Trade Liberalization and Labor's Slice of the Pie: Evidence from Indian Firms*

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Abstract

In this paper we examine the impact of major trade reforms initiated in 1991 on the relative welfare of workers in India. In particular, we evaluate the effect of trade reforms on the share of wages in total revenue among a sample of firms. Theoretically, trade reform will affect workers' shares in output by reducing the price-cost markups charged by firms as well as the bargaining power of workers. We develop a simple model that suggests that these changes can have ambiguous effects on the share of wages in total revenue. The model predicts that the net effect of trade reform will depend on the factor intensity of a given firm. Using firm-level data from India, our empirical results suggest that, on average, trade liberalization led to an increase in the share of wages in total revenue for small, labor-intensive firms but a reduction in this share in the case of larger, less labor-intensive firms. These results include time effects that control for macroeconomic factors that are potentially correlated with changes in wage shares. We also find that trade reforms, on average, led to a decline in the bargaining power of workers in firms across all size categories.

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1. Introduction

As explained by Rodrik (1997) and later Slaughter (2001), trade increases the own-price elasticity of demand for labor (its absolute value). This is due to the fact that trade makes it easier for firms and consumers to substitute the services of domestic workers with those of foreign workers (Rodrik, 1997). Rodrik further argues that a more elastic labor demand leads to a reduction in the bargaining power of workers, again precisely because their services become more substitutable. There are two kinds of empirical evidence on the effect of trade on bargaining power. The first kind relies on an indirect approach that examines the effect of trade on labor-demand elasticities, which is then used to infer the effect of trade on bargaining power. The evidence here is somewhat inconclusive. The first study on this question was by Slaughter (2001) who found very mixed evidence using four-digit industry-level data from the US. This was followed by a study using plant-level data from Turkey by Krishna, Mitra and Chinoy (2001) who found no statistically significant effect of trade reforms on labor-demand elasticities. However, Hasan, Mitra and Ramaswamy (2007), using two-digit industry-level data at the state level from India found evidence in support of the Rodrik hypothesis about the impact of trade on labor-demand elasticities. They also find that the impact of trade reform on labor demand elasticities is stronger for states with more flexible labor markets.[1] If one takes the relationship between labor-demand elasticities and the bargaining power of workers argued by Rodrik as a given, then it follows that bargaining power of workers in India went down as a result of trade liberalization.

There are also more formal and direct tests of the effect of trade on the bargaining power of workers. For example, Brock and Dobbelaerre (2006) use an efficient Nash bargaining approach in which a union and a firm bargain over wage and employment. Using Belgian firm-level data, they estimate an industry-specific measure of bargaining power for each of the industries in their sample. They then regress these bargaining power estimates on trade related variables. Their results do not indicate a

[1] See also the very interesting paper by Senses (2010) that shows, using US plant-level data, that offshoring has increased the conditional demand elasticity of production workers.

significant negative relationship between trade and the bargaining power of workers. Similarly, Arbache (2004) uses data from Brazil during their period of trade liberalization in the 1990s, and finds that there is no significant effect of trade on bargaining power. On the other hand, Dumont, Raype and Willeme (2006) use data from five EU countries and conclude that trade liberalization does lead to a decline in the bargaining power of workers.

The existing literature thus leads us to ask the following questions: how important, if at all, is the bargaining power reducing effect of trade liberalization in a developing country? If this effect exists, does it imply that workers will get a smaller slice of the overall pie? Do other channels offset this effect and make trade liberalization good for workers? One such channel is the Stolper-Samuelson effect, which implies that trade liberalization will benefit an economy's abundant factor, which is labor in the case of a labor-abundant, developing country. However, this is a general equilibrium effect that works at the aggregate level. At the more micro level, the increased competition due to trade liberalization implies that firms will lose some or all of their monopoly power. This will result in a decrease in their price-cost markups. While lower tariffs could weaken the bargaining power of workers and thereby lower their share in rents or profits, the markup channel (in which lower tariffs decrease the supernormal profits of domestic firms) can be another important force. In fact, this effect could go in a different direction than the bargaining power effect. To see this, consider the fact that while the markup reduction leads to a decrease in the wedge between the marginal revenue product (MRP) and the value of the marginal product (VMP), it also reduces rents (as a share of output) that are shared by the firm and workers' union. Thus, while the reduction in the VMP-MRP wedge directly increases the share of workers' wages (the part of a worker's wage that is a function of his/her marginal product) in total revenue, the reduction in overall rents as a proportion of output leads to a decline in the workers' share in output (this being the part of a worker's wage that arises out of rent sharing). This result, combined with the change in bargaining power, produces an overall effect that is theoretically ambiguous.

In this paper, we address this ambiguity by empirically examining the impact of major trade reforms initiated in 1991 on the relative welfare of workers in India. In particular, we evaluate the effect

of trade reforms on the share of wages in total output among a sample of Indian firms.[2] This sample covers all firms registered with the Bombay Stock Exchange. Our empirical results indicate the presence of significant firm-level heterogeneity. For example, we find that while the share of wages in total revenue increased after trade liberalization for small firms, larger firms experienced a reduction in this share. The regressions showing these results include time effects that control for macroeconomic factors that are correlated with the changes in wages shares. We consider the identification of this robust, heterogeneous effect of trade reforms on labor's share in output to be a key contribution of this paper. We also specifically look at the relationship between the bargaining power of workers and tariffs. As mentioned earlier, on the whole, the literature on the direct relationship between trade liberalization and bargaining power is inconclusive. After controlling for time effects we find that trade liberalization led to a decline in the bargaining power of workers in firms across all size categories. Thus, our results provide fairly strong and robust evidence supporting the Rodrik hypothesis regarding the impact of trade on the bargaining power of workers.

These results, in combination with the changes in the wage share, suggest that the bargaining power reducing effect of trade reforms, together with the reduction in rents available for bargaining, is dominant in the case of large and less labor-intensive firms, while the direct markup effect on the MRP paid is dominant in the case of small, labor-intensive firms. The reason for this is that the effect of trade reforms on labor share through the "direct" markup effect is increasing in the elasticity of output with respect to labor. Note that this elasticity is a measure of the labor intensity of a firm. It can be shown theoretically (and it is fairly intuitive) that firms that are more labor-intensive (usually relatively small firms), holding other things constant, have a larger proportion of the share of labor income in output that comes about through the payment of their marginal revenue product relative to what comes from rent

[2] It needs to be mentioned in this context that a rough test was carried out by Hasan, Mitra and Ramaswamy (2007). Using industry-level data from India, they find that the wage bill as a share of output was 21% lower in the period post reform, while the wage bill as a share of value added was 19% lower in the period after 1991. Since their work was based on industry-level data, it is difficult to use their results to disentangle firm-level reactions to trade reform from compositional effects based on changes in the distribution of firms. Finally, their paper could not look specifically at bargaining power effects and also did not look at the effect of trade policy on wage share after controlling for time effects. The investigation on labor demand elasticities in that paper, however, had time controls.

sharing. Given that the marginal revenue product increases and gets closer to the value of the marginal product as the markup goes down, the overall effect of trade liberalization is to increase the share of wages in total revenue for small, labor-intensive firms.

While we clearly see the need for social protection that is underscored by our empirical results, the negative impact of trade on bargaining power may not always be a bad thing. In fact, this could be one of the channels through which trade might reduce unemployment. In addition, given the low levels of labor productivity in India, a decline in the bargaining power of labor might realign incentives in a way in which greater effort is rewarded. This can be productivity enhancing and can ultimately lead to an increase in wages. Besides, in the context of India's rapid growth in this current phase of liberalized trade, a declining share of an expanding pie might still mean a growth in the absolute size of the slice going to workers. In addition, given that the wage share has been going up in the relatively smaller firms, overall wage inequality could actually be declining.[3]

The remainder of the paper is structured as follows. Section 2 takes a preliminary look at the data and provides a theoretical model that highlights how the factor intensity, and hence the size of a firm, can lead to heterogeneous effects of trade liberalization on the share of wages in total revenue. Section 3 discusses the empirical strategy used to test the predictions of the model. It also describes a procedure that uses the model introduced in Section 2 to back out estimates for bargaining power at the industry level. Section 4 describes the data, Section 5 presents the results, and Section 6 conducts several robustness checks. Section 7 examines the impact of trade liberalization on bargaining power using the industry-level bargaining power estimates. Finally, Section 8 provides a conclusion.

[3] Kumar and Mishra (2008), using National Sample Survey labor force data, have shown that trade reforms in India have led to a decline in wage inequality. The results are different for Mexico and Columbia, however. Feenstra and Hanson (1997a, b), using state-level, two-digit data for Mexico for the period 1975-88, find that wage inequality has gone up as a result of trade, specifically input trade. Attanasio, Goldberg and Pavcnik (2003) find an increase in wage inequality after the trade reforms in Colombia. The effect, however, is small in magnitude. Finally, Blom, Goldberg, Pavcnik and Schady (2004) find no significant impact of trade liberalization on wage inequality in Brazil. See Goldberg and Pavcnik (2007) for a very comprehensive and in-depth survey of work on the impact of trade on inequality.

2. Background and Motivating Theory

2.1 A Preliminary Look at the Data

Faced with an acute fiscal crisis in 1991, the newly elected government in India approached the International Monetary Fund (IMF) for assistance. The IMF agreed to provide loans under the condition that major economic reforms be undertaken. While these reforms were very broad, one key component was a reduction of tariff levels and their dispersion. Figure 1 illustrates the dramatic nature of the tariff reduction around 1991. The average tariffs fell from 152.1% in 1990 to 44.1% in 1996 and eventually to 23.2% in 2003. In addition, the standard deviation of tariffs fell from 33.2 percentage points in 1990 to 12.9 in 2003.

How have workers in India fared during this period of trade liberalization? Figure 2 graphs the changes in the share of wages in total revenue during the period 1988-2003. These shares are aggregated from firm-level data and are described in greater detail in Section 4.1. The middle line in Figure 2 represents the average change in the wage share over this period. As the graph demonstrates, the average share of wages in total revenue declined immediately after trade liberalization in 1991, but returned to its previous levels by the end of the sample period. Thus, in the long run, there appears to be very little change in the average share of wages in total revenue. This corresponds to some of the empirical work in this area that finds little or no evidence of trade liberalization hurting the bargaining power of workers (Krishna, Mitra, and Chinoy, 2001; Brock and Dobbelaere, 2006; Dreher and Gaston, 2007).[4]

As Figure 2 also illustrates, the trend in the average share of wages in total revenue masks a great deal of heterogeneity in the data. For example, the top line in the graph suggests that the share of wages in total revenue increased rapidly among smaller firms in the sample. Similarly, the bottom line in Figure 2 indicates that the share of wages in total revenue declined among the larger firms in the sample. Thus, the

[4] This is by no means the consensus. For example, Dumont, Rayp, and Wileme (2006), Hasan, Mitra, and Ramaswamy (2007), and Krishna and Senses (2009) suggest that trade liberalization has a significant effect on bargaining power, labor demand elasticities, and income risk respectively.

behavior of smaller, more labor-intensive firms appears to be drastically different than that of larger, less labor-intensive firms.[5] This finding also holds when we examine changes in the share of wages in value added (Figure 3). The goal of this paper is to explore this heterogeneity and examine whether the impact of trade liberalization varies depending on the labor intensity and the size of the firm. The next section describes a simple model that highlights an explanation for this heterogeneity within a simple bargaining framework.

2.2 Theory

The model in this section is an extension of Brock and Dobbelaere (2006). We build on their framework by allowing all inputs of production to be variable. In addition, we introduce imperfect competition in the product market by assuming that firms have some monopoly power. These changes allow us to highlight the important role that firm characteristics, such as size, market power etc. play in determining the impact of trade liberalization on the share of wages in total revenue.

We consider a setup in which a firm and a workers' union bargain over both wages w and employment N. We allow trade liberalization to affect this bargaining process in two ways. First, trade liberalization lowers the bargaining power of workers. This reflects the fact that trade makes it easier for firms and consumers to substitute the services of domestic workers with those of foreign workers (Rodrik, 1997; Dumont et al., 2006).[6] Second, trade liberalization reduces the supernormal profits or rents (as a share of output or sales) enjoyed by domestic firms and the price-cost markup **(**Levinsohn, 1993; Harrison, 1994; Krishna and Mitra, 1998**)**. While this reduces the rents (relative to sales) over which bargaining will occur, the added competition, by reducing the markup, shrinks the wedge between the marginal revenue product and the value of the marginal product. This increases the wage bill net of shared

[5] The assumption that smaller firms are, on average, more labor intensive is supported by the summary statistics in Table 1 and also by the coefficient for the small size indicator in all regressions.

[6] In Section 3.2 we explain how our framework can be used to back out bargaining power estimates at the industry level. We use these estimates to examine the relationship between trade liberalization and bargaining power. The results, which support our assumption that trade liberalization lowers bargaining power, are reported in Section 7.

rents (as a proportion of output). Thus trade liberalization unleashes different forces, going in different directions, on the share of wages in total revenue. Our model helps us explore these different forces both theoretically and empirically.

Consider a representative firm with the following production function:

$$Q = F(N, v) \tag{1}$$

where N is firm's employment of labor and v is the row vector of all other factor inputs. This production function is assumed to be constant returns to scale and thus it exhibits diminishing marginal product of labor. The firm's utility function is:

$$\pi(w, N, v) = PQ - wN - vp_v \tag{2}$$

where w is the wage paid by the firm, p_v is the column vector of prices of other factor inputs and P is the output price, which depends on Q as the firm is assumed to have market power.

There is also a risk-neutral labor union with the following utility function:

$$U = Nw + (\bar{N} - N)w_a \tag{3}$$

where $\bar{N}$ is union membership and w_a is alternative or outside wage.

The firm and union bargain and in the process set wage w and employment N. We start by assuming that the other factor inputs are fixed and then later relax this assumption. If negotiations fail, every union member secures outside employment at the alternative or outside wage. On the other hand, the firm ends up paying just the fixed factors but does not produce any output.

In the case where the other factor inputs are fixed, the generalized Nash bargaining can be written as follows:

$$Max_{w,N}(Nw + (\bar{N} - N)w_a - \bar{N}w_a)^{\beta}(PQ - wN)^{1-\beta}$$

where β is the bargaining power of workers. The first order condition with respect to w with a few manipulations gives us:

$$w = w_a + \frac{\beta}{1-\beta}\left[\frac{PQ - wN}{N}\right] \tag{4}$$

The first order condition with respect to N, with (4) substituted into it gives us:

$$w_a = MR.F_N \tag{5}$$

where MR is the marginal revenue and F_N is the marginal product of labor. Substituting (5) into (4) and rearranging yields the share of wages in total revenue as:

$$S^N = \frac{(1-\beta)\varepsilon_{Q,N}}{\mu} + \beta = \frac{\varepsilon_{Q,N}}{\mu} + \beta\left(1 - \frac{\varepsilon_{Q,N}}{\mu}\right) \tag{6}$$

where $\varepsilon_{Q,N}$ is the elasticity of output with respect to employment and μ is the price-marginal cost (or the price-marginal revenue) ratio. The latter is also known as the "markup" and is a measure of the monopoly power of the firm in the goods market. Note that $\frac{\varepsilon_{Q,N}}{\mu}$ is the elasticity of output with respect to labor deflated by the markup and represents the share of labor in output if each worker is paid only her marginal revenue product (which is the value of marginal product deflated by the markup). This is the share that workers will receive if they are not unionized. Let us call this the "non-unionized share." Unionization leads to an additional share given by $\beta\left(1 - \frac{\varepsilon_{Q,N}}{\mu}\right)$, which is nothing but a fraction β of the share of output that is not covered by the non-unionized wage share.

Taking $\varepsilon_{Q,N}$ to be a constant as is the case in a Cobb-Douglas production function, we have

$$\frac{\partial S^N}{\partial \beta} = 1 - \frac{\varepsilon_{Q,N}}{\mu} > 0, \frac{\partial S_N}{\partial \mu} = \frac{-(1-\beta)\varepsilon_{Q,N}}{\mu^2} < 0$$

The derivatives above illustrate the average relationship between bargaining power, markups, and the share of wages in total revenue.[7] It suggests that the decline in bargaining power due to trade liberalization will lead to a decrease in the share of wages in total revenue. It also indicates that the decline in markup after trade liberalization will increase the share of wages in total revenue. Thus, the

[7] The markup by itself is not a parameter of the model so that a purist might not perform a comparative static with respect to it. However, a comparative static can always certainly be performed with respect to a parameter that affects elasticity of demand at every level of output or with respect to the number of firms taken parametrically by any given firm. Both such parameters are potential determinants of the markup. Due to this reason and to keep things intuitive and simple (and the fact that this is primarily an empirical paper), we directly perform a comparative static with respect to the markup (which can be written purely and solely as a function of the firm's perceived elasticity of demand, in turn a function of the market demand elasticity and the number of firms).

overall effect is ambiguous. Note also that the first effect is decreasing in $\varepsilon_{Q,N}$ while the magnitude of the second effect is decreasing in it.

However, as discussed in the previous section, the relationship between trade liberalization and the share of wages in total revenue has been found in the data to vary with firm size and labor intensity. To help in our understanding of this relationship, we next modify our basic setup to allow the other inputs of production to vary. In this case, the Nash bargaining problem is the solution to the following:[8]

$$Max_{w,N,v}(Nw + (\bar{N} - N)w_a - \bar{N}w_a)^{\beta}(PQ - wN - vp_v)^{1-\beta}$$

Now, assuming that the markets for all other factors are perfectly competitive (the firm is a price taker in those markets), we will arrive at the following expression for the share of wages in total revenue:

$$S^N = \frac{(1-\beta)\varepsilon_{Q,N}}{\mu} + \beta\left[1 - \frac{(1-\varepsilon_{Q,N})}{\mu}\right] = \frac{\varepsilon_{Q,N}}{\mu} + \beta\left(1 - \frac{1}{\mu}\right) \quad (7)$$

Once again, note that $\frac{\varepsilon_{Q,N}}{\mu}$ is the "non-unionized share" for workers . Unionization leads to an additional share for workers, which is given by $\beta\left(1 - \frac{1}{\mu}\right)$. This is again a fraction β of the share of output that is not covered by the non-unionized wage share and the share of other factors of production. Note that the non-unionized wage share and the share of all other factors of production total up to $\frac{1}{\mu}$.

Equation (7) yields the following derivatives:

$$\frac{\partial S^N}{\partial \beta} = 1 - \frac{1}{\mu} > 0, \frac{\partial S_N}{\partial \mu} = \frac{-(\varepsilon_{Q,N} - \beta)}{\mu^2}$$

Notice that while the relationship between the bargaining power of workers and the share of wages in total revenue remains the same here as in the case where other inputs are fixed, the effect of

[8] While the firm and the union normally would negotiate on wages and employment of labor, one would not necessarily expect them to bargain over the employment of other factor inputs. However, the bargaining problem with all variable inputs, as it is written here, is equivalent to the case where one department of the firm negotiates with the union on wages and employment of labor and another department simultaneously makes decision on the quantities of other inputs to be employed. If bargaining with the union breaks down, then the firm does not place its order for other inputs (or alternatively, if the order is placed, we assume that it can be canceled). If bargaining is successful, the order is placed (or not canceled if placed). The other justification for this approach is that it is not uncommon for unions to participate in regular production decisions of firms.

markups on the share of wages is now uncertain. In particular, for firms that are sufficiently labor intensive (i.e. have $\varepsilon_{Q,N} > \beta$), we have $\frac{\partial S_N}{\partial \mu} < 0$),[9] which means lower markups will lead to a higher share of wages in total revenue. Alternatively, for firms with sufficiently low labor intensity (i.e. have $\varepsilon_{Q,N} < \beta$), we have $\frac{\partial S_N}{\partial \mu} > 0$, which means lower markups will lead to a lower share of wages in total revenue. This can be understood by looking at equation (7) more carefully. The non-unionized share, $\frac{\varepsilon_{Q,N}}{\mu}$, increases with a reduction in markup as the workers get paid closer to the value of their marginal product. On the other hand, all other factors or inputs also get paid closer to their marginal products. Note that $\frac{1}{\mu}$ represents the share of all factors in output including only labor's non-unionized share. The share of output over and above these factor shares is given by $\left(1 - \frac{1}{\mu}\right)$ and is available for bargaining between the firm and the union. This rent share goes down when the markup goes down. When the elasticity of output with respect to labor is small, the effect of markup on the non-unionized share is relatively small and is dominated by the effect of the markup on rent sharing. On the other hand, with high elasticity of output with respect to labor, the effect of markup on the non-unionized share is the dominant effect.

Thus, the overall share of wages in total revenue will increase in labor-intensive firms (which are expected and seen in our data to be the relatively small firms) with a decline in the markup and decrease with a decline in the bargaining power, making the impact of trade liberalization ambiguous in the case of such firms. In the case of large firms (that are less labor-intensive), the weight on the non-unionized share is smaller and for a given β and μ, labor rents are relatively more important. Given that $\beta\left(1 - \frac{1}{\mu}\right)$ is expected to fall with trade liberalization, we expect the overall share of labor to go down in firms with low labor intensity (which are relatively larger in size) after trade liberalization.

[9] The best way to see why $\varepsilon_{Q,N}$ is an indicator of labor intensity is with the help of a constant-returns-to-scale Cobb-Douglas production function. For a given wage-rental ratio, the labor intensity in production is increasing in the exponent of labor in the production function. This exponent is nothing but the elasticity of output with respect to labor.

The derivatives above of the labor share in output with respect to β and μ, combined with our assumptions regarding the effect of trade liberalization on the bargaining power of workers and the markup charged by firms (trade reduces firm markups and the bargaining power of workers), allow us to state the following hypotheses.[10]

Hypothesis 1: *Trade liberalization leads to a decline in the share of wages in total revenue for firms with sufficiently low labor intensity. Note that we expect this to be the case for large firms.*

Hypothesis 2: *Trade liberalization has an ambiguous effect on the share of wages in total revenue for firms that are labor-intensive. Note that we expect this to be the case for small firms.*

3. Estimation Strategy

To examine the effect of trade liberalization on the share of wages in output we will use the following specification:

$$S_{ijt}^{N} = \alpha + \beta_1 Tariff_{jt-1} + \beta_2 Large_{ijt} + \beta_3 Small_{ijt} + \beta_4 R\&D_{ijt} + \theta_i + \theta_t + \varepsilon_{ijt} \quad (8)$$

where *i* indexes firms, *j* indexes industries, *t* indexes time and S^N is the share of wages in total revenue. In alternate specifications, the latter is replaced by the share of wages in value added and the share of wages

[10] Heterogeneity in bargaining power and markups across size categories could strengthen, weaken or even overturn our theoretical predictions. Heterogeneity in bargaining power (where bargaining power is inversely related to firm size) can weaken or overturn our theoretical results by weakening the markup channel (relative to the bargaining power channel) for small firms and strengthening it for large firms, as it makes rent sharing relatively more important for the former and less important for the latter. On the other hand, heterogeneity in markups (where markups are increasing in firm size) can strengthen our results in that they make rent sharing (and bargaining) relatively more important for large firms (and less important for small firms). While we do not model these aspects, in our empirical work we allow for the heterogeneity in β and μ by controlling for both firm size and markups. In addition, we divide our sample based on an industry's labor intensity and unionization rate. In all such cases our results conform to the predictions of our model. Thus, even if the heterogeneity of β and μ is important, a straightforward implication of our empirical work is that the dominant form of heterogeneity that shows up in the trade and wage share relationship is the variation of labor intensity across firm size (supported by the positive relationship between markups and size). Lastly, heterogeneous responses of bargaining power and (inverse) markups to tariffs could affect our results. We examine this issue empirically and find no evidence to suggest that the bargaining power and markup responses to tariffs vary with firm size.

in total costs.[11] $Tariff_{jt-1}$ captures the level of protection placed on the final good in an industry, and is lagged by one period.[12] Given the results in the previous section, β_1 can be either positive or negative.

The remaining variables in equation (8) control for other factors that are likely to drive the bargaining power of workers. These factors include the size and the level of technology used by a firm. All else equal, we expect workers in firms that are larger and more technology intensive to have a weaker bargaining position. This should result in a lower share of wages in total revenue for these firms. We will control for firm size by using indicator variables for large and small firms. To create these indicators we first calculate the 33rd and 67th percentile of each industry's sales distribution over the entire sample period. This is done using the distribution of real firm sales (sales deflated by the wholesale price index). We then classify a firm as being $Large$ in any given year if its annual sales are above the 67th percentile constructed above. Similarly, we classify a firm as being $Small$ in any given year if its sales are below the 33rd constructed above. The variables $Large$ and $Small$ constructed in this way are our default size measures. The advantage of this definition is that the thresholds used to separate large and small firms are consistent and do not change over time in real terms. This, we believe, is the appropriate method of constructing size categories.

Nonetheless, to deal with the potential criticism that firm size is itself a function of tariffs, we also tried using three alternative size category measures. The first uses a time-invariant classification for firm size. Specifically, firms were classified as either large or small by comparing their average sales over the sample period with the 33rd and 67th percentiles constructed above. In this case, a firm's size classification will not change over time. Second, firms were classified as either large or small by comparing its sales at its year of entry with its industry's sales distribution during its initial year. Finally,

[11] We believe that the share of wages in output (total revenue) is the best dependent variable to use in our case since we also try to capture the effects that work through the substitutability between domestic labor and intermediate inputs (both imported and domestic) and those that work through markups. The drawback of using value added is that it nets out intermediate inputs while total costs do not capture markups.

[12] The use of one-year lagged tariffs is reasonable given that the impact of changes in trade policy on firm decision-making is unlikely to be instantaneous. The primary results in the paper are robust to the use of contemporaneous tariffs.

we also experimented with an approach where we allowed the 33rd and 67th percentile cutoffs to change annually. While this third alternative measure produces results that are very similar to the baseline, the problem with it is that both the firm size indicators and the thresholds are changing with time. As a result, we believe that this approach is less intuitive and have therefore excluded it from our analysis. All three of these alternative size classifications are a useful check to see whether the potential sensitivity of our default size measure to tariffs is distorting our results. We find no evidence for the existence of such a problem as our results are highly robust to using any of the above alternative size classifications.

After controlling for firm size as we do in our regressions, technological intensity is proxied by the natural logarithm of R&D expenditure by a given firm.[13] We also include firm fixed effects, θ_i, that control for the effect of time-invariant firm characteristics. In addition, we include time effects, θ_t, that capture the effect of macroeconomic variables. Finally, ε_{ijt} is the error term.[14]

As the analysis in the previous section suggests, the impact of trade reform on the share of wages in total revenue will depend on the size of a firm. To account for this differential effect, we interact $Tariff_{jt-1}$ in equation (8) with both firm size indicators, as follows:

$$S_{ijt}^{N} = \alpha + \gamma_1 Tariff_{jt-1} + \gamma_2 Tariff_{jt-1} * Large_{ijt} + \gamma_3 Tariff_{jt-1} * Small_{ijt} + \beta_2 Large_{ijt} + \beta_3 Small_{ijt} + \beta_4 R\&D_{ijt} + \theta_i + \theta_t + \vartheta_{ijt} \quad (9)$$

Given the predictions in Hypothesis 2, the sign of $\gamma_1 + \gamma_3$ is ambiguous. It will be positive if, in the case of small firms, the effect of tariff on wage share through its effect on bargaining power dominates and negative if its effect through its overall impact on the markup dominates. On the other hand, we expect $\gamma_1 + \gamma_2$ to be positive, which would indicate a decline in the share of wages in total revenue after trade reform for large, less labor-intensive firms.

[13] More precisely, we use ln(1 + R&D Expenditure) to account for the fact that a large fraction of firms report zero R&D expenditure in any given year.

[14] Note that industry and state indicators are time-invariant and are wiped out by the firm fixed effects.

3.1 Econometric Issues

One of the concerns with the specification used in this paper is the potential endogeneity of tariffs. For example, if tariffs are used to protect labor-intensive industries, then the estimated coefficient of tariffs will be biased. There are two main reasons why we do not expect the endogeneity of tariffs to be a primary concern in this paper. First, as explained in greater detail in Hasan, Mitra, and Ramaswamy (2007) and Krishna and Mitra (1998), the trade reform conducted in 1991 was done so under pressure from the International Monetary Fund (IMF) and was quite unexpected. Thus, these reforms can be considered exogenous to the firms in our sample. Second, as Figures 4 and 5 demonstrate, the decline in tariffs during the sample period was very similar across both the most protected and least protected industries.

Topalova and Khandelwal (2011) argue that while the immediate changes in tariffs after the 1991 reforms are exogenous, the same cannot be said of tariffs after 1997. This is because the government of India announced a new export-import policy in the Ninth Plan (1997-2002) during that year. They argue that the external pressure applied by the IMF in 1991 had abated by this time, and that the issue of potential endogeneity of tariffs became more pronounced. Note that this does not necessarily imply that tariffs are endogenous to the share of wages in total revenue. Nonetheless, we address this concern in several ways. First, we examine whether past wage shares in total revenue predict current tariffs. To do so, we calculate the average industry-level wage shares in total revenue, weighted by each firm's share of its industry's sales. We then regressed our measure of tariffs on the one-year lagged industry-level wage share as well as industry and year effects. The results do not support the notion that tariffs are driven by the share of wages in total revenue in a particular industry. Second, we follow Topalova and Khandelwal (2011) and restrict the sample to the period 1989-1997. The results remain qualitatively unchanged. In particular, we observe that the share of wages in total revenue is increasing in tariffs for larger firms and declining for smaller ones. However, the latter effect is not statistically significant.

Third, we address further concerns about the endogeneity of tariffs by adopting a variant of the instrumental variable (IV) strategy used by Goldberg and Pavcnik (2005). In particular, we first convert our baseline specification to first differences. This wipes out any time-invariant characteristic that is correlated with both the share of wages in revenue and output tariffs. We then instrument the *differenced* tariff term using 5-year lagged output tariffs. For the *differenced* interaction between output tariffs and firm size indicators, we use the interaction between 5-year lagged tariffs and the *differenced* firm size indicators.[15] For this IV strategy to be valid we need two primary assumptions to hold. First, we need current *differenced* output tariffs to be reasonably correlated with 5-year lagged output tariffs. This is ensured by the fact that one of the goals of the trade reform conducted in 1991 was to harmonize tariffs across industries in India. As a result, tariffs in an industry at any given point in time will be highly correlated with future *changes* in this industry's tariffs. Second, we need to assume that current *differences* in the error term are uncorrelated with 5-year lagged output tariffs. Given the time difference between the *differenced* error term and the instrument, we believe that the two are unlikely to be correlated.

3.2 The Bargaining Power of Workers

As described in detail in Section 2.2, our explanation for the heterogeneous impact of trade liberalization on the share of wages in revenue relies on two key linkages: (a) that trade liberalization lowers the bargaining power of workers, and (b) that trade liberalization lowers the markup charged by firms. While we believe that the latter relationship is widely and unambiguously supported in the empirical literature (see e.g. empirical studies by Levinsohn, 1993; Harrison, 1994; and Krishna and Mitra, 1998 on Turkey, Cote d'Ivoire and India respectively), there could be some doubt about the

[15] Since our firm size measures (in levels and first differences) are assumed to be exogenous to wage share (in both levels and first differences respectively), our second instrument is the interaction of the 5-year lagged tariffs (already introduced with a one-year lag) and first differenced size measure rather than the interaction between the 5-year lagged tariff and the 5-year lagged measure of size. We refrain from using the latter as an instrument to ensure that our IV strategy is consistent with the assumption that our firm size measures are exogenous in both levels and first differences. Recall that in the previous section we discussed the issue of whether the potential sensitivity of our default size measures to tariffs is distorting our results. We find no evidence for the existence of such a problem as our results are highly robust to using any of the alternative size classifications.

validity of the former. In this section we apply the framework introduced in Section 2.2 to determine how to examine the impact of trade liberalization on the bargaining power of workers using a two-stage process. In the first stage we estimate time-varying, industry-level bargaining power estimates for workers in each of the three size categories separately. We then regress our measures of bargaining power on output tariffs in the second stage.

Stage One:

From equation (7) we can express the share of wages in revenue for firm i in industry j, size category $k \in \{small, medium, large, all\}$ (where medium is the middle third of the size distribution and other size categories are as defined before) and at time t as follows:

$$S_{ijkt}^{N} = \beta_{jkt} + \gamma_{jkt} . \frac{1}{\mu_{ijkt}} \tag{10}$$

where $\gamma_{jkt} = \varepsilon_{jkt} - \beta_{jkt}$. The corresponding estimating equation is:

$$S_{ijkt}^{N} = \beta_{jkt} + \gamma_{jkt} . \frac{1}{\mu_{ijkt}} + \omega_{ijkt} \tag{10a}$$

where ω_{ijkt} is an error term. The coefficient of the constant in the above regression gives us the bargaining power of workers for firms in a given size category, industry and year. Note that, using firm-level data, a separate regression is run for each size category within an industry for each year in our sample period.

Stage Two:

In the second stage, we estimate the following equation for each size category separately:

$$\beta_{jkt} = \alpha_j + \theta_k \tau_{jt-1} + \vartheta_{jkt} \tag{11}$$

where β_{jkt} is the bargaining power of workers in industry j, size category k, and time t estimated in the first stage. τ_{jt-1} is one-period lagged output tariff and ϑ_{jkt} is an error term. θ_k thus represents the impact of trade liberalization on the bargaining power of workers belonging to firms in size category k.

4. Data

4.1 Firm-Level Data

The firm-level data used in the paper are from the Prowess database. This includes all publicly traded firms in India and is collected by the Center for Monitoring the Indian Economy (CMIE). These data have been used previously by Topalova and Khandelwal (2011), Goldberg, Khandelwal, Pavcnik, Topalova (2010), and Ahsan (2011). Together the firms in the sample comprise 60 to 70 percent of output in the organized industrial sector and 75 percent of all corporate taxes paid in India (Goldberg et al., 2010). The key advantage of this dataset is that it provides information on a panel of firms for the period 1988-2008. This allows us to examine behavioral changes due to the trade reform initiated in 1991. However, since the database consists of publicly traded firms, the data are not representative of small and informal Indian firms.

The Prowess database provides information on the total compensation to employees in a given firm. This figure includes salaries and wages as well as other compensation such as bonuses and contribution to pension funds. To calculate the share of wages in total revenue, total compensation to employees was divided by the sales reported for each firm. As the summary statistics in Table 1 demonstrate, the average firm pays 9% of its total revenue as compensation to workers. For large firms this number is 7.6% while for small firms the share of wages in total revenue is 11.4%. The latter number provides support for our assumption that smaller firms are, on average, more labor intensive. This difference between the two types of firms is robust to alternate definitions of labor intensity. For example, smaller firms have a 7.06 percentage points higher share of wages in value added and a 3.8 percentage points higher share of wages in total cost. Total cost is estimated by subtracting reported profits from sales.

4.2 Tariff Data

The data on output tariffs, covering the period 1988-2003, have been obtained from the Asian Development Bank (ADB) and are an extension of the data series used in Hasan, Mitra, and Ramaswamy (2007).[16] The original data are reported at the sector level and were converted to three-digit National Industrial Classification (NIC) industries.[17] As Figure 1 demonstrates, the average tariff level in India declined dramatically after the trade reforms were initiated in 1991. While the decline in tariffs is broadly qualitatively common across industries, there remains significant cross-industry variation, especially in the details. For example, Table 2 lists the ten most and ten least protected industries in the sample. This classification was made based on the average tariffs for each industry over the period 1988-2003. As the table shows, the difference in tariffs between the most protected industry (Manufacture of beverages) and the least protected industry (Manufacture of railway and tramway locomotives) is 64.75 percentage points.

To test the robustness of our results we will use several alternative measures of protection. The first is an indicator variable for trade liberalization that is one for any year after 1991 and zero otherwise. The second is a measure of the effective rate of protection (ERP), calculated at both the industry and firm level. This was done using the following formula:

$$ERP_i = Tariff - \frac{\alpha_i * Input\ Tariff}{(1-\alpha_i)}$$

where $\alpha_i = Cost\ of\ materials/Sales$ and $Input\ Tariff$ is the tariff placed on the inputs used by the representative firm in the industry.[18] For the industry-level measure of ERP, cost of materials and sales was replaced by their respective industry averages.

[16] We thank Rana Hasan at the ADB for providing us the protection data.

[17] The concordance table used for this conversion is available upon request.

[18] This was calculated using the 1993-1994 Indian Input-Output table.

To summarize, for our analysis, we will restrict our attention to the fifty-six three digit manufacturing industries available in the data. In addition, due to the use of lagged tariffs in the estimation equations, the final sample will cover the period 1989-2004. It will also include an unbalanced panel of 5,971 firms with a total of 40,925 observations. Complete summary statistics are provided in Table 1.

5. Results

5.1 Basic Results

In Table 3 we examine the relationship between the share of wages in total revenue and the level of protection in an industry. [19] From the analysis in Section 2.2 we know that the exact relationship is ambiguous and depends on whether the bargaining-power channel or the markup channel dominates. In column (1) we examine the basic relationship between output tariffs and the share of wages in total revenue. The point estimate suggests that a decline in tariff leads to a decrease in the share of wages in total revenue, although the result is statistically insignificant. In column (2) we include firm size indicators. The coefficient of output tariffs remains positive and insignificant. Column (2) also indicates that large firms pay a smaller share of sales as wages, whereas small firms tend to do the opposite. In column (3) we control for the technological intensity of each firm by including the natural logarithm of its R&D expenditure.[20] The coefficient for R&D suggests that firms that are more technologically advanced pay a smaller share of its sales as wages. This makes sense given that these firms are likely to be the least labor intensive. The inclusion of our R&D variable does not significantly alter the size of the coefficient of output tariff. In columns (4) and (5) we use the natural logarithm of each firm's fixed assets and total investment respectively to proxy for its technological intensity. Doing so does not significantly alter the coefficient of interest in either case. Thus, whatever impact of tariffs on labor share that we observe here

[19] Note that all regressions include firm and year effects and the standard errors are clustered at the three-digit industry level. The firm effects absorb the time-invariant industry and state effects.

[20] To account for firms that report zero annual R&D we add 1 rupee to each firm's reported R&D expenditure before taking logs.

does not seem to be driven by alternative channels such as responses of R&D spending or investment to trade liberalization. There could be a fair degree of heterogeneity in these responses due to the heterogeneity in firm productivity levels. In turn, productivity could be highly correlated with size (as well as export and import status). By adding these extra controls, we are controlling for the fact that trade might lead to the expansion of firms through possibly greater investment and R&D spending. Our results with respect to tariffs are not very different even with these controls in place. We will later use a similar strategy when we look for differential (heterogeneous) responses of firms based on firm size (that proxies for factor intensity).

Firms in the sample vary along many dimensions apart from its size. To account for this we control for other observable firm characteristics in column (6). These include the natural logarithm of each firm's age as well as its export and import status. Controlling for these other characteristics raises the point estimate for output tariffs, although it remains statistically insignificant. Finally, in column (7) we weight the regression by each firm's average sales to get a sense of the impact of output tariffs on the overall labor share in output for the sample of firms as a whole. The coefficient for output tariffs remains positive and insignificant, although the magnitude of the estimate is considerably smaller. To summarize, the results in Table 3 suggest that trade liberalization in the form of lower output tariffs has no statistically meaningful impact on the share of wages in revenue for firms in this sample. Nonetheless, it is important to keep in mind that this average effect likely masks considerable heterogeneity in the data. In particular, we expect the impact of trade liberalization on the share of wages in total revenue to vary significantly based on the size of the firm.

The above hypothesis is based on the analysis in Section 2.2 where we demonstrate theoretically that the effect of trade liberalization on labor's share in output operates through different channels. There is a bargaining power channel in which lower tariffs weaken the bargaining power of workers and thereby lowers their share in rents or profits. There is also a markup channel in which lower tariffs increases the level of competition faced by domestic firms and hence decreases their supernormal profits. While this reduces the wedge between the marginal revenue product (MRP) and the value of the marginal product

(VMP), it also reduces rents (as a share of output) that are shared by the firm and workers' union. As explained in the theory section, the first more "direct" effect on the MRP paid through the change in markups is stronger than the second effect (the effect on rents available for sharing) for relatively labor-intensive firms, which are generally relatively small in size. This is because the reduction in the VMP-MRP wedge (i.e. the non-unionized share) is proportional to the elasticity of output with respect to employment.

In Table 4 we examine the differential effect of trade liberalization by estimating equation (9). In particular, in column (1) we interact tariffs with a time-varying indicator for firm size. To construct these indicators we first calculated the 33rd and 67th percentile of each industry's sales distribution over the entire sample period. We then classified a firm as large in any given year if its annual sales were above the 67th percentile constructed above. Similarly, firms are classified as small in any given year if its annual sales were below the 33rd percentile constructed above. Importantly, if a firm either expanded or contracted from one year to another its classification was allowed to change.[21] The coefficients suggest that trade liberalization leads to an increase in the share of wages in total revenue for small firms with elasticity of this share with respect to tariff, evaluated at the mean, of -0.03. It also leads to a decrease in the share of wages for large firms with this elasticity, evaluated at the mean, of 0.09. In other words, the "direct" markup channel dominates for small firms while the combined impact through the bargaining power and the markup channels leads to a decline in the share of wages in total revenue for large firms.

In column (2) we test the robustness of the above finding by using a time-invariant classification for firm size.[22] Specifically, firms were classified as either large or small by comparing their average sales with the sample distribution of firm sales in their industry over the period 1988-2003. In this case, a firm's size classification will not change over time. The results confirm the previous conclusion that trade

[21] Some of our alternative size measures are used to check whether this creates any kind of a bias in our results. See the econometric methodology section for detailed arguments in this regard.

[22] The various indicators for firm size are highly correlated with each other, with correlation coefficients ranging from 0.61 to 0.82.

liberalization leads to an increase in the share of wages in total revenue for small firms and to a decrease in the share of wages for large firms. The elasticities at the mean are -0.04 and 0.08 respectively.

In column (3) we introduce a third method of classifying firm size. In this case, firms were classified as either large or small by comparing its sales at its year of entry with its industry's sales distribution during its initial year. To ensure that this time-invariant size classification is meaningful we restrict the sample here to those firms that do not switch classifications during the sample period. The results once again support the previous conclusion. Finally, to address the question of how small a firm has to be to see an increase in the share of wages in revenue after trade liberalization, we replace our size indicators with a percentile rank of sales for every firm in column (4). In other words we assign each firm a rank that specifies a firm's position in the distribution of sales within the sample. The results suggest that firms that are below (above) the 48^{th} percentile will see an increase (decrease) in their share of wages in total revenue after trade liberalization.[23]

While the results thus far are consistent with the predictions of our model we next examine whether our two channels (bargaining power and markup) are operating in the manner we described in Section 2.2. This is complicated by the fact that bargaining power is unobservable and difficult to proxy with data. However, we can control for the markup channel and examine whether the residual effect of trade liberalization on the share of wages in revenue is consistent with the predictions based on the bargaining power channel. To implement this we first define markup as the ratio of sales to total cost. For a given level of output, this ratio represents P/AC, where P is price and AC represents average cost. Note that AC is a good proxy for marginal cost, MC, for reasonably large firms with constant MC. Since the firms in the sample are the relatively larger firms in India (even though there is substantial heterogeneity in size even within this sample), replacing MC with AC will yield a reasonable approximation of the markup.

[23] With a more representative sample of firms the median will be an even smaller firm. Therefore, such a firm should have a negative relationship between tariff and the share with the effect likely being larger in magnitude than what we find in our CMIE firm-level data.

In column (5) of Table 4 we add the natural logarithm of markup along with its interaction with the firm size indicators.[24] These three variables control for the markup channel and the differential effect of changes in the markup on large and small firms. Thus, once we control for the markup channel, the residual effect of trade liberalization on the share of wages in revenue operates through the bargaining power channel. Based on our discussion in Section 2.2 we expect that through the bargaining power channel trade liberalization will lead to a decrease in the share of wages in revenue for all firms. In other words, the combined coefficient of output tariffs and output tariffs interacted with firm size should be positive for all types of firms. This is exactly the result we observe in column (5). In column (6) we examine the robustness of the previous result by adding a fourth-order polynomial in the natural logarithm of markup. The results are consistent with the previous finding.

The results in columns (5) and (6) confirm that the bargaining power channel is operating in a manner consistent with our earlier predictions. Moreover, the interaction between the natural logarithm of markup and the firm size indicators indicates that lower markups raise the share of wages in revenue for small firms and lower the share of wages in revenue for large firms. This is also entirely consistent with the predictions in Section 2.2.

5.2 Alternate Sources of Heterogeneity

Apart from differences in size, firms in the sample differ along several other dimensions, e.g. R&D expenditure, investment, and export and import status. Thus, the differential effect of trade liberalization on the share of wages in revenue can be operating through any of these other channels. To

[24] There could be concerns that the markup is potentially endogenous and can lead to a simultaneity bias in our estimation. We, however, take the view that the markup is really a function of the firm's monopoly power or its perceived elasticity of demand. This perceived elasticity is just a function of the overall market elasticity of demand (at the industry level) and the number of competing firms, both of which are exogenous to the firm (see for instance Helpman and Krugman, 1989). We believe that the perceived elasticity of demand varies with the tariff through the latter's effect on the number of foreign firms entering the domestic market. How the market-demand elasticity varies with output or price depends entirely upon the functional form of demand (which itself could vary in a non-systematic way across industries and even over time). Thus, given that the markup is ultimately determined by factors that are exogenous to the firm and is not the choice variable of the firm in its optimization problem (the firm chooses either price or quantity), we do not believe that the endogeneity of markups is a first-order concern in the context of our exercise.

account for these alternate sources of heterogeneity we interact these firm characteristics with output tariffs and add these interaction terms along with each of these characteristics themselves (i.e., both level and tariff interaction terms in these characteristics) sequentially to our baseline specification. . Thus, through these regressions, we try to control for alternative stories. For example, the impact of tariffs here on labor share we see could possibly be due to the differential firm responses of R&D spending or investment to trade liberalization. These differential responses could be based on heterogeneous productivity levels of these firms. Firm productivity heterogeneity could in turn manifest in heterogeneity in export and import status and how much these firms invest and how they spend on R&D. Thus, by adding these extra controls, we are controlling for the fact that trade might lead to the relative expansion of the more productive firms through possibly greater investment and R&D spending, as well as the fact that firms respond differently to tariffs based on their productivity, which we also capture using R&D, investment, export and import status etc (in interaction with tariffs).

The results, with alternative sources of heterogeneity as controls, are listed in Table 5. In column (1) we add an interaction between the natural logarithm of R&D expenditure and output tariffs. The interaction term is positive and significant, which suggests that the wage share reducing effect of trade liberalization is stronger for firms with higher R&D expenditure. More importantly, the inclusion of this additional interaction term does not affect our coefficients of interest. In column (2) we add an interaction between the natural logarithm of investment and output tariffs. Once again the coefficients of interest remain largely unaffected. Next, in columns (3) and (4) we add an interaction between output tariffs and export and import status respectively. In both cases our main results remain robust. Finally, in column (5) we weight the regression by each firm's average sales to get a sense of the differential impact of output tariffs for the average-sized firm in the sample. The coefficients of the interaction terms of interest maintain the correct sign and are in fact larger in magnitude. The sign of the overall effects, given by the sum of the tariff coefficient and the coefficient of the interaction of the tariff with the respective size variable, are also unchanged (relative to the OLS results) for large as well as small firms. Thus, to summarize, in Table 5 we have allowed output tariffs to have differential effects on the share of wages in

revenue through channels other than firm size. Even after doing so, we have found that our earlier results remain fairly robust. Thus, while these other channels may be important sources of heterogeneity, they do not diminish the role played by differences in firm size.

5.3 The Role of Industry Characteristics

Recall from Section 2.2 that the effect of trade liberalization on the share of wages in revenue depend on the labor intensity of a firm ($\varepsilon_{Q,N}$) and the bargaining power of workers (β). In particular, if $\varepsilon_{Q,N}$ is low relative to β we expect that trade liberalization will lead to a decline in the share of wages. Similarly, if $\varepsilon_{Q,N}$ is high relative to β we expect that trade liberalization will lead to an increase in the share of wages. We examine this issue in Table 6 by classifying firms as belonging to either high or low labor intensity industries ($\varepsilon_{Q,N}$) and also by classifying firms as belonging to high or low unionization industries (β). We determine the labor intensity of an industry using pre-1991 industry-level data from the Annual Survey of Industries (ASI). In particular, we use these data to calculate the share of wages in output at the three-digit National Industrial Classification (NIC) level.[25] Industries that had a share of wages in output above the sample median were classified as high labor intensity industries, while the remaining industries were classified as low labor intensity industries. Similarly, we determine the unionization rate of an industry using household-level data from the 50th Round of the National Sample Surveys (1993-1994). These household-level surveys asked currently employed individuals whether they belonged to a union. We used these data to derive the fraction of employed individuals in each industry that belonged to a union (unionization rate). We then classified industries that had a unionization rate above the sample median as high unionization industries, while the remaining industries were classified as low unionization industries.

In columns (1) and (2) of Table 6 we examine the overall effect of output tariffs on the share of wages in revenue for both high and low labor intensity industries. While the results are imprecise, we find

[25] The results are essentially identical when we use the share of wages in total costs instead. Total costs are calculated by subtracting profits from sales.

that trade liberalization leads to a higher (lower) share of wages in revenue for high (low) labor-intensity industries. This matches the predictions mentioned in the previous paragraph. Interestingly, extending our theoretical predictions further, we should observe that for small firms the impact of trade liberalization (as measured by the sum of the coefficients of the tariff and its interaction with size) is more strongly wage share increasing in high labor intensity industries. Similarly, for large firms, the wage share reducing effect of trade liberalization should be relatively muted in high labor intensity industries.[26] To examine this we add the interaction between output tariffs and firm size indicators in columns (3) and (4). The overall effect of output tariffs is more strongly wage share increasing for small firms in high labor intensity industries compared to small firms in low labor intensity industries. In addition, the wage share reducing effect of trade liberalization is smaller for large firms in high labor intensity industries relative to large firms in low labor intensity industries.

We next divide the firms further based on both its industry's labor intensity as well as its unionization rate. In particular, column (5) restricts the sample to industries that have above median labor intensity ($\varepsilon_{Q,N}$) and below median unionization (β). Thus, in column (5) we're isolating firms that likely have a high $\varepsilon_{Q,N}$ relative to β. Similarly, in column (6) we restrict the sample to industries that have below median labor intensity ($\varepsilon_{Q,N}$) and above median unionization (β), i.e. we're isolating firms that likely have a low $\varepsilon_{Q,N}$ relative to β. The coefficient of output tariffs in both cases match what we would expect given the discussion above. Finally, in columns (7) and (8) we add the interaction between output tariffs and firm size indicators.[27] The relative difference between trade liberalization impacts for large and small firms is consistent with both our earlier discussion and with what we find in columns (3) and (4).[28]

[26] We thank an anonymous referee for suggesting these additional checks.

[27] Note that by focusing on industries with high labor shares and low unionization rates and with low labor shares and high unionization rates, we are eliminating industries whose labor shares are explained by labor's bargaining power (as proxied by unionization). Thus, in these columns we are truly focusing on industries that have high and low labor intensity relative to bargaining power.

[28] In results not reported here, we experimented with a specification in which we interacted tariffs with a measure of the labor market flexibility in each state. The labor market flexibility measure is from Hasan et al. (2007). The

Lastly, we divide our sample based on our estimates of each industries value of γ_j, where $\gamma_j = \varepsilon_j - \beta_j$ for each industry j. We estimate a value of γ for each size category and industry in the sample using pre-1991 data and the method described in section 3.2. We then averaged across all size categories within an industry to construct γ_j. Columns (9) and (10) restricts the sample to firms in industries that have above and below median values of γ_j respectively. While the results are imprecise, we find that trade liberalization leads to a higher (lower) share of wages in revenue for high (low) γ_j industries. Next, in columns (11) and (12) we add the interactions between output tariffs and firm size indicators. The results suggest that the overall effect of output tariffs is more strongly wage share increasing for small firms in high γ_j industries compared to small firms in low γ_j industries. In addition, the wage share reducing effect of trade liberalization is smaller for large firms in high γ_j industries relative to large firms in low γ_j industries.[29]

The results thus far highlight a robust, heterogeneous relationship between trade liberalization and the share of wages in revenue. While we believe that the channels identified in our model in Section 2 are strongly supported by our empirical analysis, alternative explanations are possible. We addressed these alternate explanations in Table 5 by allowing the effect of tariffs to have differential effects on the share of wages in revenue through other channels. Our primary results remained robust. Next, in Table 6, we tested our model further by splitting the sample by industry labor intensity and the extent of unionization. We demonstrated that the results in the various sub samples conform to our model's predictions. Thus, we have empirically investigated all other possible explanations for the regularities we have found in the data regarding the relationship between trade liberalization and the share of wages in revenue, and how this relationship varies by firm size. While we have explored the other possible channels that one can think of, we want to emphasize that we also view unearthing this strong empirical

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negative coefficient on the interaction term, while imprecisely estimated, suggests that the reduction in the share of wages in total revenue after trade liberalization is smaller in states with more pro-worker labor market regulations.

[29] We've also divided the sample based on whether an industry has positive or negative γ_j. The results are very similar to those presented in columns (9) - (12).

regularity in itself as one of the main contributions of the paper. In addition, towards the end of the paper we investigate the link between bargaining power and tariffs, where the bargaining power is econometrically estimated using an equation derived from our theory. As will be seen, these bargaining power results further strengthen our belief in the channels we presented at the outset.

6. Robustness Checks

6.1 Endogeneity of Tariffs and Alternate Specifications

Up to this point we have assumed that the effect of output tariffs on the share of wages in revenue is exogenous. While this assumption is reasonable during the initial years after the trade reforms of 1991, it is potentially problematic during the latter years of the sample when the external pressure imposed by the IMF had abated (Topalova and Khandelwal, 2011).[30] To address this concern we adopt a variant of the instrumental variable (IV) strategy used by Goldberg and Pavcnik (2005). In particular, we first convert our baseline specification to first differences. This wipes out any time-invariant characteristic that is correlated with both the share of wages in revenue and output tariffs. We then instrument the *differenced* tariff term using 5-year lagged output tariffs. For the *differenced* interaction between output tariffs and firm size indicators, we use the interaction between 5-year lagged tariffs and the *differenced* firm size indicators. We believe that the 5-year lagged tariffs provide considerable time difference between the differenced error term of our regression and our instruments, a feature good for the validity of these instruments.

For this IV strategy to be valid we need two primary assumptions to hold. First, we need current *differenced* output tariffs to be reasonably correlated with 5-year lagged output tariffs. This is ensured by the fact that one of the goals of the trade reform conducted in 1991 was to harmonize tariffs across industries in India. As a result, tariffs in an industry at any given point in time will be highly correlated with future *changes* in this industry's tariffs. Second, we need to assume that current *differences* in the

[30] Note that while output tariffs may be driven by political economy concerns in the latter periods of the sample, it still need not be a function of the share of wages in revenue.

error term are uncorrelated with 5-year lagged output tariffs. Given the time difference between the *differenced* error term and the instrument we believe that the two are unlikely to be correlated.

The results of the IV regressions are reported in column (1) of Table 7. Both interaction terms of interest are consistent with the OLS results and remain statistically significant. A criticism of this IV strategy is that it does not control for the fact that firms may face differential time trends that are potentially correlated with the instrument. To address this we follow Park, Yang, Shi, and Jiang (2010) and add time trends interacted with initial firm characteristics. These characteristics include the natural logarithm of R&D expenditure, export status, import status, and an indicator for foreign ownership in each firm's initial year in the sample. The results with the differential time trends, as reported in column (2), are very similar to the baseline IV results in column (1). Finally, we further test the robustness of the IV results by simultaneously including *differenced* interactions between output tariffs and the natural logarithm of R&D expenditure, export status, and import status respectively. Each of these additional variables is instrumented by the interaction between 5-year lagged tariffs and the *differenced* variable itself. The results, as reported in column (3), are consistent with the findings presented in the previous tables.

Finally, in columns (4) – (6) we experiment with alternate specifications by using three, five, and seven-year differences. By taking differences over a relatively long period, we allow firms to have considerable time to adjust their labor employment decisions. In addition, long-difference estimators tend to be less sensitive to measurement error (Griliches and Hausman, 1986). The results in all three columns confirm that the impact of trade liberalization on the share of wages in total revenue depends on the size of the firm. In particular, the share of wages in total revenue increases after trade liberalization among smaller firms, while it decreases for larger firms. Also, the longer the time horizon considered, the larger are the magnitudes of the effects of trade liberalization on the share of the wage in total revenue, i.e., with time the effects are magnified. Thus, the central finding in this paper is robust to the use of these alternate specifications.

6.2 Alternate Measures of Wage Share & Protection

In columns (1) and (2) of Table 8 we examine the robustness of our previous findings by using alternate measures of wage share as the dependent variable. In column (1) we divide the wage bill by value added instead of sales. The results in these columns are consistent with previous findings. Similarly, in column (2) we divide the wage bill by total cost. The latter is calculated by subtracting reported profits from sales. Once again the results are broadly consistent with our earlier findings, although the coefficient for the interaction between output tariffs and the small size indicator is no longer statistically significant.

Next, in columns (3) – (6) of Table 8 we experiment with alternate measures of protection. In particular, in column (3) we use an indicator variable for trade liberalization that is 1 for any year after 1991 and 0 otherwise. The point estimates suggest that the share of wages in total revenue decreased after trade liberalization for large relative to small and medium firms. In column (4) we drop the level effect of trade liberalization and replace it with year effects. The results are similar to the findings in column (3).

Finally, in columns (5) and (6) we measure protection using the effective rate of protection (ERP) calculated at both the firm and industry level respectively. The exact procedure used to calculate these is outlined in Section 4.2. The coefficients in both cases confirm that trade liberalization leads to an increase in the share of wages in total revenue for small firms and to a decrease in the share of wages for large firms.

7. The Impact of Trade Liberalization on the Bargaining Power of Workers

We begin this section by first examining the bargaining power of workers in the average firm in each industry. To do so, we run a slightly modified version of equation (10a) by industry, the modification being that there is a single equation per industry over the entire sample period (with the intercept and slope coefficient not allowed to vary across years). In other words, we pool all firm-level

observations within an industry across size categories and time.. The bargaining power estimates, which are listed in Table 9, are positive for all industries and range from 0.02 to 0.09.[31]

The estimates in Table 9 give us a sense of the bargaining power of workers in the average firm in each industry. However, they do not provide any information on whether bargaining power varies by size category or how bargaining power has evolved over time. We address this issue in Table 10. In columns (1) and (2) we estimate equation (11) where the dependent variable is the bargaining power of workers for all firms in the sample in industry j and time t. These bargaining power measures are estimated by running the regression given by equation (10a) separately for each size category of firms within each industry at each point in time. The coefficient of output tariffs suggest that trade liberalization leads to a decline in bargaining power of workers. This result is robust to the inclusion of industry fixed effects in column (2). The result is also in line with the findings of Dumont et al. (2006) who examine the impact of international trade on union bargaining power for five EU countries. In columns (3) and (4) we use the bargaining power of workers in large firms in industry j and time t as the dependent variable. The coefficient of output tariffs is once again positive and significant. In columns (5) and (6) we use the bargaining power of workers in medium-sized firms in industry j and time t as the dependent variable. With the inclusion of industry effects, the coefficient of output tariffs is once again positive, though somewhat less precise, with the significance level a little above 10 percent (between 10 and 15 percent). Finally, in columns (7) and (8) we use the bargaining power of workers in small firms in industry j and time t as the dependent variable. The results are qualitatively similar to the case of other firms.

To further examine whether the impact of trade liberalization on bargaining power depends on the size category of firms, we next "stack" our bargaining power estimates. In other words, for each industry-year pair, we create three observations: (a) a bargaining power estimate for large firms, (b) a bargaining power estimate for medium firms, and (c) a bargaining power estimate for small firms. We then regress

[31] Due to small sample sizes in some industries we were forced to merge industries together. For example, in the first row of Table 9 we combined "Food and Beverage" and "Tobacco" together to form one industry. Similarly, all other industry names that are separated by commas indicate a merged industry. The sample size issue is especially important when we try to estimate equation (10a) by size category, industry, and year.

these bargaining power estimates on output tariffs, size indicators, and year effects. In addition in columns (10) and (12) we also include industry effects. The results in columns (9) and (10) confirm the earlier finding that trade liberalization decreases the bargaining power of workers. In columns (11) and (12) we interact output tariffs with all three firm size indicators (i.e. excluding the tariff term by itself) to examine whether the effect of trade liberalization on bargaining power depends on the size category of firms. For all three size categories, the interaction term in positive and significant, both in the presence as well as the absence of industry effects. Moreover, we cannot reject the null that the impact of trade liberalization on bargaining power is the same for firms in all three size categories.

To summarize, the results in Table 10 suggests that trade liberalization is associated with a decline in bargaining power for firms in all size categories. It also demonstrates that the relationship between trade liberalization and bargaining power does not vary by size category. Thus, these results strongly support our assumption regarding the relationship between trade liberalization and bargaining power in Section 2.2.

8. Conclusion

In this paper, we examine the impact of major trade reforms initiated in 1991 on the welfare of workers in India. In particular, we evaluate the effect of trade reform on the share of wages in total revenue among a sample of firms. We hypothesize that trade liberalization will affect the payments received by workers in two ways. First, trade liberalization lowers the bargaining power of workers. This reflects the fact that trade makes it easier for firms and consumers to substitute the services of domestic workers with those of foreign workers (Rodrik, 1997 and Dumont et al., 2006). Second, trade liberalization reduces the supernormal profits or rents (as a share of output) enjoyed by domestic firms and leads to a decline in their price-cost markup **(**Levinsohn, 1993; Harrison, 1994; Krishna and Mitra, 1998**)**. This reduces the rents over which bargaining will occur. The lower markups also reduce the wedge between the marginal revenue product and the value of marginal product of factor inputs. These two markup-related channels have opposite effects on the share of wages in total revenue. The overall

effect depends on the labor intensity of the firms. Our paper empirically examines the net effects of these alternative channels with special focus on the bargaining-power channel. We also look at the importance of firm size and labor intensity in this context.

Our data provide information on a panel of publicly traded firms in India, and allow us to examine behavioral changes due to trade liberalization. While there have been studies on the impact of trade liberalization on labor demand elasticities (Slaughter, 2001; Krishna, Mitra, and Chinoy, 2001; Hasan et al., 2007), much less work has been done on how trade liberalization affects the bargaining position of workers. We fill this gap in the literature by examining whether trade liberalization leads to changes in the share of wages in total revenue at the firm level. We also provide evidence that directly relates trade liberalization with the bargaining strength of workers.

Our results indicate that, on average, trade liberalization led to an increase in the share of wages in total revenue for small firms, while larger firms lowered their share of wages in total revenue. While we have explained our results above in terms of the two markup effects (one on the marginal revenue product and the other on the size of rents) and the bargaining power effect, we have either eliminated or controlled for all other explanations for these heterogeneous effects that we could think of.

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Figure 1: Trends in Tariff in India over the Period 1988-2003.

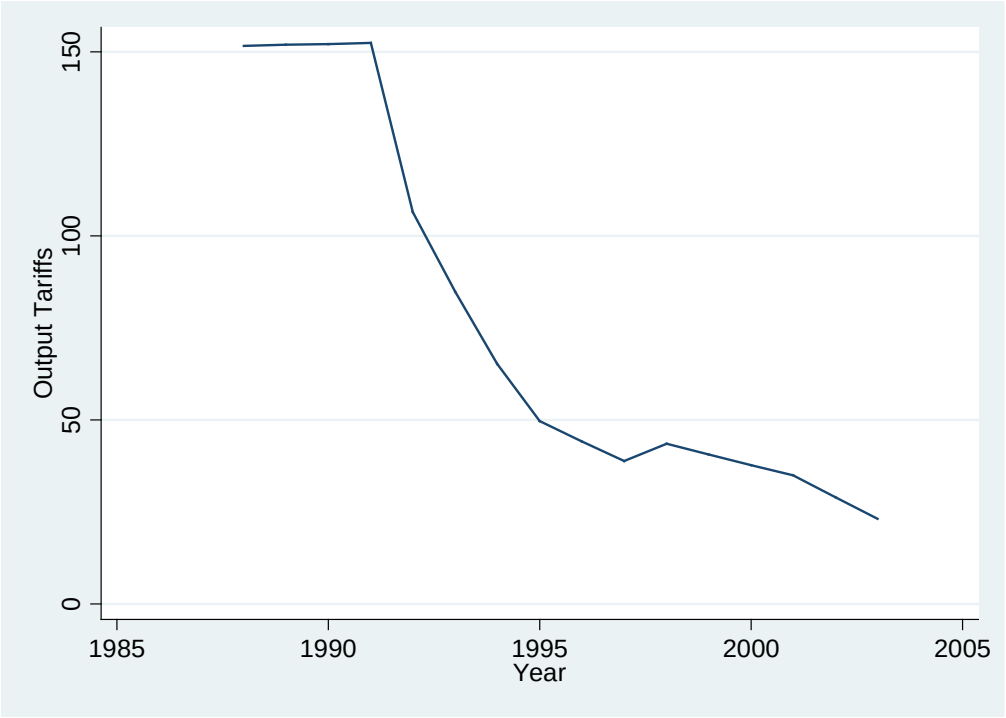

Figure 2: Changes in the Share of Wages in Total Revenue in India over the Period 1988-2003. Large firms are firms with sales above the 67th percentile of the sample sales distribution. Small firms are firms below the 33rd percentile of the sample sales distribution.

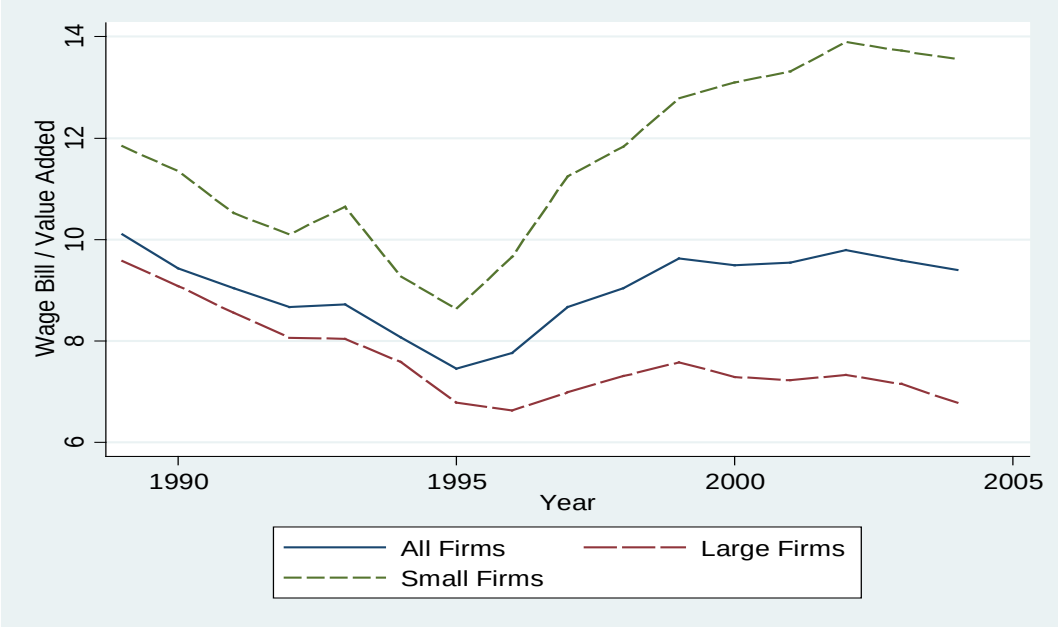

Figure 3: Changes in the Share of Wages in Value Added in India over the Period 1988-2003. See the caption on Figure 1 for the definition of large and small firms.

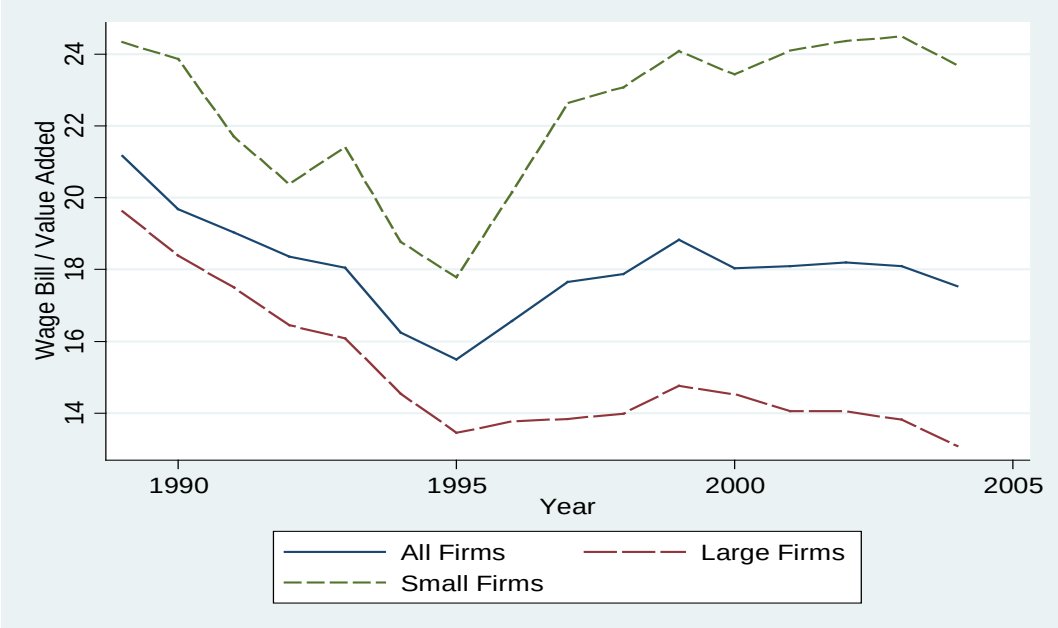

Figure 4: Trends in Tariff for the Most Protected Industries in 1988

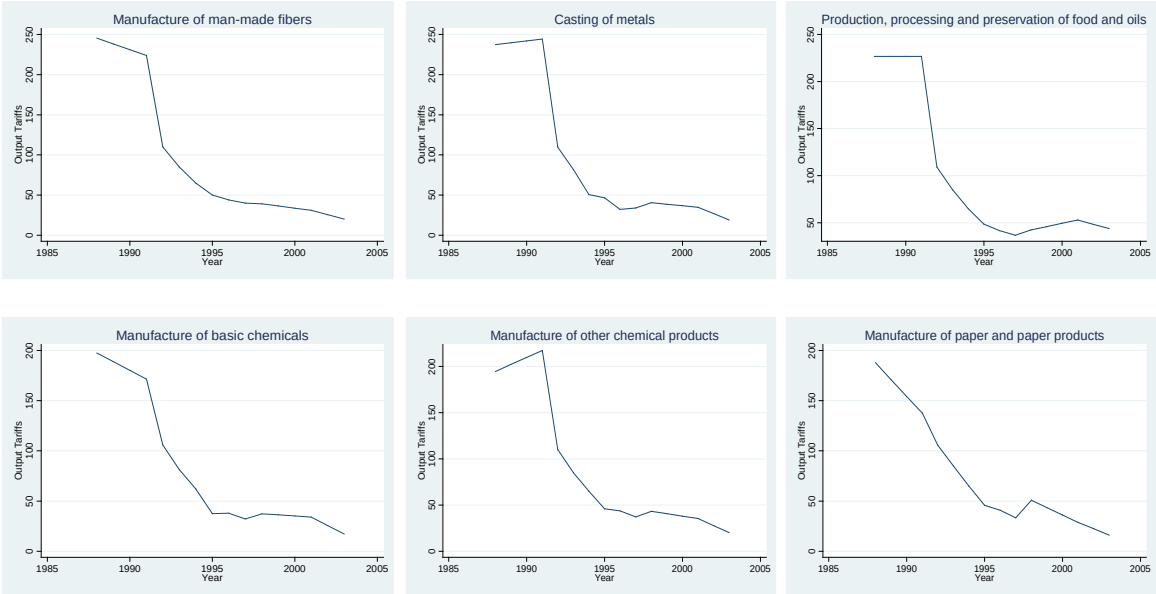

Figure 5: Trends in Tariff for the Least Protected Industries in 1988

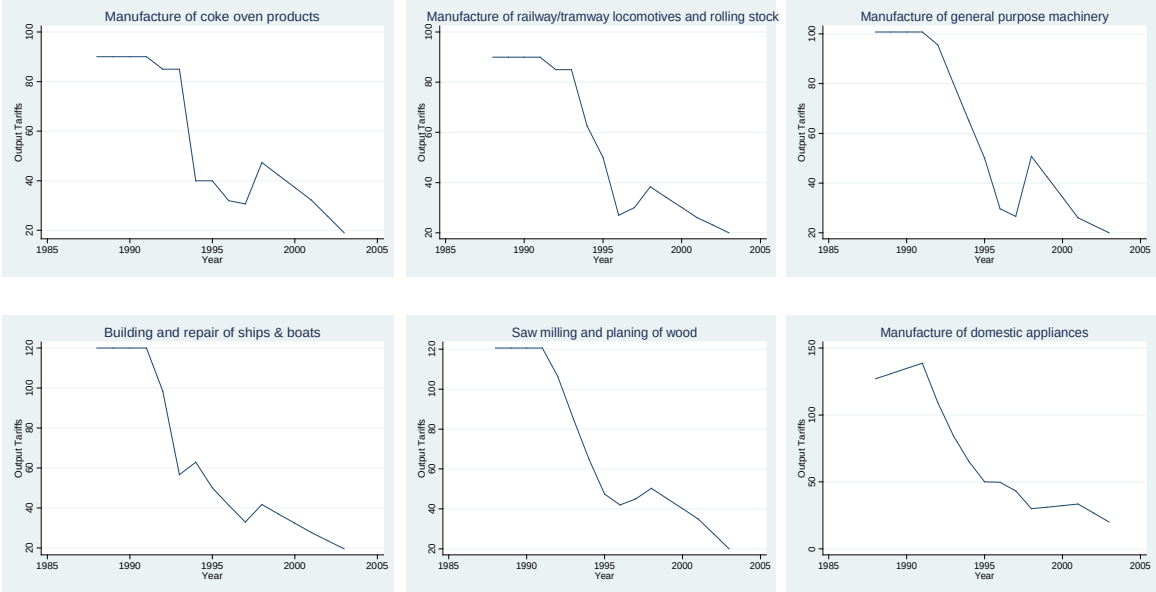

Table 1
Summary Statistics

	All Firms	Large Firms	Small Firms
Wage Bill / Sales	8.98	7.61	11.38
	[9.33]	[6.46]	[12.25]
Wage Bill / Value Added	17.82	14.92	21.98
	[14.99]	[11.62]	[18.25]
Wage Bill / Total Costs	9.04	8.10	10.91
	[22.37]	[30.74]	[22.36]
R&D Expenditure	0.33	0.92	0.01
	[3.33]	[5.73]	[0.44]
Output Tariff	0.64	0.68	0.57
	[0.49]	[0.51]	[0.40]
Effective Rate of Protection	0.70	0.73	0.62
Firm (ERP - Firm)	[0.74]	[0.74]	[0.71]
Effective Rate of Protection	0.67	0.71	0.60
Industry (ERP - Industry)	[0.57]	[0.62]	[0.48]

Notes: Large firms are ones whose annual sales are above the 67th percentile of its industry's sales distribution over the entire sample period. Small firms are ones whose annual sales are below the 33rd percentile of its industry's sales distribution over the entire sample period. ERP - Firm represents the effective rate of protection calculated using firm-level data. ERP-Industry was calculated using industry-level data. The construction of both measures is described in Section 4.2. All monetary values are in crores of Rupees. 1 crore equals 10 million. The exchange rate is roughly US $1 = 45 Rupees.

Table 2
Tariff Variation Across Industries

The Ten Most Protected Industries			The Ten Least Protected Industries		
Industry Code	Industry Name	Average Output Tariff	Industry Code	Industry Name	Average Output Tariff
155	Manufacture of beverages	119.20	352	Manufacture of railway/tramway locomotives	54.45
151	Production, processing and preservation of food and oils	98.44	231	Manufacture of coke oven products	54.77
243	Manufacture of man-made fibers	94.90	291	Manufacture of general purpose machinery	59.15
273	Casting of metals	94.69	351	Building and repair of ships & boats	62.75
242	Manufacture of other chemical products	88.53	221	Publishing	63.61
252	Manufacture of plastic products	82.61	311	Manufacture of electric motors, generators and transformers	65.58
241	Manufacture of basic chemicals	80.03	201	Saw milling and planting of wood	68.22
160	Manufacture of tobacco products	77.79	293	Manufacture of domestic appliances	69.18
210	Manufacture of paper and paper product	76.53	191	Tanning and dressing of leather	69.57
181	Manufacture of wearing apparel	76.35	172	Manufacture of other textiles	70.83

Firms are designated as most or least protected based on their average output tariff for the period 1988-2003.

Table 3
Basic Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				OLS			WLS
Output Tariffs	0.67	0.71	0.68	0.68	0.66	0.79	0.16
	(0.725)	(0.649)	(0.642)	(0.650)	(0.727)	(0.680)	(0.517)
Indicator for Large Firms		-2.36***	-2.35***	-2.27***	-2.42***	-2.33***	
		(0.206)	(0.204)	(0.194)	(0.232)	(0.212)	
Indicator for Small Firms		3.39***	3.40***	3.34***	3.55***	3.35***	
		(0.250)	(0.249)	(0.245)	(0.240)	(0.253)	
Log of R&D Expenditure			-0.53***			-0.47***	-0.29***
			(0.138)			(0.146)	(0.091)
Log of Fixed Assets				-0.24**			
				(0.115)			
Log of Investment					-0.32***		
					(0.036)		
Constant	7.05***	6.09***	6.06***	6.73***	10.53***	3.44**	5.55***
	(1.312)	(1.209)	(1.218)	(1.216)	(0.141)	(1.402)	(0.891)
Other Firm Controls	No	No	No	No	Yes	No	No
Observations	40,925	40,925	40,925	40,925	34,964	40,376	40,925
R-squared	0.064	0.129	0.130	0.129	0.146	0.134	0.041

Notes: Dependent variable is wage bill / sales. Output tariffs are lagged by one period. See notes on Table 1 for details on the construction of the large and small firm indicators. In column (6) the other firm controls are exporter and importer status indicators and the log of firm age. In column (7) the regression is weighted by each firm's average sales during the sample period. All regressions include firm and year effects. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 4
Interaction With Firm Size Indicators

	(1)	(2)	(3)	(4)	(5)	(6)
Type of Size Indicators Used	Default	Average	Initial	-	Default	
Output Tariffs	0.49	0.37	1.18	-2.06***	0.53	0.51
	(0.654)	(0.740)	(1.347)	(0.741)	(0.661)	(0.677)
Output Tariffs * Large	0.84***	0.81***	0.58		0.61***	0.60***
	(0.140)	(0.143)	(0.367)		(0.136)	(0.134)
Output Tariffs * Small	-0.94***	-0.99***	-1.49***		-0.40	-0.36
	(0.274)	(0.281)	(0.549)		(0.261)	(0.229)
Indicator for Large Firms	-2.89***				-2.44***	-2.29***
	(0.242)				(0.229)	(0.229)
Indicator for Small Firms	4.07***				2.86***	2.64***
	(0.332)				(0.326)	(0.295)
Log of R&D Expenditure	-0.32**	-0.39***	-0.34*	-0.07	-0.21	-0.18
	(0.144)	(0.143)	(0.202)	(0.194)	(0.134)	(0.132)
Output Tariffs * Percentile Rank				4.25***		
				(0.550)		
Percentile Rank				-16.25***		
				(1.308)		
Ln(Markup)					-6.14***	-6.30***
					(0.722)	(0.733)
Ln(Markup) * Large Firms					2.72***	1.21*
					(1.006)	(0.720)
Ln(Markup) * Small Firms					-2.80***	-2.41***
					(0.723)	(0.666)
Critical Percentile Rank	-	-	-	0.48	-	-
Fourth-Order Polynomial in Ln(Markup)	-	-	-	-	No	Yes
Observations	40,925	40,925	16,835	40,925	40,925	40,925
R-squared	0.134	0.069	0.064	0.186	0.248	0.270

Notes: Dependent variable is wage bill / sales. Output tariffs are lagged by one period. See notes on Table 1 for details on the construction of the large and small firm indicators. Average size indicators are constructed by using a firm's average sales for the sample period and designating it as large if its average sales are above the 67th percentile of the industry's sales distribution and small if its average sales are below the 33rd percentile of the industry's sales distribution. Initial firm size indicators are constructed by using a firm's sales in its year of entry and designating it as large if its initial sales are above the 67th percentile of the industry's sales distribution during that year and designating it as small if its initial sales are below the 33rd percentile of the industry's sales distribution during that year. Column (3) restricts the sample to firms that do not change out of their initial size classification. Markup is the ratio of a firm's sales and its total costs. All regressions include firm and year effects and a constant. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5
Alternate Sources of Heterogeneity

	(1)	(2)	(3)	(4)	(5)
			OLS		WLS
Output Tariffs	0.48	0.20	0.44	0.35	-0.80*
	(0.652)	(0.732)	(0.701)	(0.569)	(0.463)
Output Tariffs * Large	0.81***	0.67***	0.84***	0.82***	1.26***
	(0.142)	(0.163)	(0.159)	(0.148)	(0.287)
Output Tariffs * Small	-0.93***	-0.90***	-0.93***	-0.87***	-1.58***
	(0.274)	(0.294)	(0.258)	(0.283)	(0.503)
Indicator for Large Firms	-2.87***	-2.82***	-2.85***	-2.81***	-3.08***
	(0.240)	(0.252)	(0.252)	(0.236)	(0.442)
Indicator for Small Firms	4.07***	4.09***	4.02***	3.94***	4.50***
	(0.330)	(0.293)	(0.329)	(0.324)	(0.601)
Log of R&D Expenditure	-0.50**		-0.32**	-0.32**	-0.27***
	(0.227)		(0.149)	(0.140)	(0.859)
Output Tariffs * Log of	0.42*				
R&D Expenditure	(0.214)				
Log of Investment		0.19**			
		(0.075)			
Output Tariffs * Log of		-0.41***			
Investment		(0.062)			
Export Indicator (= 1 if Firm			0.07		
Exports)			(0.196)		
Output Tariffs * Export			-0.41***		
Indicator			(0.150)		
Import Indicator (= 1 if Firm				0.22	
Imports)				(0.200)	
Output Tariffs * Import				-0.93***	
Indicator				(0.177)	
Observations	40,925	34,964	40,925	40,925	40,925
R-squared	0.134	0.151	0.135	0.137	0.105

Notes: Dependent variable is wage bill / sales. Output tariffs are lagged by one period. See notes on Table 1 for details on the construction of the large and small firm indicators. In column (5) the regression is weighted by each firm's average sales during the sample period. All regressions include firm and year effects and a constant. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6
The Role of Industry Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	High Labor Intensity Industries (High ε)	Low Labor Intensity Industries (Low ε)	High Labor Intensity Industries (High ε)	Low Labor Intensity Industries (Low ε)	High Labor Intensity & Low Unionization (ε > β)	Low Labor Intensity & High Unionization (ε < β)	High Labor Intensity & Low Unionization (ε > β)	Low Labor Intensity & High Unionization (ε < β)	High γ	Low γ	High γ	Low γ
Output Tariffs	-0.64	1.10	-0.91	0.93	-1.31	0.43	-1.48	0.11	-0.62	1.20	-0.87	0.98
	(0.606)	(0.921)	(0.609)	(0.938)	(0.973)	(0.358)	(1.103)	(0.287)	(0.603)	(0.939)	(0.578)	(0.960)
Output Tariffs * Large			1.09***	0.73***			0.68	0.95***			1.01***	0.77***
			(0.302)	(0.163)			(0.393)	(0.153)			(0.212)	(0.182)
Output Tariffs * Small			-1.73***	-0.59**			-1.85***	-0.39			-1.64***	-0.64*
			(0.322)	(0.286)			(0.429)	(0.376)			(0.372)	(0.306)
Constant	9.55***	4.27**	9.79***	4.29**	10.19***	5.05***	10.43***	5.16***	8.91***	4.53**	9.08***	4.63**
	(1.186)	(1.754)	(1.153)	(1.790)	(1.771)	(0.572)	(1.862)	(0.577)	(1.172)	(1.803)	(1.128)	(1.842)
Overall Effect for Large Firms			0.18	1.66			-0.80	1.06			0.14	1.75
Overall Effect for Small Firms			-2.64	0.34			-3.33	-0.28			-2.51	0.34
Observations	16,429	24,496	16,429	24,496	10,486	13,989	10,486	13,989	17,849	22,480	17,849	22,480
R-squared	0.152	0.117	0.161	0.120	0.135	0.112	0.143	0.117	0.163	0.109	0.169	0.113

Notes: Dependent variable is wage bill / sales. Output tariffs are lagged by one period. See notes on Table 1 for details on the construction of the large and small firm indicators. ε is the elasticity of output with respect to labor while β is the bargaining power of workers. Industries are classified as high or low labor intensive based on pre-1991 industry-level data from the Annual Survey of Industries. The industry-level unionization measure is calculated using household-level data from the 50th Round of the National Sample Surveys (1993-1994). γ is defined as (ε - β) and is estimated using the procedure described in Section 3.2 of the paper using pre-1991 data. In all three cases an industry is classified as High (Low) if its value for labor intensity/unionization/γ is above (below) the sample median. All regressions include indicators for large and small firms, the natural logarithm of R&D expenses for each firm, and firm and year effects. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7
Endogeneity of Tariffs and Alternate Specifications

	(1)	(2)	(3)	(4)	(5)	(6)
	1 Year Difference (IV)			3 Year Difference	5 Year Difference	7 Year Difference
Δ(Output Tariffs)	0.01	-0.04	-0.16	0.10	0.23	0.47
	(1.044)	(1.007)	(1.117)	(0.447)	(0.657)	(0.561)
Δ(Output Tariffs * Large)	1.29***	1.29***	1.28***	0.55***	0.78***	0.96***
	(0.434)	(0.432)	(0.435)	(0.148)	(0.175)	(0.214)
Δ(Output Tariffs * Small)	-1.84***	-1.90***	-1.84***	-0.47*	-0.85**	-1.50***
	(0.402)	(0.415)	(0.397)	(0.272)	(0.400)	(0.372)
Δ(Indicator for Large Firms)	-2.16***	-2.16***	-2.13***	-2.23***	-2.51***	-2.76***
	(0.306)	(0.304)	(0.305)	(0.233)	(0.242)	(0.276)
Δ(Indicator for Small Firms)	3.37***	3.39***	3.34***	3.19***	3.88***	4.48***
	(0.290)	(0.292)	(0.287)	(0.286)	(0.444)	(0.450)
Δ(Log of R&D Expenditure)	-0.04	-0.04	-0.15	-0.11	-0.15	-0.24*
	(0.068)	(0.064)	(0.200)	(0.084)	(0.127)	(0.137)
Constant	0.06	-0.33	0.46	0.69***	1.26***	1.85***
	(0.274)	(0.279)	(0.702)	(0.206)	(0.412)	(0.516)
Initial Firm Controls X Time Effects	No	Yes	No	No	No	No
Other Firm Controls X Output Tariffs	No	No	Yes	No	No	No
Observations	29,350	29,340	29,350	21,766	14,412	9,293
R-squared	0.040	0.042	0.041	0.083	0.112	0.141

Notes: Dependent variable is wage bill / sales. Output tariffs are lagged by one period. See the notes on Table 1 for details on the construction of the large and small firm indicators. In columns (1) - (3) the differenced tariff term is instrumented using five-year lagged output tariffs. The first-differenced interactions between tariffs and the firm size indicators are instrumented using the interactions between five-year lagged tariffs and the differenced firm size indicators. Initial firm controls include each firm's log of R&D expenses, export status, and import status in their first year in the sample. Other firm controls include contemporaneous export status and import status. All regressions include year effects. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 8

Alternate Measures of Wage Share and Protection

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Wage Bill / Value Added	Wage Bill / Total Costs	Wage Bill / Sales			
Trade Protection Measure Used	Output Tariffs		Liberalization Indicator (= 1 if Year > 1991)		ERP Firm	ERP Industry
Trade Protection	0.77	0.02	1.40***		0.01	0.17
	(0.609)	(0.432)	(0.250)		(0.103)	(0.286)
Trade Protection * Large	1.11***	0.61***	-0.69***	-0.89***	0.49***	0.64***
	(0.301)	(0.138)	(0.191)	(0.165)	(0.133)	(0.143)
Trade Protection * Small	-1.40***	-0.43	0.45	0.52	-0.37***	-0.65***
	(0.368)	(0.281)	(0.369)	(0.356)	(0.131)	(0.206)
Indicator for Large Firms	-5.13***	-2.10***	-1.17***	-1.57***	-2.69***	-2.77***
	(0.496)	(0.173)	(0.252)	(0.243)	(0.239)	(0.246)
Indicator for Small Firms	7.82***	2.56***	2.82***	2.95***	3.65***	3.84***
	(0.445)	(0.279)	(0.348)	(0.360)	(0.299)	(0.303)
Log of R&D Expenditure	-0.61**	-0.09	0.15	-0.44***	-0.41***	-0.36**
	(0.239)	(0.128)	(0.103)	(0.136)	(0.145)	(0.149)
Constant	14.42***	7.39***	7.23***	6.88***	6.98***	6.67***
	(1.287)	(0.862)	(0.249)	(0.298)	(0.427)	(0.722)
Year Effects	Yes	Yes	No	Yes	Yes	Yes
Observations	40,925	40,907	40,945	40,945	40,663	40,663
R-squared	0.089	0.089	0.057	0.131	0.131	0.132

Notes: Dependent variable is wage bill / sales. Output tariffs and both measures of ERP are lagged by one period. See notes on Table 1 for details on the construction of the large and small firm indicators. ERP - Firm represents the effective rate of protection calculated using firm-level data. ERP-Industry was calculated using industry-level data. The construction of both measures is described in Section 4.2. All regressions include firm effects. Robust standard errors in parentheses are clustered at the three-digit industry level. *** p<0.01, ** p<0.05, * p<0.1.

Table 9
Bargaining Power Estimates By Industry

Industry Code	Industry Name	Beta (All)
15	Food and Beverage, Tobacco	0.09***
		(0.006)
17	Textiles, Wearing Apparel, Leather	0.07***
		(0.006)
21	Wood, Paper, Printing and	0.08***
	Publishing	(0.005)
24	Refined Petroleum, Chemicals	0.07***
		(0.005)
25	Rubber	0.02***
		(0.009)
26	Non-Metallic Minerals	0.05***
		(0.007)
27	Basic Metals, Fabricated Metals	0.04***
		(0.008)
29	Machinery & Equipment, Office	0.04**
	Machinery	(0.019)
31	Electrical Machinery, Precision	0.07***
	Instruments	(0.013)
32	Communications Equipment	0.06***
		(0.010)
34	Motor Vehicles, Other Transport	0.03**
		(0.012)
36	Furniture	0.04***
		(0.003)

Notes: Beta is the coefficient of the constant term in a regression of the share of wages in total revenue on the inverse of mark-up (sales / total costs). The regressions were run separately for each industry in the sample. Robust standard errors reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 10
Trade Liberalization and Bargaining Power

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All Firms		Large Firms		Medium Firms		Small Firms		Stacked Sample			
Output Tariffs	0.30***	0.20***	0.60***	0.29**	0.26***	0.10	0.12***	0.003	0.33***	0.14***		
	(0.068)	(0.067)	(0.141)	(0.114)	(0.091)	(0.063)	(0.037)	(0.037)	(0.059)	(0.053)		
Output Tariffs * Large Firm Sample											0.32***	0.12**
											(0.074)	(0.053)
Output Tariffs * Medium Firm Sample											0.36***	0.16***
											(0.068)	(0.063)
Output Tariffs * Small Firm Sample											0.32***	0.13**
											(0.058)	(0.062)
Constant	-0.66***	-0.48***	-1.24***	-0.70**	-0.46***	-0.16	-0.15	0.06	-0.62***	-0.28**	-0.65***	-0.30**
	(0.194)	(0.179)	(0.315)	(0.267)	(0.168)	(0.148)	(0.113)	(0.110)	(0.129)	(0.127)	(0.134)	(0.132)
H0: Interaction Terms are Equal (P-Value)	-	-	-	-	-	-	-	-	-	-	0.436	0.456
Industry Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	192	192	192	192	191	191	174	174	557	557	557	557
R-squared	0.239	0.494	0.200	0.423	0.158	0.249	0.169	0.363	0.158	0.256	0.161	0.256

Notes: Dependent variable is the industry-level bargaining power of workers. Output tariffs are lagged by one period. The number of observations is lower in columns (5) - (8) as some industry-year pairs lack enough observations to estimate bargaining power in each sub sample. In columns (9) - (12) each industry has three observations per year: one for all large firms in the industry, one for all medium firms, and one for all small firms. Columns (9) - (12) also include firm size category effects. All regressions include year effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.