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THE WAGE RESPONSE IN EXPORTING FIRMS: EVIDENCE FROM MACHINERY AND CHEMICAL INDUSTRIES IN INDIA

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INTRODUCTION

There is little consensus that the effect of more openness to international trade has a high and significant impact on employment and wages in a country. In terms of economic intuitions drawn from, as well as leading to, evidence across a large number of developed and developing countries, it appears that more trade via removal of erstwhile distortions have been responsible for loss of jobs in several industries in all trading countries. The loss of jobs has predominantly been owing to relatively inflexible unionised wage contracts in formalised private firms. On the other hand, for publicly operated firms, the impact has translated into a low level of output with reasonable offers of benefits with early retirements or 'golden handshakes'. It is so because layoffs are often difficult in public organisations usually endorsing stronger labour laws (see, for example, Dougherty, 2009 for India). The pattern is not very different across developed and developing countries, because everywhere government-controlled firms are always less flexible than private firms, even within the same industry structure.¹ However, the proliferation of international trade has given rise to newer activities, including relocation of jobs to the 'unorganised' sectors of the economy, where wages are determined by interactions of demand and supply of labour for such jobs. The informal sector is largely outside the purview of formal regulations and unionised negotiations. It is then expected that the average wage will drop on account of this labour market transition, raising both within industry wage inequality and overall pressure on the labour market. Would the organised sector be able to sustain relatively higher wage payments under the circumstances? Further, what implications are there for the wage movements in purely exporting firms? This paper investigates if the exporting

¹ See for example, Hussain and Sahay (1992), that enlists critical differences between public firms and private firms in the following way: (a) a public firm having soft budget constraint has distorted incentive structure, private firms do not; (b) a public firm cannot lay off workers as easily as private firms; (c) a public firm is saddled with a rigid hierarchical system where bureaucratic delays and coordination problems in decision making are common, such that public firms are less flexible than private firms in responding to exogenous shocks (p. 810).

firms belonging to two rather large industries in India, namely, machinery and chemicals, display positive wage movements as functions of export earnings and a vector of important explanatory variables. In this context, we use a number of control variables that alongside the volume of exports can also explain the direction and magnitude of wage movements in exporting firms belonging to these two industries.

We should emphasise that the research question is important because, compared to the formal industries of the type we deal with in this paper, the larger complementary set of industrial and semi-industrial activities in India display high levels of informalisation, which tend to increase as the economic reforms are initiated. A more general concern that follows is that such expansion will reduce informal wages, with retrenched workers entering from the formal sector. For a typical employer, the option to move production to the unorganised sector, if otherwise feasible, is partly determined by how greater trade openness affects wages. If, due to greater openness, the wages rises significantly (as we shall discuss shortly), then it is possible that the firms outsource production to the informal sector, where such wage gain may be minimal owing to characteristics discussed above. Conversely, if greater openness leads to a fall in formal wages, then the industries may attract more workers into the sector (assuming that the formal wage continues to be higher than the informal wage, due to the prevalence of formal benefits, etc). In fact, Marjit and Kar (2011) show that given access to low-wage workers in informal sectors, formal firms shall stagnate on the level of formal employment. The lack of labour demand shall create downward pressure on wages and employment elsewhere. In countries where the outside opportunity is limited to pre-decided unemployment benefits, the effect of exogenous transition shocks should be different from those we engage with here. The institutional difference between the organised sector (organised, in the sense of being part of a registered labour union apart from adherence to labour laws, to environmental strictures, tax regulations, etc.) and the unorganised sector, remains critical for the determination of higher formal wages regardless of the worker inflows and outflows in the informal sector. Nevertheless, even within the organised sector, the wage difference prevails owing to several factors. A number of papers have previously discussed issues relating to risk and rent-sharing arrangements between firms and workers (see Bigsten, et al., 2003; Kar & Datta, 2014 for a brief review) in organised industries as potential explanations towards varying wage contracts despite apparently similar skills and productivity for a cross-section of industrial jobs.

It could also be the result of a host of other factors that determine how the wage and employment patterns respond to various exogenous shocks facing the industry. The exposure to international trade can be one of them, along with the scale of activity, the structure of the market, the organisational characteristics both at the firm and at the industry level, the mean age of the industry (or of individual firms),

etc. As far as international trade is concerned, the welfare implications of trade reforms with the informal sector as an important part of the economy have recently come up for much discussion (Marjit & Kar, 2011; Marjit et al., 2007; Chaudhuri, 2000; Marjit, 2003; Chaudhuri & Mukhopadhyay, 2010). A primary reason perhaps, is that leaving out the informal sector fails to capture the impact of trade policy reforms on a huge labour force in the developing countries. In fact, data from Southeast Asian, East European, African, and Latin American countries show varying rates of urban informal sector employment within the range of 15 per cent to 20 per cent in Turkey and Slovakia to 80 per cent in Zambia, and even more, to approximately 83 per cent in Myanmar. Moreover, considering the state of agricultural and rural activities in these countries, it is quite apparent that the total shares of the informal sector in these countries are quite high (ILO, 1999). This is also corroborated by some of the other studies (for example, Turnham, 1993), which provide evidence that in low-income countries like Nigeria, Bangladesh, Ivory Coast, India, etc. the share of the urban informal sector is at least 51 per cent of the workforce. Alternatively, seen from the point of view of the 'minimum wage' earners, only 11 per cent of Tunisia's labour force is covered by the minimum wage, while in Mexico and Morocco a substantial number earns less than the minimum wage; in Taiwan, the minimum wage received by many is less than half of the average wage (Agenor & Montiel, 2008).

The distinction illustrates that the jobs in the formal and organised sector could turn out to be considerably more productive if the wage is an indicator of productivity under competitive conditions. Dutta, (2007) for example, shows that the relative wage of industrial workers in India fell after the onset of economic reforms, which steeply lowered the tariff rates facing the most protected industries in the country. In developed countries, more imports originating in low-wage developing countries led to 'real' job losses (defined as the gross job loss as against net losses, because trade also creates jobs elsewhere, see Kletzer, 2002), where the loss due to import penetration in sectors like textiles and apparel outweighs job creation due to exports, even if negligibly.

Based on these issues, the present paper shall show that higher export earnings, and increase in the values of other variables, translate into higher wages for one industry, but not for the other. Nonetheless, the overall impact is driven by the wage gain in one of the industries. This seems to broadly corroborate studies from other countries. Amiti and Davis (2012) have recently shown that fall in output tariff lowers wages in import-competing industries but raises the same in exporting firms. On the other hand, the fall in tariff imposed on the intermediate input raises wage in the import-competing industries compared to those which buys inputs locally. A number of other studies (Schank, Schnabel & Wagner, 2010; Park et al., 2010; Yasar, Nelson & Rejesus, 2006; Arnold & Hussinger, 2005; Greenaway & Yu, 2004; Bernard & Wagner, 1997; Czinkota & Johnston, 1983) look at the relationship between exporting firms and wages, about productivity in such firms, the effect of financial

crisis, etc. These constitute mainly studies for Germany and East European countries, and investigate the effect of sales on exporting firms' activities. In this context, we use some of the variables popular in the related literature in order to observe the effect of foreign exchange earnings on wages for firms belonging to the two industries specified above. In the following section we discuss the empirical specification and the data source. We also discuss the scope of the variables and the definitions as available from the Centre for Monitoring Indian Economy (CMIE) database, Prowess. The paper goes on to describe the empirical results and describes the analytical points associated with it, and then concludes in the final section.

DATA SOURCE AND EMPIRICAL SPECIFICATION

Data

The data is generated in the form of panel data, which is extracted from the CMIE (Centre for Monitoring Indian Economy) database. The data covers a period of 14 years, between 2000-2013 for 1171 firms in the machinery industry and 1970 firms in the chemical industry. However, in terms of purely exporting firms within these two industries, the number of firms belonging to the machinery industry is 336 (28.6%), while that in the chemical industry it is 574 (29%). We offer next a description of the data, which includes detailed descriptive statistics (Table 1). Outcomes of the panel regression are provided in Tables 2-4 and discussed in detail in the section which follows the tables. The variables of interest in our model include:

Sales and Sales Growth (SA and SA²)

The sales figures reported for every firm in its audited financial statement for every financial year and the growth in sales may be positively related to wage growth for the industry as a whole. It is possible that the sales growth does not automatically translate into wage growth at the level of the firm unless some contractual arrangements previously entered into are amended.

Age and Age²

The Age of the firm as calculated from the date of incorporation may provide an indication of how the wage offered in respective firms responds to increase in the volume of trade. Once again, for firms that have been in business for a long time as shown by changes in the age profile, wages may not respond significantly when the export volume rises as compared to relatively younger firms. Usually, second order relations for age are negative.

Net Fixed Assets (NFA)

The variable we use as Net Fixed Assets is denoted by NFA. The asset structure of a firm significantly affects the firm's capital structure and since we collect data on how the firm borrows — whether through the debt instruments or through the

equity instruments — the size of the net fixed assets becomes an important variable of interest. Nonetheless, it should be noted that Grossman and Hart (1982) have shown that a firm's tangible fixed assets can be negatively correlated with its leverage (*ratio of firm's total domestic debt to total assets*). According to those authors, a firm with limited tangible fixed assets has less collateralised debts and more difficulty in monitoring the extravagancy of its employees because of asymmetric information. In this case, a firm can attempt to reduce its agency costs by increasing leverage, which allows the firm to be more stringently monitored by creditors such as bondholders and financial intermediaries. Therefore, a firm with limited tangible fixed assets can raise its leverage. In addition, if the company has huge tangible fixed assets, then the proportion of fixed operating costs instead of flexible operating costs, in the total operating costs for the firm's production and sales activities, increases. This raises its operational risk and probability of bankruptcy. In this case, an increase in tangible fixed assets can also lead to lower leverage. If an increase in tangible fixed assets raises a firm's bankruptcy costs such as the cost of asset sales, the firm's leverage could also be lowered.

Total Foreign Exchange Earnings (TFE)

The literature argues that productivity gains are larger for import competing firms than exporting firms.² The foreign exchange earned by the firms is therefore expected to be negatively related to the firms' productivity, but positively related to wages. It includes earnings from exports of goods and services and foreign exchange earnings as dividends and interests.

Profit after Tax (PAT)

We have considered the net profit of the firm after deducting taxes. Profit after tax equals the sum of the total revenue and the change in stocks less cost and corporate taxes. We expect PAT and wages to be positively correlated. In fact, we offer a combination of PAT and sales to offer the cluster distribution of exporting firms in each of the industries considered in this paper. These are shown in figures 1 and 2 for the machinery and chemical industries, respectively.

Industry classification

Unique features of a certain industries also affect the debt structures of the firms in that industry. Each industry may have industry-specific patterns of financing because of disparities in product market structure and types of competitive actions between firms. To control for these industry effects, many empirical studies include dummies for industry. We offer two sets of regression for the two industry types and then a unified regression for all 910 firms constituting the panel for 14 years.

Borrowing: Debt and/or Equity (ID/IE)

We include the type of borrowing (credit structure) as one of the explanatory variables, since a firm's borrowing pattern affects profit and wages. We expect that

² See Epifani (2003) and Bernard (2006).

firms that use the more expensive mode of borrowings shall pay lower wages in the end, where the mode is used as a control variable.

The Econometric Specification

We undertake a fixed effect regression analysis. The empirical structure for the analysis is as follows:

$$(1) Y_{it} = \alpha + \gamma_i Z_{it} + \sum_{i=1}^k \beta_i X_{it} + \varepsilon_{it}$$

The representation is either for all firms across industries, or for firms in individual industries. The results are available in Tables 2-4, respectively. Here, Y_{it} is the dependent variable, a panel of k cross-sectional observations and t time series observations on wages paid at the firm level. γ_i is the coefficient for Z_{it} representing the foreign exchange earnings (TFE) at the firm level reported for every year. X_{it} 's represent the vector of independent variables for k cross-sectional observations and t time series observations. ε_{it} is the idiosyncratic error term in equation (1). The *null hypothesis* in our model is that if the foreign exchange earnings through exports rise, it translates into higher wages depending on industry characteristics captured via the vector of independent variables. We have already defined the scope of other variables.³

EMPIRICAL RESULTS

The detailed empirical model for this study is as follows:

(2)

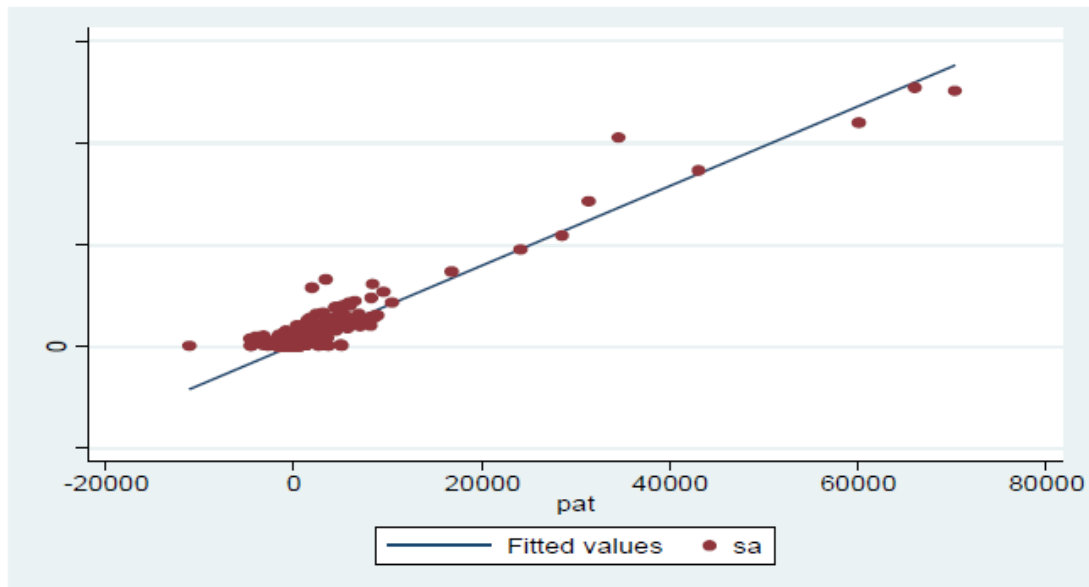
$$w_{it} = \alpha + \beta_1 TFE_{it} + \beta_2 SA_{it} + \beta_3 SA_{it}^2 + \beta_4 PAT_{it} + \beta_5 IE_{it} + \beta_6 ID_{it} + \beta_7 NFA_{it} + \beta_8 Age_{it} + \beta_9 Age_{it}^2 + \varepsilon_{it}$$

The panel fixed effects regression shows that on average, the explanatory power of the model is close to 0.5. This suggests that for firm-level panels with a lot of in-built heterogeneity, the model is a relatively good fit. This feature is true for both the machinery and chemical industries as it is also for the overall regression results. It should be noted that the model presented here is an elementary version of the econometric specification that can improve the scope and quality of the same

³ In related literature, two-stage least square regression analysis along with panel fixed effects have often been undertaken essentially to check for possible endogeneity arising from reverse causality. In our case, since the decision to engage in trade rarely depends on what it would cause to the wage rate, we bypass such tests. In case of two-stage least square analysis use of instrumental variables is guided by the econometric requirement that they must be correlated with the variables they instrument for.

analysis if several other conditions hold. Nevertheless, what we report here is still potent enough to show that the variations in characteristics across industry types is perhaps quite influential in arriving at differential outcomes with respect to one or more of the variables used as controls in this regression. From figures 1 and 2 it can at least be suggested that for the machinery industry, a large number of firms display uniform cluster around low values of sales and profit combinations. The industry appears competitive.

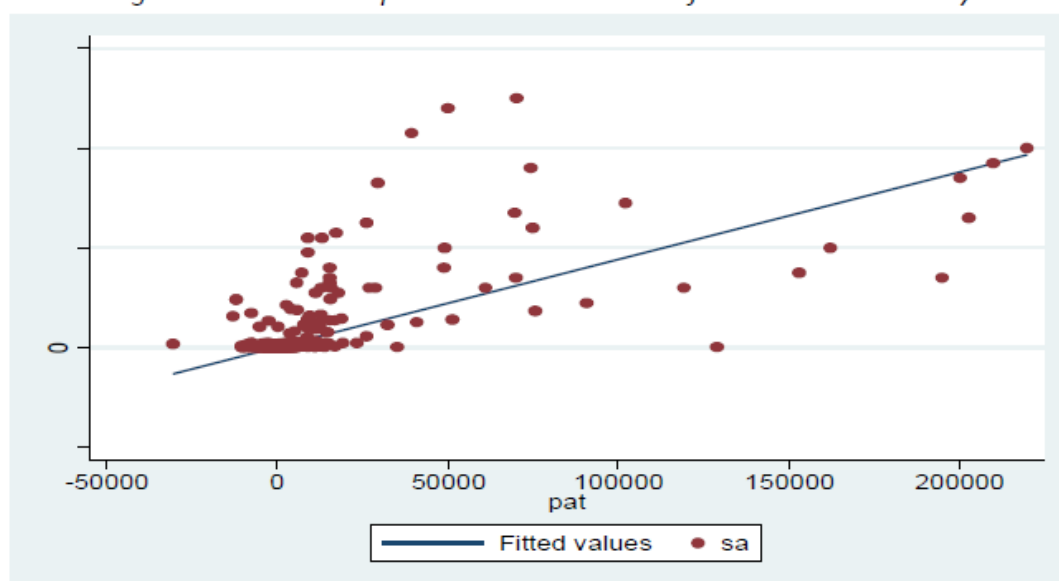
Figure 1: Relationship between SA and PAT for Machinery Industry



Source: Own calculations

On the other hand, the distribution of firms for the chemical industry is quite scattered over the years. While a considerable number of exporting firms in the chemical industry are concentrated at low levels of sales and profit, a substantial number of firms also show high sales and high profits. The fitted trend in the machinery industry is however, steeper than that in the chemical industry, although both are unambiguously upward sloping.

Figure 2: Relationship between SA and PAT for Chemical Industry



Source: Own calculations

The main results of this analysis follow. In table 1, we show that the rise in foreign exchange earnings for both the machinery and chemical industries taken together cause the wages to fall, albeit the decline in wages owing to a 1% rise in TFE is fairly small. The fall in wages is negative and statistically significant, nonetheless. The table reports the coefficient values of the main explanatory variable (TFE) and the control variables, with the standard errors shown in respective parentheses. For this table (and the subsequent ones), we conduct four regression analyses given in four columns of the table, the first one (column 1) with all variables, the second one (column 2) by dropping the age square, column 3 reporting all variables with 'zero' change in TFE and finally column 4 by dropping debt as the instrument of borrowing. In each case, a rise in TFE lowers wages, when simultaneous changes in SA (but not SA^2 , except in column 4 when ID is dropped) supports this effect, while increasing wages by its own effect. Similarly, profit after tax raises wages, but cannot outweigh the negative effect on wages owing to a rise in exports. It seems that the intuition behind negative growth of wages, despite greater access to exports and income from I, may have to do with the clustering of firms under machinery. The structure of the machinery industry being rather competitive in nature, staying in business and being able to export is possibly an outcome of cost cutting activity at the firm level.

Table 1. Overall Panel Fixed Effects Regression

Variables	Model 1	Model 2	Model 3	Model 4
<i>NFA</i>	9.38E-03*** (8.89E-04)	9.38E-03*** (8.88E-04)	5.61E-03*** (9.46E-04)	3.34E-03*** (8.42E-04)
<i>SA</i>	2.90E-03*** (5.56E-04)	2.91E-03*** (5.55E-04)	2.92E-03*** (6.16E-04)	7.90E-03*** (4.01E-04)
<i>SA</i> ²	1.29E-09*** (9.08E-11)	1.29E-09*** (9.06E-11)	1.27E-09*** (1.01E-10)	4.90E-10*** (7.47E-11)
<i>PAT</i>	.03*** (4.70E-03)	.03*** (4.69E-03)	4.11E-03*** (4.80E-03)	9.24E-02*** (3.86E-03)
<i>IE</i>	.01*** (4.18E-03)	.01*** (4.16E-03)	-.01*** (3.91E-03)	.03*** (3.57E-03)
<i>ID</i>	1.62E-03 (2.87E-03)	1.62E-03 (2.86E-03)	-5.53E-03 (3.13E-03)	-
<i>TFE</i>	-9.45E-03*** (-6.23E-04)	-9.45E-03*** (-6.21E-04)	-	-.01*** (-5.73E-04)
<i>Age</i>	6.00 (10.10)	7.35 (4.42)	-1.99 (-10.97)	10.06*** (1.69)
<i>Age</i> ²	.01 (.11)	-	.12 (.12)	-4.99E-03*** (-8.53E-04)

***, significant at 1% level, ** significant at 5% level and *, significant at 10% level.

The machinery industry was also among the most protected sectors in the country, which by standard logic of trade theory is expected to suffer in terms of wages and employment when the level of protection falls and the volume of trade (import) grows. Such effects have been discussed in the introduction as well. In table 1, we further show that if the firm does not export, then sales, growth of sales and PAT, all explain rising wages over time. The age of the firm is essentially non-significant in most cases, except in column 4, where we have dropped ID from the analysis. It should be reminded that the debt as an instrument of borrowing is not very popular in India, despite potentially lower costs associated with it. Thus, the individual effect of ID is non-significant everywhere, while that of equity is positive. This also contradicts standard results in related literature, perhaps because the firms do not have access to low-cost finances (see Guha-Khasnobis & Kar, 2006). Thus, when ID is dropped from the analysis, the effect of TFE on wages is considerable (negative

and significant). In addition, the age of the firm becomes a significant positive explanatory variable explaining rise in wages in such firms.

Subsequently, we conduct identical regression analyses for machinery and chemical firms and report the results in tables 2 and 3 respectively. The machinery industry shows that higher profits at the firm level have actually led to a fall in wages for reasons mentioned above. In addition, the rise in TFE leads to significant negative impact on the wages, which weakens slightly when ID is dropped from the analysis in column 4 of table 2. Once again, ID is non-significant across all specifications of the model and age or age-squared does not affect the rise or fall in wages when TFE changes. Interestingly, the sales growth leads to a fall in wages leading to a concave relation between sales and wages in the presence of other control variables.

Table 2: Fixed effect panel regression result for Machinery industry

Variables	Model 1	Model 2	Model 3	Model 4
<i>NFA</i>	5.47E-03 (9.86E-03)	5.23E-03 (9.87E-03)	9.24E-03 (.01)	.07*** (9.42E-03)
<i>SA</i>	.08*** (4.48E-03)	.08*** (4.48E-03)	.06*** (4.07E-03)	.07*** (2.85E-03)
<i>SA²</i>	-5.29E-09 (4.71E-08)	-7.11E-09 (4.71E-08)	9.31E-08* (4.59E-08)	4.46E-08*** (4.24E-09)
<i>PAT</i>	-.13*** (.01)	-.13*** (.01)	-.13*** (.01)	-.15*** (.07)
<i>IE</i>	-.06*** (.01)	-.06*** (.01)	-.07*** (.01)	-.04** (.01)
<i>ID</i>	-.06 (.03)	-.06 (.03)	-.05 (.03)	-
<i>TFE</i>	-.05*** (9.13E-03)	-.05*** (9.11E-03)	-	-.06*** (.01)
<i>Age</i>	5.06 (3.34)	1.17 (1.13)	2.73 (3.32)	1.15 (3.35)
<i>Age²</i>	-.04 (.03)	-	-.01 (.03)	-8.73E-03 (.03)

***, significant at 1% level, ** significant at 5% level and *, significant at 10% level. The chemical industry, on the other hand, reports a rather small negative (but significant) change in wage owing to higher value of exports negating the null

hypothesis. One explanation could be that the industries considered here might not constitute comparative advantage for a country like India, where protection at relatively high levels has rendered the firms non-competitive by global standards. Thus, more exports may be feasible only by reducing the wage cost, given that cost of capital and other raw materials are hardly industry-specific. The unorganised industrial sectors in India may also be of critical importance here. The formal firms outsource fragments of the output to the informal sector. This, as already argued above may lower employment and wage in the formal sector. However, we do not have sufficient data to understand such transition completely within the scope of this paper.

Table 3: Fixed effect panel regression result for Chemical industry

Variables	Model 1	Model 2	Model 3	Model 4
<i>NFA</i>	8.88E-03*** (1.04E-03)	8.87E-03*** (1.04E-03)	6.27E-03*** (1.16E-03)	9.12E-03*** (6.04E-04)
<i>SA</i>	2.76E-03*** (6.10E-04)	2.72E-03*** (6.08E-04)	2.65E-03*** (6.87E-04)	2.83E-03*** (2.74E-04)
<i>SA</i> ²	1.47E-09*** (9.89E-11)	1.48E-09*** (9.87E-11)	1.40E-09*** (1.11E-10)	1.38E-09*** (4.84E-11)
<i>PAT</i>	.02*** (5.75E-03)	.02*** (5.74E-03)	-5.78E-03 (5.74E-03)	.03*** (2.96E-03)
<i>IE</i>	5.71E-03 (4.41E-03)	5.41E-03 (4.40E-03)	-.01*** (4.50E-03)	.02*** (2.30E-03)
<i>ID</i>	-1.40E-03 (3.36E-03)	-1.40E-03 (3.36E-03)	-6.81E-03 (3.76E-03)	-
<i>TFE</i>	-8.54E-03*** (6.48E-04)	-8.50E-03*** (6.47E-04)	-	-9.73E-03*** (3.63E-04)
<i>Age</i>	8.78 (16.63)	-4.77 (7.48)	.69 (18.59)	13.78*** (3.58)
<i>Age</i> ²	-.18 (.19)	-	-.03 (.21)	-.07 (.04)

***, significant at 1% level, ** significant at 5% level and *, significant at 10% level. Nevertheless, the estimates show that the rise in export value is associated with a fall in wage bills at the level of the firm, more prominently for the manufacturing firms and less so for the sales and profit-wise more dispersed, chemical industry.

The other factor (using net fixed assets as a proxy), which can be better estimated in terms of capitalisation at the level of the firm, it is possible that greater amount of exports is associated with higher returns for the owners of capital as often envisaged in standard neoclassical models. That, the labour loses in the process may not be an unusual outcome in the context of general equilibrium models.

CONCLUDING REMARKS

It is generally argued that greater exposure to international trade has many consequences for the factors of production in a given country. We test a partial equilibrium model mainly with workers' wages and total foreign exchange earnings as the one-way causal relation. Here, the main hypothesis, that more export earnings boost workers' wages, has been refuted for the machinery and chemical industries in India. We used panel data for 14 years, which was not balanced owing to missing information for some of the variables and for certain years. Yet, the number of observations was substantially high enough to allow considerable variation and analytical strength to the main question posed in this study. We showed that for the machinery industry the wages reduction is high and significant, even if the firms constituting this industry tend to earn more foreign exchange through exports.

Most studies earlier (but essentially for the developed countries) have shown that exports lead to wage gains in industries such as iron and steel, machinery, electronics, etc. The results are unusual in the sense of wage losses attributed to higher foreign exchange earnings, but duly comprehensible if one considers the typical general equilibrium effects where the impact of a price change for the traded commodity does not always have positive or distribution-neutral effects on the factor prices. If the rise in the value of exports favours capital more, such that the intensity of factor use in such industry leads to more than proportionate rise in the return to capital, then a drop in absolute wages may not be unexpected. In fact, we have also shown that the impact on wages is actually positive, despite a rise in foreign exchange earnings when the fixed assets grow at the level of the firm, leading to diminishing returns.

However, for the chemical industry, the impact on wages is not so bad. Despite the fact that the relationship is still negative, the magnitude is small. This may be owing to a relatively lower degree of capital intensity in the chemical industry as compared to production of machinery (which seems like a realistic feature). Overall, the stronger negative wages effect in the machinery industry dominates the result across industries. We have also observed the effect of the type of credit availed at the firm level on wages, when the foreign exchange earnings change.

Since, a number of critical factors, including the capital intensity, could not be captured in this analysis, there is scope to both improve upon this study with a more

detailed data set and appropriate empirical specifications. However, this paper still shows that the effect of greater openness may not always be favourable to the factor inputs, including a possible fall in wages. In future, we wish to develop further on this issue with more industries and an expanded data set.

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