Trade Liberalisation and Employment Effects in Indian Manufacturing: An Empirical Assessment

1. Background

Issues of employment and its security, productivity and wages have been central to India's development strategy. Increasing productive employment in non-agriculture sectors, particularly Manufacturing, remains a challenge for India despite state interventions for generating employment and increasing its security[1]. The share of Manufacturing in employment continued to be low relative to agriculture. In 2009-10, the share of employment in manufacturing was 11.03% as compared to the share of gross value added in manufacturing at 15.9% (see Table 1). Despite expansion in output, the rate of employment increases in industry, particularly manufacturing appears to have slowed down, commonly referred to as "jobless growth". (T N Srinivasan 2010, Bhalotra (1998), Goldar (2000), Kannan & Ravindran (2009), Papola (2012), Planning Commission 2012). Therefore, increasing employment outside agriculture emerged as a policy concern for both short and long term and a desirable goal to achieve[2].

Table 1: Share of Employment and Gross Value Added (1999-200, 2009-10; in %)

Sectors	Shares			
	1999-2000		2009-10	
	Employment	Gross Value Added (GVA)	Employment	GVA
Agriculture	59.9	23.8	53.2	14.6
Manufacturing	11.1	15.5	11.03	15.9
Non-manufacturing	5.3	11.8	10.49	12.2
Services	23.7	48.9	25.28	57.3
Total	100	100	100.0	100

Source: Satish Mehrotra et.al (2013)

[1] As a part of development strategy, state assumed a dominant role in the economy. The Planning Commission was set up in 1950 to formulate national plans. The Five Year and Annual Development plans included several policy interventions for generating employment and increasing its security. Besides, industralisation, the public sector was developed to generate employment. In 2006, Public sector accounted for 67% of the total organized sector employment. With the initiation of reforms in 1991, there was a shift of public ownership in the manufacturing sector which resulted in steady decline in employment. This was largely on account of the state enacted labour laws that required large scale enterprises to take permission from government for retrenching workers. Another area of intervention was the reservation of certain consumer goods production exclusively by labour intensive small scale industry (SSI). Many inefficient small enterprises were able to survive because they were sheltered from competition. As such India did not succeed in exploiting the competitive advantage in abundant labour supply by producing labour intensive manufactures for domestic and world markets. As such, this policy was also not successful in rapidly expanding employment.(for details see T N Srinivasan 2010)

[2] Given the "inclusive" growth and development strategy, it was presumed that with growth in output, employment opportunities would also increase. This has been the focus of the Indian planning process. But, this did not happen. The rate of growth of employment was found to be slower than the rate of growth of output. Therefore, in successive plans strategies, policies and programmes were designed to bring about a focus on employment generation as a specific objective. During 1970s, 1980s and 1990s, a number of employment generation and poverty alleviation schemes were implemented. Schemes like Integrated Rural Development Programme, National rural employment programme and Mahatma Gandhi Rural Employment Guarantee Act emerged as vehicle to provide wage employment through public works programme. There were also schemes to promote self employment and entrepreneurship through provision of assets, skills and other support to the unemployed. (Planning Commission 2012).

One of the major challenges addressed in the 12th Plan period (2012-2017) is how to increase the share of formal sector employment opportunities. As such, the strategy for employment generation needs to augment productive employment opportunities both in the formal and the informal sectors and decent work conditions. Generating productive employment would necessitate transfer of surplus labour out of low productivity agriculture to industry or services. In this regard, two kinds of transition would be needed: first, movement of unskilled labour from agriculture to unorganized industry/services; and second, movement of labor from informal employment in the unorganized sector to formal employment in organized sector. [3] Based on the desired sectoral distribution of employment[4], the 12th Plan projections for manufacturing employment is 70.58 million in 2012-13 and 94.22 million by 2016-17 assuming a GDP growth of 8-9% and employment elasticity at 0.31. These targets translate into almost doubling of employment in manufacturing over the next four years as the estimated manufacturing employment in 2009-2010 was 50.74 million (Mehrotra 2013).

Achieving the 12th Plan employment targets have to be viewed in the overall perspective of India's increased integration with the global economy and the liberalization of trade and investment policies. Between 1990 and 2012, India's trade to GDP ratio increased from 15% to over 51%. At the same time, India's manufacturing exports as a per cent to total merchandise exports decreased from 76.1% in 2000-01 to 59.2% in 2007-08 and then increased to 61.5% in 2010-11 (DGCI&S). Given that the size of India's manufacturing sector is expanding[5], one of the key policy issue that needs to be addressed is to assess the impact of trade in creating productive manufacturing employment and achieving the 12th Plan targets.

2. Dimensions of Trade and Manufacturing Employment

The theoretical linkages between trade and manufacturing employment is derived from the trade impact on exports and imports of manufactures (higher exports can lead to more production and therefore more employment) and the labour coefficients of individual industries. Based on Heckscher-Ohlin model, a favourable effect of trade liberalization on manufacturing employment is expected in the context of developing countries. Under free trade, there would be a move towards specialization in labour intensive manufactured products and a shift away from production of capital and skill intensive manufactured products. These changes in industrial structure brought about by trade liberalization can

[3] Casual or ad hoc employment in organized enterprises is informal employment. Almost all the employment in unorganized sector is informal. Organized manufacturing is defined

[4] The share of agriculture in employment is expected to decline from 50 to 45% and increase in the share of employment of manufacturing from 14.5% to 18% (Planning Commission 2012)

[5] Between 2005-06 and 2012-13, the size of India's manufacturing sector increased from about 4000billion rupees to 8000 billion rupees at constant prices (RBI, Aranca research 2013)

lead to greater demand for unskilled labour and a fall in demand for skilled labour thereby leading to reduction in wage inequality. However, as trade in all commodities is not governed by comparative advantage arising from factor endowment, trade liberalization may not necessarily lead to higher employment and lower wage inequality but can lead to a rise in employment elasticity which in turn can lead to growth in employment in manufacturing sector (Ghose 2000). This is particularly significant under conditions of surplus labour and dualistic labour markets in India.

India embarked on major trade liberalization policies beginning from July 1991 which accelerated in early 2000. Tariff rates were reduced, export incentives were rationalized, quantitative restrictions on imports and exports were eased and exchange rate became market determined[6]. Complementary policies were initiated relating to industrial policies, FDI and foreign technology imports. A number of studies have reported marked acceleration in employment growth (Goldar 2000, Nagraj 2000 and Tendulkar 2000) and slower growth in real product wages following trade liberalization. Recent trends in manufacturing employment indicate a fall in workforce between 2004-05 and 2009-10 largely accounted by decline in employment in the unorganized sector (see Table 2). In this context, it would be useful to investigate the causes for these trends and find out if the contraction of trade due to global financial crisis in 2007-08 has caused these observed trends. This, in a way, would be validating the earlier results.

Table 2: Number of Workers by Sector (1999-2000, 2004-05, 2009-10; in million)

Worker	1999-2000			2004-05			2009-10		
	Total	**Unorganised**	**Organised**	**Total**	**Unorg.**	**Org.**	**Total**	**Unorg.**	**Org.**
Agriculture	237.67	232.2	5.47	258.93	252.8	6.09	244.85	242.11	2.74
Manufacturing	44.05	30.92	13.13	55.77	39.71	16.06	50.74	34.71	16.03
Non-manufacturing	20.84	13.89	6.95	29.96	20.64	9.32	48.28	30.36	17.92
Total services	94.20	65.62	28.57	112.81	81.72	31.09	116.34	80.15	36.19
Total workforce	396.76	342.64	54.12	457.46	394.90	62.57	460.22	387.34	72.88

Source: NSS

At the firm level, trade openness can have differential effects on firm profitability and activity depending on the distribution of firm specific assets. Empirically, there is literature that explores the idea that firms with differing levels of total factor productivity within an industry respond to trade liberalization shock by specialising in exports, producing for

[6] A brief note on trade policy developments in India is given in Appendix 1.

domestic markets only or exiting the industry (Melitz 2003, Chanay 2008, Eaton, Kortum and Kramarz 2011). In the Indian context, studies have shown that lower tariffs on final goods and intermediate goods have increased firm level productivity, particularly for import competing industries (Topalova & Khandelwal 2010). By using industry specific tariff reduction during 1989 to 1996, Topalova (2004), analyses the effects of tariff reduction across firms with differing characteristics and concludes that trade liberalization has increased the productivity of private firms and not for public sector firms. Satish Chand and Kunal Sen (2002) found that liberalization of intermediate goods sector is more important for TFP gains than that of the final goods sector. Thus, the empirical literature on trade liberalization and firm productivity has varied dimensions.

The focus of this study is to examine the impact of trade on employment in manufacturing sector. Exports should increase the production of goods which are intensive in the abundant factor. On the other hand learning by doing may lead to certain advantages which are not dictated by H-O type mechanisms. Hence the demand for labour compared to capital and that of skilled labour vis-à-vis unskilled labour may depend on the relative strength of mechanisms dictating the specializations. Thus in this study an attempt would be made to estimate the aggregate employment effect as well as the impact on skilled vs. unskilled labour demand will be looked at. The industries would be segregated into export-oriented, import oriented and domestic oriented to look at whether the estimated coefficients differ across these groups.

Further, how firm-specific incentives impact these relationships would be answered. At the industry-level inter-industry allocations are considered whereas intra-industry re-allocations are ignored. This can only be estimated at the firm-level. The focus would be to understand if trade has lead to more labour intensive composition of output in India; and to examine how trade induced productivity effects have impacted employment across industries. On this basis, understand the employment generation potential of manufacturing sector and analyse the constraints for growth and employment at the firm level. The impact of the firm being labour-intensive or capital-intensive on the results would be checked on the basis of the Labour-Capital ratio.

3. Main Research Questions

The research questions attempted in this study are thus

i. How has Trade impacted manufacturing employment in India particularly in terms of labour composition and real wages?
ii. What has been the intra-firm allocations and productivity effects of trade liberalization at the firm level.
iii. How have costs related to trade policy impacted employment in India?

4. Methodology

For assessing the impact of trade, the study would attempt to analyze the data at two-levels given data availability issues: (a) industry and (b) firm level. At the industry level, the focus is on quantifying the effect of trade on manufacturing employment as a whole. All manufacturing industries are classified into export-oriented, import oriented and non-trading manufacturing industries (Domestic oriented). It is expected that export-oriented industries would increase employment of labour if the goods that are produced are intensive in this factor. Whereas, higher imports would decrease employment if they are finished goods. But if we are mainly importing intermediate goods, which is the case for India, then it may actually increase the employment when final goods are made in the country itself. On the other hand it is expected that domestic oriented firms would have a positive impact on employment as they are not trading at all. It would be interesting to find out the net effect of these different forces.

At the firm level, the focus is to capture the behavior of firms towards trade induced productivity gains and whether these stem from intra-industry allocation of resources among firms with different productivity levels. When markets are imperfectly competitive, trade liberalization may affect firm level variables such as mark–ups, size and productivity. Trade liberalization can lead to higher level of productivity at the firm level via two driving forces. First, increases in competition resulting from lower output tariffs can cause firms to increase their efficiency. Second, when tariffs on inputs are lowered following trade reform, this can lead to an increase in the number and volume of imported inputs from abroad. Firms are able to access more and cheaper imported inputs which can boost firm- level productivity. This productivity impact can vary across industries that are export oriented, import oriented and non-trading. Under this differing trade induced productivity effects, the implications on employment growth at the firm level need to be assessed. The impact of existing firm-technology on the results would be assessed by considering the capital-labour ratio.

(a) Methodology for Industry level analysis

The effect of trade on manufacturing employment at the industry level can be decomposed into *Scale effect, Composition effect and Process effect. Scale effect* quantifies the effect of trade on total manufacturing output; *Composition effect* quantifies the effect of trade on the contribution of the each of the industries to the total manufacturing output; and *Process effect* quantifies the effect of trade on employment through changing labour coefficients (Kunal Sen 2008).

Thus, the linkage between trade and overall manufacturing employment is captured by the following definition.

$$L = Q.\sum w_i \ (L/Q)_i \qquad (1)$$

Where L is total manufacturing employment

Q is total manufacturing output

$w_i = Q_i/Q$ and i refers to the different industries in manufacturing

From the above definition, trade can impact manufacturing employment in three ways. First, if export orientation of the manufacturing industries is high then trade can induce higher level of manufacturing output (Q) and thereby increase manufacturing employment. Alternatively, if import penetration is high then trade decreases manufacturing employment. This is referred to as the *Scale effect*. Second, by increasing the output of exportables, trade can induce a change in the shares of different industries (w_i) in Manufacturing output. This is referred to as *Composition effect.* In the H-O framework, developing countries with abundant labour, will export labour intensive commodities and import capital intensive commodities under trade openness. This will be captured by the *Composition effect*. And, third, trade can impact employment by changing the labour coefficients (L/Q_i), i.e., labour required to produce a given output. This is referred to as *Process effect* of trade. (Kunal Sen, 2008). With increased trade, the quantity and the kind of labour required can change. Such changes in factor demand results in change in relative prices which in turn can lead to factor substitution in production. Further, trade can induce technological transfers or decrease X-inefficiency which is reflected in the productivity effects. Due to increase in competitive pressures, firms may substitute labour for capital. These induced trade effects on factor demand are captured by the *Process effect*.

The disaggregated production and employment data is as per the National Industrial Classification (NIC) which is the classification code used by the Central Statistical Organisation (CSO). The time period considered for the study is 1989-90 to 2010-11 across around 150 industries (at 4-digit NIC level). As the definitions of industries changed over time, concordance between 1998-99 and 2004-05 series need to be worked out. Further, the trade data follows the International Trade Classification- Harmonised (ITC-HS) and is reported in India by DGCI&S. Given the asymmetry in data based on two different classifications, it is necessary to formulate concordance between 4 digit NIC and 4 digit ITC HS.

Based on the concordance series, the methodology for identifying export oriented and import competing industries is as follows:

- Industry wise share of exports in production as well as for the manufacturing sector will be estimated. The industries whose share of exports is higher than the average of the manufacturing sector will be identified as *Export oriented*

industries. The remaining industries will be defined as *Import Oriented industries.* Domestically oriented industries, where export to output ratio is close to zero, will be a subset of this category and will be included in the analysis as a separate segment. For doing this it would also be considered whether the industries have kept their status intact for more than 80% of the years considered in our study. Hence whether an industry is export-oriented or not would depend on above average share in exports in at least 16 out of the 20 years considered for the study.

Second, to analyse the effect of different factors on changes in employment, Growth accounting approach is used (Kunal Sen 2008). In this approach, changes in employment will be decomposed into the effect of changes in domestic demand, exports, imports and productivity. This decomposition assumes that increases in exports create additional employment while increased imports reduces employment. Further, this decomposition is derived from the macro identity and cannot be interpreted as causal factors.

$Q_{it} = D_{it} + X_{it} - M_{it}$ (2) where Q= Domestic production of industry i at time t

D= Domestic demand of industry i at time t

X = Exports of industry i

M= Imports of industry

Employment can be calculated as:

$L_{it} = l_{it} (D_{it} + X_{it} - M_{it})$ (3) where L_{it}= employment in industry i at time t

$l_{it} = L_{it}/Q_{it}$ and $m_{it} = M_{it}/D_{it}$

Changes in employment between t=0 and t=1 can be decomposed into[7]:

$$\Delta L_i = l_{i1} (1-m_{i0})\Delta D_i + l_{i1}\Delta X_i + l_{i1} (m_{i0}-m_{i1}) D_{i1} + (\Delta l_i) Q_{i0} \quad (4)$$

[7] $\frac{L_{it}}{Q_{it}} = l_{it}$ $\quad M_{it} = m_{it} D_{it}$

$L_{it} = l_{it} Q_{it}$
$= l_{it} (D_{it} + X_{it} - M_{it})$

$$\frac{d L_{it}}{dt} = l_{it} \frac{d (D+X-M)}{dt} + Q \frac{d l_{it}}{dt}$$

$$= l_{it} \left\{\frac{d D_{it}}{dt} + \frac{d X_{it}}{dt} - m_{it} \frac{d D_{it}}{dt} - D_{it} \frac{dm_{it}}{dt}\right\} + Q \frac{d L_{it}}{dt}$$

$$= l_{it} (1 - m_{it}) \frac{d D_{it}}{dt} + l_{it} \frac{d X_{it}}{dt} - l_{it} D_{it} \frac{d m_{it}}{dt} + Q \frac{d l_{it}}{dt}$$

$$= l_{it} (1 - m_{it}) \frac{d D_{it}}{dt} + l_{it} \frac{d X_{it}}{dt} + l_{it} (mi_0 - mi_1) D_{it} + Q \frac{d l_{it}}{dt}$$

The first term on the right side of the equation measures the changes in domestic demand on employment, the second term measures the effect of changes in Exports and the third term measures the changes in import penetration. The last term measures the effect of productivity changes. Thus, this approach provides a method for separating the *Scale effect from the Composition effect* of trade on employment. Specifically, the effect of trade on employment is caused by changes in labour intensity of production across industries and through the expansion or contraction of output due to export or import changes.

The *Scale effect* and *Composition effect* explain the relationship between trade and overall employment. A change in the composition of output towards labour intensive industries will shift the demand for labour to the right and with fairly elastic labour supply, this will increase the overall employment. However, if trade stimulates faster productivity growth then trade induces additional effects which need to be captured. Trade induced productivity growth can arise due to decrease in X-inefficiency following increased international competition and trade induced technological transfers (via increase in imports of capital goods). Both these can affect the quantity and kind of labour required to produce output. These effects of trade-labour linkage within industries are defined as *Process effects* and are broadly captured by the impact of trade in goods on the own price elasticity of labour demand.

The effect of trade liberalization on labour demand elasticity is an important issue to examine as it has important labour market outcomes. There are two main channels by which trade openness can increase labour demand elasticity. First, trade reforms provide access to cheaper imports of intermediate and capital goods and semi-finished goods which are substitutes for domestic labour. The second channel is through Marshall's four rules of derived labour demand[8], i.e., labour demand is more elastic the greater the elasticity of demand for output. Now when output demand elasticity is high then a percentage in output price leads to greater percentage change in employment. Given that trade liberalization leads to greater availability of substitutes for any product, product demand elasticity increases which in turn raises factor demand elasticities.

This is captured by the estimation of the labour demand equations at the industry level. Hasan, Mitra and Ramaswamy (2003) have looked at how major trade reforms initiated in India in 1991 affected the industry-level elasticity of labor demand in the manufacturing sector by using state-level data. Their results indicate that labor demand elasticities

[8]The four rules of derived labour demand are:

(i) Labour demand is more elastic the greater the elasticity of substitution (if w increases firm can easily substitute towards capital and will reduce labour demand more)

(ii) Labour demand is more elastic the greater the elasticity of demand for output (If w increases MC of production rises. This raised p and reduces product demand. The greater the reduction in consumer demand the larger the reduction in employment)

(iii) Labour demand is more elastic the greater the supply elasticity of capital.

(iv) Labour demand is more elastic the greater the labour share in total cost

increase with reductions in protection. They also find that the response of labor demand elasticities to protection is conditioned by the nature of labor institutions. Protection thus appears to have the effects that theory would predict. By using different set of data, Goldar (2009) found evidence that trade liberalization had a positive effect on labour demand elasticity in Indian manufacturing. He further found that downward trend in labour demand elasticity continued from pre-reforms period to post reforms period till mid-1990s. The trend was reversed after mid-1990s which the author attributed to significant trade liberalization with lagged effect, weakening of the bargaining power of trade unions and labour market reforms.

Both these studies have estimated labour demand elasticity for manufacturing in pre and post reform time periods. The current study estimates the demand elasticities across three categories of industries, i.e., export oriented, import oriented and domestically oriented industries. To capture the effect of trade openness on labour demand along with other demand factors of price and quantity, the following demand equation for labour, which is the standard derived demand equation augmented by trade integration variable[9].

[9] Assuming a Cobb-Douglas production function for representative firm in industry i in period t:

$$Q_{it} = A^{\gamma} K_{it}^{\alpha} N_{it}^{\beta} \quad (1)$$

where:
Q = real output
K = capital stock
N = units of labour utilized

and where α and β represent the factor share coefficients and γ allows for factors changing the efficiency of the production process. A profit-maximising firm will employ labour and capital at such levels that the marginal revenue product of labour equals the wage (w) and the marginal revenue product of capital equals its user cost (c). Solving this system simultaneously to eliminate capital from the expression for firm output e following expressions is obtained:

$$Q_{it} = A^{\gamma} \left(\frac{\alpha N_{it}}{\beta} \cdot \frac{w_i}{c}\right)^{\alpha} N_{it}^{\beta} \quad (2)$$

Taking logarithms and rearranging equation (2) allows us to derive the firm's, and therefore the industry's, derived demand for labour as:

$$\ln N_{it} = \phi_0 + \phi_1 \ln (w_i/c) + \phi_2 \ln Q_{it} \quad (3)$$

where :

$\phi_0 = -(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta) / (\alpha + \beta)$
$\phi_1 = - \alpha / (\alpha + \beta)$
$\phi_2 = 1 / (\alpha + \beta)$

If the technical efficiency of the production process increased over time then the rate of technology adoption and increases in x-efficiency would be correlated with trade changes, therefore it is hypothesized that parameter *A* in the production function varies with time in the following manner:

$A_{it} = e^{\delta_0 Ti} M_{it}^{\delta 1} X_{it}^{\delta 2}$, $\delta_0, \delta_1, \delta_2 > 0$

where:
T = time trend
M = import penetration
X = export penetration

$L_{it} = \alpha + \beta_1 W_{it} + \beta_2 Q_{it} + \varphi Z_{it}$ (5) Where

Lit = employment in industry i at time t

Wit = Real wage in industry i at time t

Qit = Real output in industry i at time t

Zit = degree of openness of industry i at time t

The degree of openness is captured by using two proxies for trade openness. These are Export- output ratio (EO) at the industry level and Import penetration ratio (IM). The justification for this is that with trade liberalization, firms would have to compete with imports. If firms are not competitive then import penetration would be high. Similarly, with regard to export, trade liberalization induces higher exports for competitive firms. Further, these two proxies separate the effects of import competition from export orientation.

By doing so, Equation (5) can be rewritten as:

$L_{it} = \alpha + \beta_1 W_{it} + \beta_2 Q_{it} + \varphi_1 IM_{it} + \varphi_2 EO_{it}$ (6)

Equation 6 will be estimated by using the natural logarithms of the variables so that the estimated coefficients can be interpreted as elasticities of labour demand. We would expect $\beta_1 < 0$ and $\beta_2 > 0$. Also, we would expect $\varphi_1 < 0$ and $\varphi_2 < 0$. The estimation will be based on panel data method. Once econometric models have been estimated desired policy simulations can be run to identify impacts of shocks to domestic demand, productivity and India's export markets on employment.

All the industry-level equations are having time dimension of 20 years and around 150 industries. This panel data set would be used to run the regression equations using the fixed effects model. Hausman test would be performed to find the appropriateness of using the fixed model compared to the random effects model. It is felt that a priori a fixed effect model would be appropriate as the omitted variables may be related to the explanatory variables taken. Again there are certain factors which are fixed over time and their impact may not vary over time - like industry to which the firm belongs etc. It is also expected that

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which implies:
$\ln N_{it} = \phi^*_0 - \mu_0 T - \mu_1 \ln M_{it} - \mu_2 \ln X_{it} + \phi_1 \ln (w_i/c) + \phi_2 \ln Q_{it}$

With:
$\phi^*_0 = -(\alpha \ln \alpha - \alpha \ln \beta) / (\alpha + \beta)$
$\mu_0 = \mu\delta_0$
$\mu_1 = \mu\delta_1$
$\mu_2 = \mu\delta_2$
$\mu = \gamma (\alpha + \beta)$

This section has been taken from Greenway et al (1998)

the within group variability would be high given the diversity of the industries. Thus a fixed effect model theoretically seems more appropriate.

(b) Methodology for Firm level analysis

Industry-level analysis fails to capture the re-allocations within particular industries due to trade opportunities. Recent literature on firm-level studies analyses intra-industry re-distribution effects which cannot be captured at the sectoral-level. The landmark paper in this respect has been that of Melitz (2003) who extended the heterogeneous firm model of Krugman (1980) to show that more productive firms would export and the least productive would exit the market. Moreover, the particular industry is exposed to trade more would be the additional inter-firm reallocations towards more productive firms. Since the primary enquiry of this proposal is to find out the impact of liberalization on employment, employment composition and linking trade through productivity to employment this is worth exploring at the firm-level. De Hoyos and Lacovone (2011) have shown that trade liberalization affects productivity at firm-level through four channels

1. Intensified market competition
2. Improved trade facilitation in trading intermediate products
3. Export promotion
4. FDI

While considering the relationship between exports and firm performance two issues have to be kept in mind. First, it is not clear that trade liberalization induced internal restructuring makes firms more productive and hence induce them to export. Second, whether exports promote productivity and employment (learning-by-exporting hypothesis) has to be established. Thus the major problem at the firm level to test this relationship is to account for this possible endogeneity. A fixed effect panel data model following Cameron and Trivede (2004) can be used for this purpose. The specification of the empirical model is as follows:

$$\ln \Pr od_i = \beta_0 + \beta_1 \ln Exp_i + \beta_3 \ln R\&D_i + \beta_4 (\frac{Exp + \mathrm{Im}\, p}{Sales})_j + \beta_5 T_i + \beta_6 NT_i + \beta_7 I_i + \varepsilon_i \ldots . (1)$$

$$\ln Emp_i = \beta_0 + \beta_1 \ln Exp_i + \beta_2 \ln Sale_i + \beta_3 \ln Wage_i + \beta_4 (\frac{Exp + \mathrm{Im}\, p}{Sales})_j + \beta_5 T_i + \beta_6 NT_i + \beta_7 I_i + \beta_8 (L/K)_i + \varepsilon_i$$

…..(2)

The variables taken are logarithm of productivity (Prod) as a dependent variable in the first equation. The independent variables being logarithm of exports (Exp), logarithm of research

and development expenditure (R&D) and a industry-level openness variable to which the firm belongs constructed as export plus imports by the total sales of that industry j to which the firm i belongs. This is an important variable which can test for impact of openness on productivity. This variable would vary over time for the particular industry and capture the dynamics of industry-level openness. The impact of trade policy on firms would be captured by costs related to tariff (T), non-tariff Barriers (NTBs) and reduction in costs due to incentives (I). The L/K ratio capturing differing technologies across firms would be calculated by employment/capital employed where capital employed a value parameter would be deflated by price index of capital. The employment variable would be broken up into skilled, semi-skilled and un-skilled according to the qualification and work done by the employees. Employees involved in planning and execution would be considered as skilled. Those doing skilled but regular jobs taking instructions from supervisors would be considered as semi-skilled and the peripheral works supporting the process like peons, people involved in loading and unloading would be considered as un-skilled. Separate regressions would be run to find out the impact of trade on each of these types of labour. The other classification of the labour which is important is according to gender. Female workers may have been impacted differently than male co-workers due to trade. We can estimate the employment equation separately for male and female workers. Further, wage data from survey can also test for how female-male wage gap have been impacted by trade.

The second equation is self-explanatory we are estimating the impact of exports, industry-level openness and other firm variables like wages and sales on employment. Productivity would be calculated as Value added/total employees and Output/total employees. Two separate equations would be estimated for these two different productivity values at the firm-level.

The data for the firm-level study would be generated from a survey of 250 firms. Ratio of export-oriented, import-oriented and non-traded firms in the sample would be decided by the ratio of such firms in the aggregate database of firms (PROWESS). The kind of variables required for the study which can give us interesting insights, like trade policy variable effects at the firm-level, impact of trade on types of labour can only be performed provided the data can be directly collected from the firms.

5. Data Requirements and Sources

Assessment of increased trade on employment requires industry wise trade data on exports and imports. The databases that would be accessed are DGCI&S (Directorate General of Commercial Intelligence and Statistics) trade data of India and WITS database. Similarly, organised industry wise employment, output data is also necessary which is available in the Annual Survey of industries brought out by CSO, India. These two different data series, which

are different in classification of industries and tradable products need to be combined through concordance tables.

Time period considered would be 1999-2000 to 2011-2012. The time period was chosen keeping in mind major changes incorporated in ASI data from 1999-2000 when all electricity undertakings other than captive units as well as departmental undertakings such as railway workshops, etc. have been kept outside the purview of this survey. Terminal year is based on the latest year for which data is available.

Survey of 250 firms through a structured questionnaire containing information on trade costs, type of labour engaged, technology used, firm-level policies to generate more profits, industry competition, price, sales according to products, exports according to destinations etc. These data if captured would become an unique dataset on which many future research studies also can be attempted.

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Appendix 1

Trade Reforms in India

India's post- independence development strategy was that of national self-sufficiency for which import-substitution was central. "Export Pessimism" conditioned the planning strategy. As such, India's trade regime was amongst the most restrictive in Asia underlined with high nominal tariffs and extensive non-tariff barriers. The regime included complex import licensing system, restrictions on exports and imports to the public sector (canalization), phased manufacturing programs that mandated progressive import substitution and government purchase preferences for domestic producers. Such highly protective trade regime seriously affected the efficiency of Indian industries and contributed to high cost of production as well as to their lack of technological dynamism. It also created bias against exports which got reflected in India's poor export performance. India's share in world exports which was 2 per cent in 1950 fell to 0.4 per cent in 1980 and to 0.5 per cent in 1990 (Goldar 2002).

During the 1980s, India embarked on market reforms to ease import and industrial licenses. Trade policy remained restrictive and only 12 per cent of manufactured products could be imported under open general license and average tariff was still high at 90 percent. The macroeconomic imbalances that followed increased India's vulnerability to shocks. As a result of gulf war in 1990, the country was plunged into a severe balance of payment crisis. In response, a major trade reform was undertaken in 1991 as part of wider economic reform supported by IMF. Radical changes in trade reform were ushered in. Some of them are: (a) reduced role of import and export control system- abolition of supplementary licenses for all importers except small-scale industries; removal of quantitative restriction on imported inputs and capital goods for export; enhancement of Import Replenishment license entitlements. Another important step in trade reform has been the reform of the exchange rate system which has become largely market determined. In addition to this, tariffs were drastically reduced.

It was only after a challenge by India's trading partners in the Dispute Settlement Body (DSB) of the WTO that these goods were freed of licensing a decade later in April 2001. In 1991, the highest tariff rate stood at 355 per cent, simple average of all tariff rates at 113 per cent and import weighted average of tariff rates at 87 per cent. The general direction has been towards liberalization with top rates coming down to 25 per cent in 2003-04 and further to 20 per cent in 2007-08. India's simple tariff rates declined to 12 per cent in 2010-11. India remained committed to further trade liberalization.

As regards to the composition of exports between the year 2001 and 2011 the major gain in share has been petroleum products (15%) and engineering products (11%). Textiles have lost around 15% in terms of shares in total exports. Hence India's export basket has become more sophisticated over the years. If we look at region-wise share of India's exports during the same

period then Asia has been a major gainer from 37% to 50%. Whereas, EU and USA, who had a combined share of 50% in 2001 have come down to 39% in 2011. Thus destination-wise other developing and emerging markets are becoming more important markets for Indian products. In terms of imports ores and metals have increased substantially in share from 2.61% in 2001 to 14.17% in 2009-10. In terms of share in top 100 import products in the World the share of Indian exports is significantly high in petroleum products (6.7%), diamonds (23.8%) and jewelry items (28.5%) in 2011.