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India's Trade Sensitive Employment Analysis at the Sectoral Level

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India's Trade Sensitive Employment

Analysis at the Sectoral Level

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Abstract

The current paper examines to address the issues related to employment generation vis-à-vis export growth. The literature identifies that the relationship is complex and is dependent on number of factors such as labour intensity of production process, technology integration, import content in exports or degree of domestic value addition, business cycle etc. to drive or thwart higher employment. It is also linked to availability of skilled labour force as per requirement. Using ASI and TiVA database, three panel datasets have been created from 2008/09-2013/14 to analyse this relationship. The study finds that in exporting industries overall growth in employment is higher than the manufacturing sector as a whole, however, critical variations are seen with respect to the firm size and factor intensity. Labour intensive sectors has greater potential to hire workers, especially female workers. The paper also highlights that factor intensity and export orientation does not provide a comprehensive picture since two other compelling forces like domestic value addition and total factor productivity has significant role to play. The study suggests that female employment rises in labour intensive industries where productivity is low, contractual and managerial employment rises where productivity is high. However, contractual employment declines with the rise in exports at industry level. In case productivity rises along with domestic value addition it is observed that employment of contractual workers is enhanced. Further, rise in domestic value addition does not reveal a significant relationship with rising employment which is perhaps due to the fact that not many industries in India are currently connected with global value chain.

JEL Classification: F14, F16

Keywords: Trade, Contractual Employment, Managerial Employment, Female Employment, Domestic Value Addition.

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Readers should send their comments on this paper directly to the author.

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India's Trade Sensitive Employment: Analysis at the Sectoral Level

Introduction:

The relationship between international trade and employment growth is complex. Trade liberalisation in developing countries triggers a process of specialization in favour of labour intensive goods. Since labour is an abundant factor of production in most developing countries, it implies that openness to trade increases the demand for labour and hence, has the potentiality to generate employment in large scale. However, the historical evidences show a mixed results. Many studies find that it is true mostly in East and South East Asia (Milner and Wright, 1998; Orbeta, 2000, etc.). On the contrary, African and Latin American economies have reported that trade integration has a negative impact on domestic employment (Mesquita and Najberg, 2000; Ravenga, 1994; Rattso and Torvik, 1998; etc.). The idea that specialisation in labour intensive industries in labour abundant developing countries will generate substantial employment come from the theoretical background of Heckscher-Ohlin type models which have strong assumption on identical technology across the countries. It is far from a realistic scenario. The New Trade theories on the other hand with an assumption of technological differences among countries argue that trade liberalisation produces multiple equilibria (Grossman and Helpman, 1991) and countries may land up with different equilibrium situation in post liberalisation scenario. Vivarelli (2002) opines in reference to 'technological catch-up' hypothesis that trade openness may bring new technologies in developing countries which potentially affect employment adversely through an increase in total factor productivity. So, trade theories provide a conditional link between trade and employment especially for developing countries. Trade openness could increase employment by increasing output growth but it could hamper employment also by enhancing total factor productivity. The final outcome depends on the interaction between these two competing effects. According to Vivarelli (2002), the possibility of declining employment is high in countries those have significant supply side constraints such as poor infrastructure, inefficient labour market etc. C. Michael Aho and James A. Orr (1981) published a paper in Monthly Labour Review[1] which analysed the trade sensitive employment in US economy. The paper argues that with the expansion of exports significant job opportunities have been created in the USA. However, imports have also grown, slowing employment growth or displacing workers in import-competing industries. The net effect of the trade-related changes in employment opportunities is relatively small and is largely a function of the business cycle. But, the net effect masks the impact on workers because international trade

[1] published by the U.S. Bureau of Labour Statistics

theory predicts that workers in export- and import-competing sectors will possess different skills. Due to the rise of global value chain and international production network, export oriented sectors also outsource components and accessories internationally which rise the share of foreign value added in national exports. This also has a potential negative impact on domestic employment even when total export rises.

Studies conducted on Indian data have also recognised the change in employment trend and structure. Several experts identified trade liberalisation as a major catalyst to this change. Meherotra et. al. (2014) noted that there has been a fall in demand for manufacturing exports and increasing capital intensity also resulted in a decline in manufacturing employment during 2004-05 – 2009-10. Banerjee and Veeramani (2015) found a strong negative relationship between import tariff rates and female employment rate, supporting the hypothesis that firms, when exposed to international competition, tend to reduce costs by substituting male with female workers. On the contrary, greater use of new technology and capital intensive production biases the gender composition of workforce against females. So rise in female employment is a function of two opposite forces: one which pushes unskilled workers due to cost consideration and other which increases productivity by introducing new technology and thereby reducing employment. Kapoor (2016) also observed that with the growing capital intensity of production, the role of labour vis-à-vis capital has declined in the production process and in India we have observed declining share of labour payment as percentage of gross value added. The share of skilled labour (non- production workers i.e. supervisory and managerial staff) in the wage pie rose from 26.1% to 35.8%, while that of unskilled labour (production workers) fell from 57.6% to 48.8% of total wage bill during 2000/01-2011/12. However, we have observed the rise of unskilled and contractual workers in the production process.

Kucera, et al. (2012) estimate the effects of the 2008–09 trade contraction on employment in India and South Africa, using social accounting matrices (SAMs) in a Leontief multiplier model. The study finds that India and South Africa experienced substantial employment decline because of trade contraction with the European Union and the United States. Hasan et al. (2012) studied the impact of trade liberalisation on employment in India using state and industry-level unemployment and trade protection data. The state-level analysis reveals that urban unemployment declines with trade liberalization in states with flexible labour markets and larger employment shares in net exporter industries; and industry-level analysis indicates that workers in industries

experiencing greater reductions in trade protection were less likely to become unemployed, especially in net export industries. Vashisht (2015) noted that the direct impact of trade on manufacturing jobs has been positive. However, trade induced decrease in labour demand is significant which neutralized direct job gains to a great extent. Therefore, unlike other Asian economies, the overall employment gain from trade has been minimal in India. Veeramani (2016) also found that employment supported by Indian exports (both merchandise and services) increased at an annual growth rate of 3.4 percent from about 34 million in 1990-00 to 62.6 million in 2012-13, which is faster than that of country's total employment. However, while the export-led employment increased in absolute terms, jobs supported per million dollars of exports declined during the period. This can be attributed to change in the composition of exports in favour of more capital and import intensive sectors.

The existing literature on India reveals that employment structure has undergone a significant change in last two decades. At one hand, more jobs are created for unskilled workers but their share in factor payments are not increasing. Female employment is a function of export growth of highly labour intensive sector. Secondly, technology integration in the production system, rising import of parts and components, increase in productivity, etc. have a negative impact on the job growth. Jobs are created for more skilled workers in sectors which is embracing more capital oriented production system. Overall, there has been job growth when export rises steadily and it slows down when export stabilises or declines. Most of the studies look at one or two issues at one go and do not provide a holistic view. In this paper, our main attempt is to see at sector and firm level the relationship among major variables such as employment, export, domestic value addition, productivity and wages etc. together. The dynamics among the variables will help us to validate theoretical and empirical findings of earlier studies and let us know the extent of negative and positive forces to determine the relationship between employment and exports in Indian context.

Database used and their description:

To understand the influence of exports on employment. Plant/firm level, Annual Survey of Industries (ASI) database is used which is collected by the NSSO and processed by CSO. In the ASI frame all the industries are categorized in their apt National Industrial Classification (NIC) groups on the basis of the principle product manufactured, which follows the structure of Standard Industrial Trade Classification (SITC) of United Nations (UN). Sample period considered for our empirical application is from 2008-09 to 2013-14.

Data is studied at 2 levels i.e. At 2 digit and 3 digit NIC 2008 codes. Two vital variables through which exports affect the employment are total factor productivity and domestic value addition.

We will estimate total factor productivity in our paper considering the Cobb-Douglas production function with three inputs capital, labour and material. Thus, from ASI database, we will extract information regarding the fixed assets, working capital, employment, labour cost, output and exports of firms. As ASI database provides the industrial information only for the registered firms because it covers only the factories registered under Sections 2m(i) and 2m(ii) of the Factories Act, 1948 i.e. those factories employing 10 or more workers using power; and those employing 20 or more workers without using power. So, to get the idea of unorganised sector employment with respect to sectoral classification, we have used the Employment and Unemployment rounds of 2007 and 2011. NSSO database will help us to build the myopic view towards the industrial exporting sectors' employing behaviour.

To gain the higher insights of contribution of exports in employment can be studied with the help of "Domestic Value addition" which is taken from OECD-WTO TiVA database. TiVA database make use of 34×34 input-output table (IOT). Official IOT, prepared by the statistical agencies in different countries, form the basis of the construction of the inter-country IOT by WIOD and TiVA tables. Due to paucity of value-added data, which is available till 2011-12, we have forecasted its data till 2013-14. We have concorded the industrial classification given in TiVA database with the NIC 2008 codes to merge this dataset with the ASI.
List of Variables used in paper, necessary variables are deflated with WPI:

- **Capital (K):** It is the capital stock. This we have calculated using the Perpetual Inventory Accumulation following the idea proposed by Srivastava (1996) and Nag (2005). Model identifies the initial investment, constant growth rate of capital stock from the data of gross fixed capital and accumulated depreciation. To get capital, the net value closing of all the fixed assets' of firms are taken, which includes Land, Building, Transport equipment, Plant & Machinery, Computer equipment including software, Pollution control equipment , Others and Capital work in progress. It is provided in Block-C of ASI dataset.

- **Labour (L):** ASI provides the data in its Block-E regarding employment and labour cost. For this, it classifies labour as following:

1. Female: Female workers employed directly

2. Male: Male workers employed directly
3. All directly employed : 1 + 2
4. Contractual workers : Workers employed through contractors
5. Supervisor workers : Supervisory & managerial staff
6. All workers : 3 + 4 + 5 + Unpaid family members/ proprietor/ coop. members + Other employees

- **Wages (w):** Wages/salaries (in Rs.) is given in Block-E of ASI dataset for all types of workers discussed above.

- **Material (M):** Stock of Raw Materials is used as input. Raw Materials & Components and Packing materials is the variable used to calculate the Stock of Raw material, by taking its closing value difference from opening value. It is given in Block D of ASI which tells about the opening and closing balance of working capital and loans.

- **Output (Y):** It is the output. Ex-factory value of output is given in the ASI data for each firm which is considered as output variable at current prices.

- **Accumulated Depreciation (AD):** As ASI reports the book value of the fixed assets, so, having difference between net and gross closing capital, we get the accumulated depreciation.

- **Depreciation (Dep) :** It is defined for time period t as : $Dep_t = AD_{t+1} - AD_t$

- **Gross Fixed Assets (GFA):** It is defined with the gross closing value of all fixed assets.

- **Depreciation rate(δ_r):**It tells the rate at which fixed assets are depreciated.

- **Investment (I):** Investment in any time, (t) is defined as the difference between gross capital closing and opening.

- **Total Factor Productivity (TFP):** It is the share of output not expounded by the extent of inputs used in production.

- **Domestic Value addition (VA):** Total Domestic Value-Added embodied in gross exports (by Industry), which includes 3 components - Direct Industry Value-Added, Indirect Domestic Value-Added and Re-imported Domestic Value Added. It is taken from OECD-WTO TiVA database and forecasted for 2012/13 and 2013/14.
- **Domestic Value Added by Gross Exports (va_by_ex):** It tells about the share of domestic value added in gross exports by industry. Industries given TiVA are matched with the 2-digit NIC codes industry.

Methodology Used

- **Measuring Capital**

Capital stock used in the study is based on the book value of the fixed assets at the end of the year (given in ASI database). Using the Perpetual Inventory Accumulation Method capital stock for period t is defined as

$K_t = (1-\delta)K_{t-1} + I_t$, where δ is depreciation rate and I_t is investment in period t. Depreciation rate is determined endogenously following Srivastava (1996)

$Dep_t - AD_{t+1} - AD_t$

And $\delta_t = {}^{2}/_{L_n}$, where, $L_t = {}^{GFA_t}/_{Dep_t}$, Dep_t is the depreciation in year t and AD_t is the Accumulated depreciation in year i.

Thus we have calculated the unique depreciation rate of all firms in all years by taking mean of depreciation rate over all years. Now, capital stock can be determined easily, and to get K_{2008}, we have used the 'replacement value' considering the ratio of gross capital formation at national level at current and constant prices.

- **Defining Labour and Capital Intensive Industries/Firms**

The vital task is to identify the industries/firms which are labour or capital intensive or changing behaviour with time in the manufacturing sector. Labour intensity is defined as the ratio of total workers over capital. Both of these data is taken from ASI database. Workers include both directly employed and employed through contractors, employees other than workers (supervisory, managerial and other employees) and unpaid family members/proprietor etc. (Kapoor, 2016).

Das, Washwa and Kalita (2009) and Radhicka Kapoor (2016) have also worked on same grounds to identify the labour and capital intensive industries. In our paper, we are using the relatively different definition of labour and capital intensive industries:

"An industry is classified as labour intensive if its labour intensity (identified using labor-capital ratio via ASI dataset) is above the median value of all the industries given in a year. Similarly, an industry is classified as capital intensive if its capital intensity is below the median value."
To understand the impact of exports on employment, we will create three panel datasets for the period 2008/9-2013/14:

- Industry level at 2 digit NIC 2008 codes: It has 138 observations for 23 industries. It is calibrated with the Value Added Information from TiVA.
- Industry level at 3 digit NIC 2008 codes: It has 436 observations for 73 industries.
- Firm level at 3 digit NIC 2008 codes: It has 1299 observations for 219 firms.

- **Total Factor Productivity Calculation**

Frontier production function approach has been considered to estimate the Total Factor Productivity both at industry and firm level using Cornwell Schmidt and Sickles (1990). Here, dependent and independent variables are expressed in terms of log. Functional form of the model is:

$$y_{it} = \alpha_i + x'_{it}\beta + v_{it}$$

And

$$v_{it} \sim N(0, \sigma_v^2), i = 1, 2, \dots, N \quad , \qquad t = 1, 2, \dots, T$$

$$\alpha_i = \alpha_0 - u_i \quad , u_i \geq 0$$

To get the time varying effect in the model, α_i is replaced by the quadratic function of time

$$\alpha_{it} = C_{i1} + C_{i2}t + C_{i3}t^2$$

Or

$$w'_{it} = [1, t, t^2]$$

And

$$\vartheta_i = [C_{i1}, C_{i2}, C_{i3}]$$

Thus the equation becomes:

$$y_{it} = x'_{it}\beta + w'_{it}\delta_i + v_{it}$$

Here, δ_i can be estimated can be estimated by the regressing the residuals of $(y_{it} - x'_{it}\beta)$ for firm i on w'_{it} : that is on the quadratic function of time. Group OLS is used to get the estimated value of α_{it} which is consistent for all i and t as $T \to \infty$. Thus, productivity of each industry i at time t can be calculated as:

$$TFP_{it} = \exp(\widehat{\alpha_{it}})$$

We have considered a Cobb-Douglas production function considering 3 inputs (K, L and M) to estimate the productivity.

Trend in Indian Industries

Output, Employment, Factor Intensity and Productivity

In this section, we'll make an attempt to understand the employment trend and structure of manufacturing sector as a whole and major exporting sectors together. ASI firm level data is used for this purpose. Further, several firm level characteristics are used to decipher the pattern of employment growth more rigorously. The data considered for this analysis is for the period 2008-09 to 2013-14. We have also used NSSO employment and unemployment data to get deeper view on employment structure.

Table 1 below provides a snapshot of output and employment growth. The year 2008-09 in a way represents a period where India was not having many FTAs and 2013-14 is a representative year in post FTA era. India signed number of FTAs with Asian countries during 2010-2011. The table is divided into two parts: one for overall manufacturing sector and another one for export oriented sector. In any year, if an industry is exporting more than 15% of its produced output, we have considered it an exporting industry. Table 1 explains that output produced by exporting industry has been around 42% of total output produced by the manufacturing sector as a whole employing around 33% of total employed. Firms have further been divided into large, medium and small firms based on employment (small < 50, 50<= medium< 250, large >=250). It may be noted that output and employment growth of small sized firms have superseded others. It can also be observed that overall output growth of exporting firms have been 8.0% which is higher than manufacturing sector's overall growth of 6.7%. Employment growth of exporting sectors also have been more than overall manufacturing sector. However, interestingly, output growth of small exporting firms (14.8%) has been less than overall output growth of small firms (16.8%). The same trend is available for employment growth of small firms. It can be concluded that prima facie overall employment growth of exporting firms during the selected period is slightly more than employment growth in manufacturing sector as a whole but medium and small sized exporting firms have lesser employment growth. It is the large exporting firms which grew substantially both in terms of output and employment during the period.

Table 1: Output and Employment Growth

	Manufacturing Sector (Overall)					
	Output By ASI (in billion)			Employment By ASI (In thousand)		
	2008-09	2013-14	Growth	2008-09	2013-14	Growth
Overall	224.00	310.00	6.7%	11000.0	13000.0	3.4%
Large Firms	188.00	264.00	7.0%	8495.6	10400.0	4.1%
Medium Firms	33.70	41.30	4.2%	2302.6	2322.7	0.2%
Small Firms	2.20	4.79	16.8%	193.3	314.3	10.2%
	Major Exporting Sector					
Overall	88.40	130.00	8.0%	3517.56	4348.18	4.3%
Large Firms	78.70	117.00	8.3%	2799.85	3617.63	5.3%
Medium Firms	9.01	10.70	3.5%	660.45	642.67	-0.5%
Small Firms	0.75	1.49	14.8%	57.26	87.87	8.9%

Source: Calculated from ASI firm level data

Table 2 below provides some of the major performance parameters for manufacturing sector as a whole and export oriented sectors. Capital formation as percentage of output and capital-labour ratio increased for the manufacturing sector as a whole implying capital deepening of Indian industry. On the other hand, in case export oriented industries there has been a significant growth in capital-labour ratio but capital-output ratio fell. This indicates that output growth in export oriented industries is significant which corroborates the finding in Table 1. During the period 2008/09-2013/14, domestic value added as percentage of exports fell implying rise of imported components and accessories embedded in Indian exports. The decline is more pronounced in case of export oriented sectors.

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Table 2: Important Ratios in Manufacturing and Export Oriented Sectors

	Manufacturing Sector (Overall)		
	2008-09	**2013-14**	**Growth**
Capital formation/output	0.242	0.296	4.1%
Domestic Value Added/Export	0.657	0.633	-0.9%
Capital/Labour	0.257	1.154	35.0%
	Major Exporting Sector		
Capital formation/output	0.208	0.197	-1.1%
Domestic Value Added/Export	0.658	0.619	-2.1%
Capital/Labour	0.042	0.253	43.4%

Source: Calculated from ASI firm level data and TiVA database, OECD. Data on Domestic value added for 2013/14 is projected

At the next level, industries are divided into capital and labour intensive industries. Methodology of the same has been described in the previous section.

Table 3: Division of Industries based on factor Intensity

Labour- Intensive Industries	Capital -Intensive industries
10 Manufacture of food products	11 Manufacture of beverages
12 Manufacture of tobacco products	17 Manufacture of paper and paper products
14 Manufacture of wearing apparel	19 Manufacture of coke and refined petroleum products
15 Manufacture of leather and related products	20 Manufacture of chemicals and chemical products
16 Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	21 Manufacture of pharmaceuticals, medicinal chemical and botanical products
25 Manufacture of fabricated metal products, except machinery and equipment	22 Manufacture of rubber and plastics products
28 Manufacture of machinery and equipment n.e.c.	23 Manufacture of other non-metallic mineral products
32 Other manufacturing	24 Manufacture of basic metals
	29 Manufacture of motor vehicles, trailers and semi-trailers

Manufacture of textiles seems to be fluctuating behaviour between Labour and Capital intensive according to median of K/L. But as per mean it is Labour intensive industry). Following NSSO data, in manufacturing sector, textile is among one of the sectors where highest number of people are employed and hence, we have considered it separately to understand its employment structure in organised sector[2]. Apart from this, two industries had a structural shift.

- Shifting from K to L intensive: 18 Printing and reproduction of recorded media
- Shifting from L to K intensive: 30 Manufacture of other transport equipment

We have treated them separately as changing factor intensity category.

[2] Textile sector is excluded from the calculation under labor intensive industries in Table 6-9.

Table 4: Factor Intensity and Productivity Growth

Industries	Intensive	TFPG
16 Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Labour Intensive	6.47
13 Manufacture of textiles	Changing	1.95
14 Manufacture of wearing apparel	Labour Intensive	1.62
19 Manufacture of coke and refined petroleum products	Capital Intensive	1.59
20 Manufacture of chemicals and chemical products	Capital Intensive	1.25
30 Manufacture of other transport equipment	Changing L to K	-1.38
17 Manufacture of paper and paper products	Capital Intensive	-2.07
10 Manufacture of food products	Labour Intensive	-2.73
28 Manufacture of machinery and equipment n.e.c.	Labour Intensive	-3.63
31 Manufacture of furniture	Changing	-4.08
15 Manufacture of leather and related products	Labour Intensive	-4.08
22 Manufacture of rubber and plastics products	Capital Intensive	-4.58
11 Manufacture of beverages	Capital Intensive	-5.07
18 Printing and reproduction of recorded media	Changing K to L	-5.82
21 Manufacture of pharmaceuticals, medicinal chemical and botanical products	Capital Intensive	-5.98
29 Manufacture of motor vehicles, trailers and semi-trailers	Capital Intensive	-6.02
23 Manufacture of other non-metallic mineral products	Capital Intensive	-6.50
12 Manufacture of tobacco products	Labour Intensive	-7.33
25 Manufacture of fabricated metal products, except machinery and equipment	Labour Intensive	-7.70
24 Manufacture of basic metals	Capital Intensive	-7.82
26 Manufacture of computer, electronic and optical products	Changing	-8.37
27 Manufacture of electrical equipment	Changing	-12.06
32 Other manufacturing	Labour Intensive	-21.20

* TFPG calculated for the period 2008/09-2013/14

Before we make attempts to link exports with employment, it is interesting to observe, that total factor productivity has increased for some of the labour intensive exports and who are also export oriented sectors during the period 2008/09 and 2013/14. For example, wood products, textile and apparel, etc. have higher TFPG. However, majority of the industries lost in terms of productivity growth during this time. Table 4, arranges the industries in terms of productivity growth.

Employment Structure and Factor Intensity

Let us now, turn towards more detailed discussion on the structure and trend of employment in various sectors in India. In this section, we have considered both ASI and NSSO database. It is important to note that ASI data has limited number of sub-headings on employment structure but NSSO has more details. Further, NSSO accounts for informal employment additionally in the sector. However, data is available up to 2011-12. We have used 64th and 68th Round for the analysis.

It may be noted that employment growth has been 1.70% in labour intensive industries but it was 6.8% in case of capital intensive sectors. Wages and Salaries growth also has been higher in capital intensive sectors compared to labour intensive sectors. However, total people employed in labour intensive sector has been much higher than capital intensive sector. In 2013/14, following ASI data total employment in labour intensive sector was 3.63 million. On the contrary, the figure has been only 1.2 million in capital intensive sectors. Interestingly, Textile Industry alone has the potential to employ more than total workers in the capital intensive sector. And overall employment of textile industry grew at 1.30%. The growth of supervisory and managerial staff and contractual workers in capital intensive sector has also superseded labour intensive sector. However, female employment growth is higher in labour intensive sector. In textile sector there is increase in each type of employment but growth of directly employed female workers is least, just 0.8%.

Table 5: Employment and Wages as per ASI Data

	Labour-intensive Manufacturing Sector					
	Employment (in million)			Nominal Wages & Salaries (in Rs billion)		
	2008-09	**2013-14**	**Growth**	**2008-09**	**2013-14**	**Growth**
Workers employed through contractors	0.93	0.85	-1.9%	39.6	77.6	14.4%
Supervisory & managerial staff	0.28	0.32	2.4%	98.9	213	16.6%
Female workers employed directly	0.38	0.60	9.7%	10.2	27	21.5%
Male workers employed directly	1.24	1.40	2.5%	99.2	192	14.1%
Total employees	3.34	3.63	1.7%	300	606	15.1%
	Capital-intensive Manufacturing Sector					
Workers employed through contractors	0.25	0.38	9.1%	14.80	40.40	22.2%
Supervisory & managerial staff	0.10	0.14	7.9%	42.20	114.00	22.0%
Female workers employed directly	0.03	0.04	5.0%	1.58	4.09	21.0%
Male workers employed directly	0.39	0.50	4.9%	41.30	92.40	17.5%
Total employees	0.87	1.20	6.8%	115.00	287.00	20.1%
	Textile Industry					
Workers employed through contractors	0.18	0.21	3.0%	9.44	19.40	15.5%
Supervisory & managerial staff	0.09	0.11	2.4%	22.20	45.50	15.4%
Female workers employed directly	0.20	0.21	0.8%	7.73	16.80	16.8%
Male workers employed directly	0.81	0.85	0.9%	48.20	91.70	13.7%
Total employees	1.40	1.50	1.3%	98.10	194.00	14.6%

Source: ASI Database

Now turning to NSSO data, we can find nuanced picture of employment structure in labour and capital intensive industries. Compared to 2007 data, it is revealed that percentage wise more employees are in the age bracket of 30-45 years in case of capital intensive industries with a significant decline in the category of 45-60 years. It is important to note that more than 75% employees are male and there has been some increase (in terms of percentage distribution) of female employees in labour intensive industries during the period 2007 and 2011. Table 8 and 9 provides a summary picture of employment in terms of education category and skill. It may be noted that both in capital and labour intensive industry, the employment of unskilled/semi-

skilled workers have increased but more significantly in labour intensive industries. It is very clear that in terms of percentage, there is a decline of skilled workers. The share of employees with education level up to primary has increased during the selected period.

Table 6: Percentage Age distribution of employees in labour and capital intensive industries (as per their principal status)

	2007			
Age	**15-30**	**30-45**	**45-60**	**>60**
Labour - intensive	39.66	35.15	18.32	4.99
Capital - intensive	34.13	36.95	24.25	3.43
Overall	37.1	35.03	19.23	6.46
	2011			
Labour - intensive	35.25	38.22	18.89	5.68
Capital - intensive	37.32	41.04	17.96	3.45
Overall	36.67	37.59	19.13	5.1

Source: Authors' calculation from NSS data

Table 7: Percentage distribution of employees in terms of Gender in labour and capital intensive industries (as per their principal status)

	2007		2011	
	Male	**Female**	**Male**	**Female**
Labour - intensive	76.36	23.64	75.45	24.55
Capital - intensive	85.96	14.04	88.01	11.99
Overall	72.99	27.01	76.25	23.75

Source: Authors' calculation from NSS data

Table 8: Percentage distribution of employees in terms of Education in labour and capital intensive industries (as per their principal status)

	2007						
	not literate	**literate without formal education**	**till primary**	**Middle**	**secondary**	**senior secondary**	**above 12**
Labour - intensive	21.98	0.99	10.01	19.12	23.00	14.11	10.80
Capital - intensive	17.13	0.51	8.37	11.42	19.38	16.16	27.02
overall	26.35	0.84	9.37	17.59	21.02	12.38	12.46
	2011						
Labour - intensive	20.28	0.68	27.31	20.41	13.22	7.41	10.70
Capital - intensive	13.15	0.50	15.60	16.47	16.75	10.40	27.13
overall	19.73	0.66	26.14	20.59	13.82	7.45	11.62

Source: Authors' calculation from NSS data

Table 9: Percentage distribution of employees in terms of Skill in labour and capital intensive industries (as per their principal status)

	2007		2011	
	Unskilled/semi-skilled	**Skilled**	**Unskilled/semi-skilled**	**Skilled**
L - intensive	74.45	25.55	81.90	18.11
K- intensive	55.38	44.62	62.47	37.53
overall	74.43	25.57	80.93	19.07

* Skilled workers are the people who have attained education at least till senior secondary.

Source: Authors' calculation from NSS data

Econometric Framework

In this section, an attempt has been made to understand the relationship between exports and employment more in details through their statistical robustness. Several independent variables such as productivity, wages, factor intensity, domestic value added, etc. are considered to control the effect between export and employment generation. Different dependent variables such as female, male, contractual employment etc. have been tested. We have looked into both industry and firm level effect for the period 2008/9-2013/14. A panel data approach has been considered for this purpose. All results confirm fixed effect model.

The list of dependent variables ("x" in the equations) used

- All Employed = Direct male and female workers + Contractual workers + Supervisors and Managers+ Other employees + Unpaid family members +proprietor + Coop. members
- Male workers employed directly
- Female Workers employed directly
- Total Directly employed workers
- Workers employed through contractors
- Supervisory & managerial staff

Independent variables used in the regressions:

- **Export** : Exports by the industries
- **tfp_hat**: Estimated total factor productivity
- **all_wages**: Average wages considering all employment
- **fm_wages**: Average wage of male and female workers together who are employed directly
- **contract_wages**: Average wage of contractual workers
- **super_wages**: Average wage of supervisory and managerial staff
- **va_by_ex**: Domestic value added/exports
- **labor_by_cap_ratio:** Labour/Capital
- **D_0:** Dummy variable if labour intensive industry, then D_0=1
- **D_3:** Interaction dummy: $D_3 = d_0$*log(L/K)
- **Ind_dum:** matrix of dummies for each industry at NIC- 3 digit level

Subscripts used in the regression equation:

- i : industries (either at NIC 2-digit or 3-digit, depending on the regression equation)
- t : time period i.e. 2008/9-2013/14
- j : firms i.e. small, medium or large depending on total workers in the firm

Log transformation has been done on each variables to handle non-linearity among the variables.
Three set of regressions have been conducted.

1. At NIC-3 digit level, employment with respect to exports.

$$\log("x")_{it} = \alpha_0 + \alpha_1 \log(export)_{it} + \alpha_2 \log(tfp\_hat)_{it} + \alpha_3 \log("x"wages)_{it} + \alpha_4 D_{0i} + \alpha_5 D_{3it} + \varepsilon_{it}$$

2. At NIC-2 digit level, employment with respect to domestic value added by exports and exports. This is due to the fact that domestic value addition data from TiVA/OECD has been mapped against NIC-2 digit level.

$$\log("x")_{it} = \alpha_0 + \alpha_1 \log(va\_by\_ex)_{it} + \alpha_2 \log(export)_{it} + \alpha_3 \log(tfp\_hat)_{it} + \alpha_4 \log("x"wages)_{it} + \alpha_5 D_{0_i} + \alpha_6 D_{3_{it}} + \epsilon_{it}$$

3. At NIC-3 digit level, employment with respect to exports at firm level where industry level dummies have been considered to manage the fixed effect model.

$$\log("x")_{ijt} = \alpha_0 + \alpha_1 \log(export)_{ijt} + \alpha_2 \log(tfp\_hat)_{ijt} + \alpha_3 \log("x"wages)_{ijt} + \alpha_4 D_{0_j} + \alpha_5 D_{3_{ijt}} + \alpha_6 (Ind\_dum)_j + \epsilon_{ijt}$$

Empirical Results

1. Table 10 describes the regression result of equation 1 at NIC 3-digit level where different types of employment are considered as dependent variables.
2. Table 11 provides the results of equation 2 where NIC-2 digit level data has been considered. This is due to the fact that domestic value addition data from TiVA/OECD has been mapped against NIC- 2 digit level.
3. Table 12, provides firm level regression results of equation 3 where NIC-3 digit industry level dummies have been considered to manage the fixed effect model.

[1] In case of regression of male and female directly employed, independent variables of wages is taken of male and female wages together.

Table 10: Regression Result at Industry level (On NIC 3 digit)

On NIC 3 digit	1	2	3	4	5	6
VARIABLES	Female workers	Male workers	All directly employed	Contractual Workers	Supervisory & managerial staff	All Employed
export	0.0840***	0.0157*	0.0109	-0.0512***	0.0148	-0.0036
	(0.0231)	(0.0092)	(0.0089)	(0.0107)	(0.0121)	(0.0090)
tfp_hat	-0.0302	-0.0356	-0.0194	0.1030***	0.0032	-0.0209
	(0.0794)	(0.0317)	(0.0306)	(0.0376)	(0.0409)	(0.0304)
"x" wages	0.6597***	0.4074***	0.4902***	0.6776***	0.4857***	0.5408***
	(0.0703)	(0.0280)	(0.0271)	(0.0198)	(0.0317)	(0.0264)
d_0 : if labour - intensive == 1	8.1172***	2.4544***	3.9010***	4.8659***	6.1052***	5.3694***
	(1.3436)	(0.5358)	(0.5176)	(0.6547)	(0.7141)	(0.5203)
$D_3 = d_0$*log(L/K)	0.6035***	0.1854***	0.2952***	0.3733***	0.4680***	0.4091***
	(0.1027)	(0.0410)	(0.0396)	(0.0500)	(0.0546)	(0.0398)
Constant	-8.6072***	0.9140	-0.6572	-3.4801***	-2.2088***	-1.2941**
	(1.5143)	(0.6039)	(0.5834)	(0.4536)	(0.6720)	(0.5844)
Observations	349	349	349	347	349	349
R-squared	0.3622	0.5007	0.5975	0.8162	0.5276	0.6549
Number of industry_nic_3	73	73	73	72	73	73
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 10 describes results for 6 regression equations. Wage variables are highly significant implying that more employment is associated with higher wages. Labour intensive industries have generated more employment and coefficients are also significant. This is also reinforced with the interaction dummy D_3 which reflects the degree of labour intensity. Higher export as a percentage of output leads to rise in direct male and female employment significantly but it reduces contractual employment and increase the employment of supervisors and managerial staff. Overall, rise in exports reduces the employment (but insignificantly), so it is the impact of productivity. We can argue that rise in productivity reduces the direct employment and increases contractual and managerial workers. The final increase in employment is a function of export and productivity growth. Female employment rises in labour intensive industries where productivity is low and contractual employment decreases even when export rises and productivity growth plays an important role. So not only rise in export but role of productivity in employment growth cannot be ignored.

Table 11: Regression Results at Industry level (On NIC 2 digit)

	1	2	3	4	5	6
VARIABLES	**Female workers**	**Male workers**	**All directly employed**	**Contractual Workers**	**Supervisory & managerial staff**	**All Employed**
va_by_ex	1.2825**	-0.1930	-0.1041	0.5636	-0.9822	0.0069
	(0.5128)	(0.2076)	(0.3188)	(0.4144)	(0.6185)	(0.2930)
export	-0.0165	-0.0090	-0.0111	-0.0285**	-0.0026	-0.0102
	(0.0151)	(0.0062)	(0.0095)	(0.0122)	(0.0184)	(0.0087)
tfp_hat	-0.0321	0.0435	-0.0172	0.0164	0.1330	-0.0269
	(0.1032)	(0.0418)	(0.0647)	(0.0831)	(0.1229)	(0.0591)
"x" wages	0.4465***	0.2850***	0.2893***	0.5288***	0.3586***	0.3445***
	(0.0584)	(0.0317)	(0.0487)	(0.0408)	(0.0802)	(0.0408)
d_0 : if labour - intensive == 1	2.4767*	1.8774***	0.9687	3.5191***	3.2819*	2.6086***
	(1.3599)	(0.5279)	(0.8284)	(0.9318)	(1.6546)	(0.7501)
$D_3 = d_0$*log(L/K)	0.1917*	0.1440***	0.0759	0.2661***	0.2408*	0.1967***
	(0.1018)	(0.0398)	(0.0624)	(0.0703)	(0.1249)	(0.0565)
Constant	1.3681	5.3131***	5.5520***	0.3005	1.5340	4.5885***
	(1.2694)	(0.7421)	(1.1483)	(0.9489)	(1.8959)	(1.0035)
Observations	118	118	118	118	118	118
R-squared	0.5442	0.5601	0.4413	0.7033	0.2725	0.5559
Number of industry_nic_2	23	23	23	23	23	23
Standard errors in parentheses						
***** p<0.01, ** p<0.05, * p<0.1**						

Table 11, describes the regression results of equations with domestic value added. If any industry is more connected with global value chain it is expected that domestic value addition in their export will go down. In other words, it will increase foreign value addition in exports which may reduce the employment potentiality. With the rise in domestic value addition, female employment increases significantly but male employment falls insignificantly. In labour intensive industries domestic value addition is accentuated with more female workers. Overall, rise in domestic value added is not having significant relationship with increase in employment. This is due to the fact only few sectors in India are now more connected with global value chain. However, it is interesting to observe that coefficients of value addition and TFP are inverse in some cases. The final impact on employment growth is dependent on a complex relationship between productivity growth, increase in domestic value addition and export growth. In case supervisory employment, higher productivity leads to more employment but export and higher domestic value addition not necessarily push employment of this category. With rise in productivity, female employment drops and male employment increases. However, in many cases relationships are not very strong

Table 12: Regression Results at Firm level with Industry level fixed effect (On NIC 3 digit)

Firm Level with Industry level fixed effects	1	2	3	4	5	6
VARIABLES	Female workers	Male workers	All directly employed	Contractual Workers	Supervisory & managerial staff	All Employed
export	0.04**	0.03***	0.03***	0.03***	0.03***	0.02***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
tfp_hat	-0.19**	0.07*	0.03	0.13**	0.03	0.04
	(0.08)	(0.04)	(0.04)	(0.06)	(0.04)	(0.03)
"x" wages	0.86***	0.79***	0.81***	0.92***	0.76***	0.85***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
labor_by_cap_ratio	0.44***	0.32***	0.37***	0.32***	0.31***	0.37***
	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Constant	-7.08***	-4.86***	-4.38***	-6.95***	-4.73***	-4.76***
	(0.65)	(0.36)	(0.34)	(0.42)	(0.38)	(0.32)
Observations	914	923	923	900	923	923
R-squared	0.94	0.98	0.98	0.98	0.98	0.99
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Lastly, a set of regression equations have been run at firm level data from disaggregated ASI dataset. The results are described in Table 12. Firms are differentiated with industry level dummies at NIC -3 digit level. The r-squared has increased significantly compared to previous set of equations. At firm level, rising exports pushes employment and it is true for all kinds of employment. The relationship is significant. With the rise in firm productivity, female employment drops and rise in male and contractual workers are observed. However, the relationship is not robust for overall employment. Hence, we can argue that more female employment is connected with firms having lower productivity. More training and skill development is essential for female employees. Contractual employment are also pushed for more working hours leading to more output per worker. It is seen in Table 11 that higher domestic value addition leads to more contractual employment. Further, higher the labour intensity of the sector, higher is the probability of employment generation. Finally, increasing wages definitely attract more workers and thereby increases employment.

Conclusion

The paper using ASI and NSSO employment data explains the stylised facts of employment trend in Indian manufacturing industry with a special focus on exporting industries. Though employment growth in exporting industries has been higher than manufacturing sector as a whole during the period 2008/09-2013/14, it has been significantly different with respect to the size of the firms. Employment growth in smaller firms was higher considering the manufacturing sector as a whole compared to export oriented sectors. Share of female employment has increased in labour intensive sector and reduced in capital intensive

industries. There has been a significant growth of unskilled/semi-skilled workers (almost 6 percentage point overall) both in capital and labour intensive industries. However, percentage share of skilled workers are much higher compared to labour intensive industries. Textile sector, which is one of the biggest sector where people are employed, is dominated with the presence of male workers. However, ability of textile sector to hire workers is more than all the industries together listed as capital intensive sector. The paper also has made attempts (with ASI and TiVA database) to unearth the complex relationship between export and employment especially in the presence of changing productivity, factor intensity and share of domestic value addition in exports. It has been noticed that final impact on employment generation due to rise in exports is dependent on the progress in other parameters as well. Highly labour intensive industries tend to use more female workers as exports are going up. This increases the domestic value addition also in these industries. Rising domestic value addition is positively related to contractual employment. However, with the technology infusion productivity has also increased in some sectors. Rising productivity tends to increase managerial staff, reduces female employment. If the productivity rises along with domestic value addition, it leads to more employment of contractual workers. Hence, the relationship between export growth and employment generation is conditional. As export growth is a function of business cycle, it is important to note that global volatility also affects employment but its effect depends on variables such as productivity, factor intensity and domestic value addition.

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