D_0$ in *ASI*. Finally, assuming depreciation ratio per year is 5 per cent, real net capital stock K is set as $K_t = (1-\delta)K_t^G$.

Firstly, we estimate labour demand function of the following form:

$$\begin{aligned}\ln L_{ist} = {} & \alpha_{is} + \beta_1 \ln W_{ist} + \beta_2 \ln GVA_{ist} + \beta_3 \ln K_{ist} \\ & + \gamma JSRdummy_t + \mu_1 (\ln W_{ist})(JSRdummy_t) \\ & + \mu_2 (\ln GVA_{ist})(JSRdummy_t) + \mu_3 (\ln K_{ist})(JSRdummy_t) \\ & + \theta JSRindex_s + e_{ist}\end{aligned}$$

[*10] We learn about the characteristics on the *ASI* data from Goldar (1997) and Goldar (2004). We follow them as precisely as possible.

[*11] The data source we use are as follows: Reserve Bank of India, *Database on Indian Economy*, and *Handbook of Statistics on Indian Economy*; CSO, *Input-Output Transaction Table 1989* and *National Account Statistics*.

where L_{ist} is number of employees in state s at time t, W is real wage rate, GVA is real gross value added, K is capital stock, JSR dummy is a dummy variable which takes the value of unity in 1984 or after 1984 and zero before 1984, JSR index is the state-level job security regulation index (see table 8), and α_{is} is state-industry fixed effect. The variable e is a stochastic error.

In this specification, we can see the impact of the job security regulation on not only labour demand itself but also labour demand elasticity with respect to wage, output and capital. We are interested in investigating to what degree the introduction of job security regulation affect a firm's labour demand activity.

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[Table 10]

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Column (1) of Table 10 shows that the job security regulation depresses a firm's labour demand directly. The estimated coefficients on the JSR dummy which is 1 if the year is 1984 or after 1984, zero otherwise, and state-level JSR index are negative and highly statistically significant. In columns (2) and (3), we employ the slope dummies in order to examine the impact of the job security regulation on the labour demand elasticity with respect to wage, output and capital. The estimated coefficients on the interaction of wage and capital are statistically insignificant but that on the interaction of output is negative and statistically significant. Job security regulation decreases the labour demand elasticity with respect to output by 6 to 7 per cent point. This suggests the possibility that introduction of that regulation contributes the jobless growth in organized textile and apparel industries. We find that in columns (1) to (3) wage, output and capital elasticity are significantly minus 0.24 to 0.36, plus 0.05 to 0.11 and plus 0.43 to 0.44 respectively.

Next, we run following regression:

$$\begin{aligned}\ln L_{ist} = \alpha_{is} + \beta_1 \ln W_{ist} + \beta_2 \ln GVA_{ist} + \beta_3 \ln K_{ist} \\ + \gamma JSRdummy_t + \mu \ln L_{ist-1} + e_{ist}\end{aligned}$$

In this specification, we includes lagged dependent variable $\ln L_{ist-1}$ implying that the coefficient on $\ln L_{ist-1}$ will be biased if above equation is estimated by OLS since unobserved α_{is} must be correlated with lagged dependent variable $\ln L_{ist-1}$. Then, we employ the generalized method of moment (GMM) proposed by Arellano and Bond (1991) who generate the consistent estimate on the coefficient of the lagged dependent variable [*12].

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[Table 11]

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In Table 11 column (1) presents the one-step GMM estimator. Sargan test statistics is distributed according to chi-square distribution under null hypothesis that over identification exits. This test confirms whether the instruments for identification are valid or not. The result shows the instruments for

[*12] Arellano and Bond's GMM is popular as Bhalotra (1998), Hasan, Mitra and Ramasowamy (2003) and Badri Narayanan (2005) used in estimating dynamic labour demand function.

identification are valid. AR(1) and AR(2) are tests for the first-order and the second-order serial correlation in the residuals respectively. If null hypothesis of absence of the second-order serial correlation is rejected, the coefficient of lagged dependent variable will be inconsistent. However, even when null hypothesis of absence of the first-order serial correlation is rejected, the coefficient will be inefficient but still consistent. In column (1), the estimated coefficient may not be consistent as null hypothesis of absence of the second-order serial correlation is rejected. Wald test is about zero-slop restrictions. The result tells us that null hypothesis of zero-slop restrictions is rejected.

In column (2) and (3), we find the same pattern except of the pass of AR(2) test. While column (2) shows the one-step robust GMM estimator, which is robust to heteroskedasticity, column (3) presents the two-step GMM estimator, which is asymptotically more efficient. We find that all variables are statistically significant and also confirm job security regulation will depress a firm's demand for labours. We can calculate the short-run and the long-run elasticities of labour demand with respect to explanatory variables as follows: Short-run elasticities with respect to wage, output, and capital are minus 0.39, plus 0.03 and plus 0.69 respectively, and the long-run are minus 0.51 ($= -0.39/(1-0.24)$), plus 0.04 ($= 0.03/(1-0.24)$), plus 0.91 ($= 0.69/(1-0.24)$) respectively.

In column (4) we regard wage and output as endogenous variables and then employ the two-step GMM using the lagged wage and output as additional instrument variables. Column (4) shows the same pattern except of the estimated coefficient on the lagged dependent variable, which is 0.12 point higher than the coefficient in previous columns. The estimated coefficient of JSR dummy is still negative and statistically significant. We find that short-run elasticities with respect to wage, output, and capital are minus 0.36, plus 0.03 and plus 0.70 respectively, and the long-run are minus 0.56 ($= -0.36/(1-0.36)$), plus 0.05 ($= 0.03/(1-0.36)$), plus 1.09 ($= 0.70/(1-0.36)$) respectively.

Finally, Column (5) presents OLS estimate for checking how degree the GMM estimators are different from OLS estimators. We find the coefficient of lagged labour demand estimated by OLS is 0.19 to 0.31 point higher than those by GMM. Using OLS, there might be overvaluation of the estimated coefficient of lagged dependent variable.

4.2 Informal Sector

The enterprise survey of the NSSO's 55th round covers informal enterprises in the non-agricultural sector. The survey classifies enterprises in informal sector into two types, e.g. " Own Account Enterprises " which don't hire any worker on a regular basis and " Establishments " which are all the remaining enterprises. All unincorporated enterprises which operate on either proprietary or partnership basis are considered to constitute informal sector.

It is noted that the definition of Informal sector is different from the concept of unorganized sector. The unorganized sector constitutes not only proprietary or partnership enterprises but also cooperative societies, trusts, private and public limited companies. The informal sector is regarded as a subset of the unorganized sector. It is noted that all manufacturing units of proprietary or partnership type which *ASI* covers are not considered as informal enterprises.

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[Table 12]

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Table 12 shows the descriptive statistics for the variables we use in regression analysis. The data we use covers " Manufacture of Textiles " (17) and " Manufacture of Wearing Apparel; Dressing and Dyeing of Fur " (18) of 2-digit code of NIC 1998 for the 15 main states in 1999. The data unit is firm.

The definition of the main variables we use in regression is as follows:

Labour input (L): We employ number of hired worker as labour input Therefore, we neglect working owner and other worker/ helper.

Wage rate (W): Wage rate is defined as the ratio of the total emolument to number of hired worker. Looking at the data set, total emolument is unavailable in almost all cases except a few firms. We drop the sample firms which do not employ haired labours as we are interested in labour demand response to wage rate. That is reason why we use hired labour as labour input in this paper.

Gross value added (GVA): We use gross value added which is available in the NSS survey.

Capital Stock (K): We use own fixed asset as capital stock. Fired fixed asset is also available in the NSS survey, but there is a lot of missing values. Due to the unreliability as statistics, we don't combine own fixed asset and fired one.

Then, we estimate the labour demand function of the form:

$$\begin{aligned}\ln L_{jis} = {} & \alpha_{1ji} + \alpha_{2js} + \beta_1 \ln W_{jis} + \beta_2 \ln GVA_{jis} + \beta_3 \ln K_{jis} \\ & + \gamma JSRindex_{js} + \mu_1(\ lnW_{jis})(JSRindex_{js}) \\ & + \mu_2(\ln GVA_{jis})(JSRindex_{js}) + \mu_3(\ln K_{jis})(JSRindex_{js}) + e_{jis}\end{aligned}$$

where α_{1ji} is industry fixed effect and α_{2js} is state fixed effect. It is noted that we are unable to use the JSR dummy since NSS survey has cross section data set in 1999 without time series.

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[Table 13]

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In Table 13, we present the results of output constrained model. Column(1) shows that wage and output variables are negative and positive respectively and both are statistically significant. The state-level JSR index is negative but insignificant. In Column (2) we include interaction of JSR index with wage and output. The wage and output remain the same as Column (1). The interactions of JSR index with the wage and output are positive and negative respectively and statistically significant. It implies that job security regulation restrains the labour market flexibility. The JSR index turns out to be positive and significant. In summary, job security regulation in organized sector stimulates the labour demand in informal sector. However, it depresses not only organized but also informal labour market flexibility.

In column (3), (4) and (5) we include state fixed effect and industry fixed effect. Specification is different each other just only in terms of classification level of industry. We find roughly same pattern as column (2). However, not magnitude but significant level of interaction with wage varies according to specification. Interaction of the JSR index with wage can be regarded not to be robust in output constrain model. Interestingly, the size of the coefficient of output in informal sector is seen to be much higher than in organized sector. This implies labour demand in informal sector is more sensitive to

output fluctuation comparing to organized sector.

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[Table 14]

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Table 14 shows the results of capital constrain model, which is regarded as superior model to output constrain model as capital market imperfection is common phenomena in Indian context. Column (1) shows all variables are statistically significant and have expected sign in despite of excluding interaction of JSR index, the state fixed effect and the industry fixed effect. In Column (2), (3), (4) and (5), we find the same pattern as follows: First, wage is negative, of which size ranges from minus 0.37 to minus 0.34 and its interaction of JSR index is positive, of which size does from plus 0.04 to plus 0.08. Both variables are significant. Second, output is positive, ranging from plus 0.67 to plus 0.68 and the interaction is negative ranging from minus 0.13 to minus 0.10. Both are statistically significant. Third, capital is positive and significant, but its size is relatively small e.g. plus 0.03 to plus 0.04. The interaction of JSR dummy is exceptionally insignificant. Fourth, JSR index is negative and statistically significant. We confirm again that job security regulation in organized sector contributes the shift from organized sector to informal sector as labour absorber and makes informal labour market inflexible in the sense of decline in wage and output elasticity of labour demand.

5 Concluding Remarks

We provide the new estimate of the labour demand function in the textile and apparel industries by using data from CSO's *Annual Survey of Industries* and NSSO's *Informal Non-Agricultural Enterprises*. We find as follows; First, job security regulation in organized sector depresses the labour demand in organized sector. However, it increases employment in informal sector. The job security regulation contributes to displace employment in organized sector for employment in informal sector. Second, job security regulation makes not only organized but also informal labour market less flexible. It reduces wage and output elasticity of labour demand. Third, adjustment cost hypothesis are justified as lagged dependent variable is positive and statistically significant in estimated equations. Forth, while labour demand in organized sector is more strongly linked to movement of capital stock, employment in informal sector is more sensitive to output fluctuation. This is interesting fact-finding in this paper.

Finally, I take notes of the problems in this paper and future research subjecst as follows:

(1) We treat only hired workers in the case of informal sector. This may raise sample selection problem. We can employ, for example, Tobit in order to deal with this problem.

(2) We do not try to treat the endogeneity of the explanatory variables in labour demand function of informal sector. Instrumental variable approach can be usefull.

(3) We do not use other important variables affecting the determinants of labour demand, e.g. trade union's power, frequency of industrial dispute, import tariff, infrastructures, and so on. These variables may well be used. Moreover, NSSO's survey has rich information about firm's activity. We should utilized it.

(4) We can fill gap between CSO's *ASI* and NSSO's *Informal Non-Agricultural Enterprises* by using

the data from NSSO's *Unorganised Manufacturing Enterprises Survey*. Moreover, we can download the 3-digit industry data at state level of *ASI* from Circon Capital Market web site. Now, we are preparing to use the 3-digit data of state level.

(5) Theory on a firm's demand for labours must be improved by taking account of the character of Indian textile and apparel industries.

6 Appendix

We can see the solution of a first order linear differential equation in a textbook for mathematics. Let its differential equation be $\dot{x} = bx + \phi(t)$, then the solution is as follows:

$$x = e^{bt}[H(t) - H(0) + \bar{x}]$$

where $H(t) = \int \phi(t)e^{-bt}dt$ and $\bar{x} = x(0)$. We substitute $x = \lambda,\ b = r,\ \phi(t) = -(F' - w)$ into above formula. Taking care of the endpoints of the interval, we get easily following two equations:

$$\lambda_t e^{-rt} = H_t - H_0 + \lambda_0 = \int_{s=0}^{t} -(F'_s - w)e^{-rs}ds + H_0 + \lambda_0$$
$$\lambda_T e^{-rT} = H_T - H_0 + \lambda_0 = \int_{s=0}^{T} -(F'_s - w)e^{-rs}ds + H_0 + \lambda_0$$

Subtracting the second equation from the first equation and setting $T \to \infty$ yields

$$\begin{aligned}\lambda_t e^{-rt} - \lim_{T\to\infty} \lambda_T e^{-rT} &= \int_{s=0}^{t} -(F'_s - w)e^{-rs}ds - \int_{s=0}^{\infty} -(F'_s - w)e^{-rs}ds \\ &= \int_{s=t}^{\infty} (F'_s - w)e^{-rs}ds\end{aligned}$$

Substitute the transversality condition $\lim_{T\to\infty} \lambda_T e^{-rT} = 0$ into this equation, finally we get

$$\begin{aligned}\lambda_t e^{-rt} &= \int_{s=t}^{\infty} (F'_s - w)e^{-rs}ds \\ \lambda_t &= \int_{s=t}^{\infty} (F'_s - w)e^{-r(s-t)}ds\end{aligned}$$

as seen in our text.

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