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

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SUMMARY

The purpose of the study is to examine the impact of international trade on manufacturing employment since economic liberalisation in India. The theoretical literature suggests that trade affect the demand for labour through scale, composition and process effects. Since India is largely a labour abundant country, its comparative advantage rests in labour intensive manufacturing. However, the study finds that since the onset of reforms, the production and trade specialisation has been biased towards capital-intensive production and, therefore, has failed to absorb the vast pool of labour resources. Using the Feasible Generalized Least Squares (FGLS) estimation techniques to account for panel heteroscedasticity, the study finds that trade has a statistically significant impact on the labour demand elasticities across 4-digit NIC industries during 2004-11. The export orientation has relatively greater impact on employment, especially the skilled workers. The import penetration has reduced workers demand in recent period. The survey of selected manufacturing largely corroborate the econometric analysis using secondary data and reveals that the trade liberalisation has deepened capital intensity across firms and reduced the demand for labourers, especially the demand for male workers. Female workers on the other hand have experienced positive change in demand due to exports.

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1. Background

Increasing employment in manufacturing emerged as a policy concern for India. Despite expansion in manufacturing output, the rate of employment increases in industry, particularly manufacturing appears to have slowed down, commonly referred to as "jobless growth"(See Srinivasan 2010, Bhalotra, 1998, Goldar, 2000, Kannan & Ravindran, 2009, Papola, 2012 and Planning Commission, 2012). The share of manufacturing in employment continued to be low relative to agriculture. In 2009-10, the share of employment in manufacturing is 11percent as compared to the share of gross value added in manufacturing at 16 percent (see Table 1).

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

Sectors	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)

One of the major challenges addressed in the 12th Plan period (2012-2017) is how to increase the share of formal sector employment opportunities. Based on the desired sectoral distribution of employment[1], 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 percent 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 is 51 million (Mehrotra, 2013).

Achieving the 12th Plan employment targets have to be viewed in the overall perspective of India's rapid integration with the global economy since the onset of trade and investment liberalization policies. Between 1990 and 2012, India's trade to GDP ratio has increased from 15 percent to over 51 percent. At the same time, India's manufacturing exports as a percent of total merchandise exports has decreased from 76 percent in 2000-01 to 59 percent in 2007-08 and

[1]The share of agriculture in employment is expected to decline from 50 percent to 45 percent and increase in the share of employment of manufacturing from 15 percent to 18 percent (Planning Commission 2012)

then increased to 62 percent in 2010-11. Given that the size of India's manufacturing sector is expanding[2], one of the key policy issues that need to be addressed is the impact of trade in creating productive manufacturing employment and achieving the current 12th Plan targets. A number of studies have reported marked acceleration in employment growth (see Goldar 2000, Nagraj, 2000 and Tendulkar 2000) and slower growth in real product wages following trade liberalization. The recent trends in manufacturing employment indicate a fall in workforce during2004-05 and 2009-10 that is largely accounted by a decline in employment in the unorganized sector (see Table 2).

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

Workers	1999-2000			2004-05			2009-10		
	Total	**UNO**	**OR**	**Total**	**UNO**	**OR**	**Total**	**UNO**	**OR**
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

Note: UNO=Unorganised, OR=Organised
Source: NSS

The focus of this study is to examine the impact of trade on employment in the organised manufacturing sector. The standard trade theory predicts that the exports should increase the production of goods that are intensive in the abundant factor. Hence, the demand for labour compared to capital and that of skilled labour[3] vis-à-vis unskilled labour[4]may depend on the relative strength of mechanisms dictating the specializations. Thus in this study, an attempt is made to estimate the aggregate employment effect as well as the impact on the demand for skilled vs. unskilled labour supply. The export or import orientation of the industries would be to see how firm-specific incentives impact these relationships. Further, the study examine whether trade has led to more labour intensive composition of output in India and how trade induced productivity effects have impacted employment across industries. On this basis, the study propose to understand

[2]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)
[3]Skilled labour Include all persons holding positions of supervision or management.
[4] It includes all persons employed directly on payment of wages or salaries and engaged in any manufacturing process or its ancillary activities like cleaning any part of the machinery or any premises used for manufacturing or storing materials or any kind of work incidental to or connected with the manufacturing process.

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 analysed on the basis of the capital-labour ratio.

2. Main Research Questions

The research questions attempted in this study are:

i. How has trade impacted manufacturing employment in India at aggregate and disaggregated levels?
ii. How has the costs related to trade policy impacted employment in India for different types of workers?

Broadly, the analysis in the study is structured into ***two*** parts: In the *first* part, based on NIC 4-digit industry data from the Annual Survey of Industries (ASI) database, industry-level data on various variables of interest were obtained. Amongst these, using the HS 6-digit trade data, the implications of trade flows would be assessed. Further, the study will examine the employment elasticities, productivity trends and trends in wages during the reference period. In the *second* part, a firm level survey of the selected industries is carried out to understand the constraints for expanding employment opportunities in these industries. The survey covered 110 firms including firms from the unorganized sector.

Based on above, the key policy issues to be addressed are: (i) the problem of creating productive employment in manufacturing sector and meeting the 12^{th} Plan targets; (ii) impact of trade on manufacturing employment; and. In a liberalized trade regime, scale economies provide an opportunity for increasing output and employment in industries that have inherent comparative advantage. Therefore, for increasing the share of manufacturing in GDP and employment, a detail policy strategy for promoting labour intensive exporting industries is necessary. For this, an assessment of the performance of labour intensive export industries in manufacturing sector and the constraints for the same need to be identified. The current study attempts to fill this research gap. The recent industry data trends confirm the possible reversal of "jobless growth" and therefore the current study links the trade dimensions to manufacturing output and

employment relationships and aims to develop policy framework for strengthening the employment generation potential of the manufacturing sector under the liberalized trade regime.

3 Trade Liberalisation Policies in India: An Overview

During the past two decades, India has been witnessing major changes in industrialization and trade development strategies. This is in sharp contrast to the earlier regime of inward oriented import-substitution regime where the government played an active role in resource allocation[5]. The domestic industry, heavily insulated from international competition, was under strict regulation and multiple controls over private investment. This limited the areas in which private investors were allowed to operate including the scale of operation, the location of new investment and the technology to be used in the production process (Ahluwalia, 2002). The trade-policy regime was highly protectionist and regulated through heavy tariff/non-tariff controls. Most of the imports were subjected to discretionary import licensing or 'canalized 'by the monopoly the government trade organizations (Bhat, 2011). In this situation, non-tariff barriers acted as the major policy instrument for regulation. Several empirical studies on the performance of Indian manufacturing during the period of import substitution have highlighted the cost of such blanket protection[6].

Initial steps towards trade liberalisation were taken up during the early 1980s.Following the severe Balance of Payments Crisis in early 1990s, a number of external & internal liberalization measures were implemented. As part of the reform process, most of the government control in the industrial activities were dismantled and the list of industries reserved solely for the public sector were reduced to only three industries: Defense Aircrafts and Warships, Atomic Energy Generation and Railway Transport. The government abolished the Monopolies and Restrictive Trade Practices (MRTP) Act to discourage the concentration of economic power and set up a new competition law for regulating anti-competitive behavior of industrial firms (Ahluwalia, 2002).

[5]The basic philosophy of the earlier regime was self-sufficiency, minimal dependence and commanding heights of the public sector.

[6]For a recent account of these issues, see Acharya *et al*, (2003), Kochhar *et al* (2006) and Panagariya (2008).

The import licensing was abolished for capital goods and intermediates, which became freely importable in 1993, along with an adoption of a flexible exchange rate regime (Ahluwalia, 2002). The protective regime gradually shifted from tariff to quantitative restrictions and subsequently OGL lists (i.e. list of products that require no import license) were expanded. The import liberalisation was introduced so that firms can modernize their product structure by importing technology from abroad[7]. The policy dismantled almost all entry barriers, and gradually brought down tariffs and non-tariff barriers making the economy more outward oriented[8]. Tariffs were progressively brought down and all quantitative restrictions were removed[9]. All export subsidies were abolished and exporters were allowed tradable entitlement called Exim-Scrips for importing even restricted items needed to keep up the export performance.

3.1 Trade Protection instruments in Indian Manufacturing Sector

In Table 3, two major indicators of protection, namely Effective rate of protection (ERP) and Import Coverage Ratio (ICR) for Indian manufacturing sector during 1980-2000[10] is given. It can be see that during the 1980s, protection through tariffs (measured by ERP) increased in all sectors. On the other hand, protection through quantitative restrictions (based on import coverage ratio) such as NTB declined marginally for most industrial sectors.

In contrast to the period of 1980s, the trade protection declined unambiguously and markedly in the early 1990s for aggregate as well as use based industries in general. In terms of use-based classification, the highly protected industrial sectors (in terms of both ERP and IC) are intermediate goods industries and the least protected segments are capital goods industries. By the end of the 1990s, the consumer goods sector became the major protected industry and the

[7]Some of the other promotional measures include the permission to freely import technology, purchase foreign components, and expand capacity for larger entrepreneurs.
[8]The peak tariff fell from over 200 percent in 1990 to 65 percent in 1994 and the average nominal tariff more than halved during 1990-94.
[9]Quantitative restrictions on imports of manufactured consumer goods and agricultural products were removed on April 1, 2001.
[10]Effective rate of protection is a measure of the total effect of the entire tariff structure on the value added per unit of output in each industry, when both intermediate and final goods are imported. This statistic is used to measure the real amount of protection afforded to a particular industry by import duties, tariffs or other trade restrictions. Import coverage ratio is the share of a country's own imports that is subjected to non-tariff barriers (OECD, 2012).

capital goods the least protected. This shows that, since the beginning of the trade liberalisation, the protective regime has significantly liberalized and Industries operate in less protective regime than before. Moreover, there is an unambiguous evidence of change in preference for quantitative restrictions than to tariff protection. During the early 1990s, the peak tariffs on manufactures were almost 400 percent on average. This reduced to about 30 percent and currently, the average is under 10 percent (World Bank, 2011).

Table 3
Measures of Trade protection in India: by use based classification, 1980-2000 (in %)

Trade Protection indicators	1980-85	1986-90	1991-95	1996-2000
Intermediate Goods Industries				
Average Effective Rate of Protection	147.0	149.2	87.6	40.1
Import Coverage Ratio	98.3	98.3	41.8	27.6
Capital Goods Industries				
Average Effective Rate of Protection	62.8	78.5	54.2	33.3
Import Coverage Ratio	95.1	77.2	20.5	8.2
Consumer Goods Industries				
Average Effective Rate of Protection	101.5	111.6	80.6	48.3
Import Coverage Ratio	98.7	87.9	45.7	33.4
All Industries				
Average Effective Rate of Protection	115.1	125.9	80.2	40.4
Import Coverage Ratio	97.6	91.6	38.0	24.8

Source: Reproduced from Das (2003)

Table 4
Tariff structure in the organised manufacturing sector in India:By Use Based Classification, Selected Years (%)

Use Based Classification	1990	1996	2000	2005	2010	2013
Capital goods	72.68	33.09	26.83	14.15	7.44	7.83
Intermediate goods	82.29	38.43	33.39	17.36	9.37	10.32
Consumer goods	92.24	47.45	37.91	19.6	14.92	15.45
Raw materials	66.81	25.11	31.39	24.8	20.81	20.12
Total (Average)	78.51	36.02	32.38	18.98	13.14	13.43

Note: Reported tariffs are based on Simple Average Tariff (MFN)
Source: Author's calculation based on UNCTAD-TRAINS database

We collected MFN applied tariff profile of Indian manufacturing sectors based on use-based classification from UNCTAD TRAINS[11] and the data for selected period of liberalisation is given in Table 4. It is evident that during the early period of 1990s, the tariff rates were relatively

[11]UNCTAD-TRAINS (Trade Analysis and Information System) is a trade and market access information system combining the database containing data drawn from UN TARMAC, a joint primary data collection with the International Trade Centre (WTO, ITC) and the WITS software.

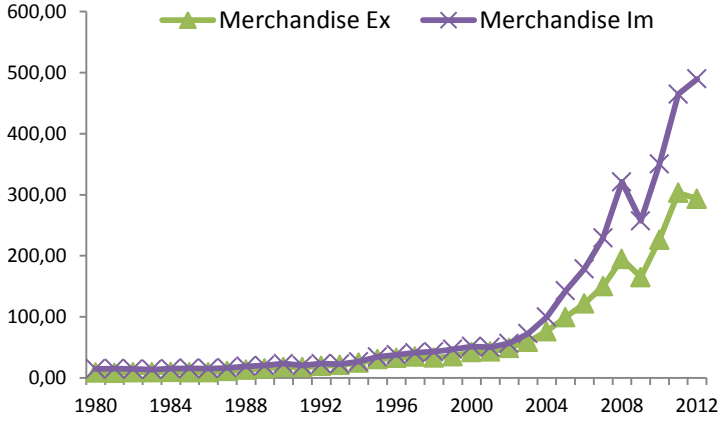
higher for all categories of manufacturing. Since then there has been a marked decline in protection across use-based products. The steepest fall is observed in capital goods, from 73 percent in 1990 to 8 percent in 2013. Similarly, the intermediate goods (82 percent to 10 percent) and consumer goods (92 percent to 15 percent) witnessed a similar trend during the same period. On average, the aggregate manufacturing sector witnessed a significant tariff reduction since liberalisation as it currently stands at around 13 percent in 2013.

These policy changes during the past few decades suggest that Indian economy has transformed from an inward oriented protective regime to a more outward oriented and market friendly economy. Moreover, post WTO period, India witnessed some notable changes in its trade and industrial performance. This is analysed in the following sub-sections.

3.2 An Overview of India's Manufacturing Trade

The increasing economic integration since liberalisation is largely attributed to the growing volume of International trade in goods and services. In terms of merchandise trade, the share of India's exports in the world exports has increased from 0.5 percent in 1990 to 1.6 percent in 2012 (WDI, 2014). On the other hand, the share of imports in total world imports increased much higher, i.e. 0.7 percent to 2.6 percent for the same period (WDI, 2004).

Figure 1
India's Merchandise exports and imports (1980-2012) Current Billion US$



Source: Authors calculation based on World Development Indicators, Online database

Table 5
Growth Rates of India's Manufacturing Trade (%)

Manufacturing Trade	1990-00	2001-12	1990-2012
Exports	9.3	18.1	14.1
Imports	9.2	21.8	16.1

Source: Authors calculation from UN Comtrade, accessed from WITS online database

A detailed commodity wise pattern of exports reveals some interesting facts (see Table 6). It is evident that there is a marked decline of primary exports, which comprises of agriculture & allied products and Ores & Minerals, from 24 percent in 1990 to 15 percent in 2012. In contrast, during the same period, the share of manufacturing has remained around 61-72 percent range. Within manufacturing, there is a gradual shift from the traditional and less sophisticated products like textiles & allied products and leather products to technology intensive products such as transport equipments, machinery items, electronic products and basic chemicals and pharmaceuticals. For example, in 1990, India exported 24 percent of textile products. By 2012, the share has declined to only 9 percent. In contrast, the share of engineering products has increased from 12 percent to 22 percent for the same period. Similarly, the share of chemical products has also increased from 10 percent to 13 percent. The notable compositional shift reflects the increasing technological dynamism of Indian exports in recent decade. This change in export performance is expected to have significant impact on the labour markets.

4 Manufacturing Employment in India since liberalisation: A Brief Review

One of the objective of the economic liberalisation policy is to increase the employment opportunities of the large unutilized workforce of India. Since over 60 percent of India's population is in the working age of 15-59 years, a growing manufacturing sector provides the opportunities for absorption of unemployed workforces. Being predominantly a labour abundant country, it is expected that the specialisation pattern of India would be in labour intensive production activities. However, several empirical studies have noted that this is not apparent since the onset of economic liberalisation. In this background, this section attempts a brief overview of employment scenario in India in recent periods.

Table 6
India's Export Composition: 1990-2012 (in %)

Commodities	1990-91	1995-96	2000-01	2005-06	2010-11	2012-13
I. PRIMARY PRODUCTS	23.8	22.8	16.0	15.9	13.1	15.5
I.A *Agriculture and Allied Products*	18.5	19.1	13.4	9.9	9.6	13.6
1. Tea	3.3	1.1	0.9	0.4	0.3	0.3
2. Coffee	0.8	1.4	0.6	0.3	0.3	0.3
3. Rice	1.4	4.3	1.4	1.4	1.0	2.1
4. Wheat	0.1	0.3	0.2	0.1	0.0	0.6
5. Cotton Raw including Waste	2.6	0.2	0.1	0.6	1.2	1.2
6. Tobacco	0.8	0.4	0.4	0.3	0.3	0.3
7. Cashew & Nuts	1.4	1.2	1.0	0.6	0.2	0.3
8. Spices	0.7	0.7	0.8	0.5	0.7	0.9
9. Oil Meals	1.9	2.2	1.0	1.1	1.0	1.0
10. Fruits and Vegetables	0.7	0.5	0.4	0.5	0.4	0.4
11. Processed Fruits, Juices	0.7	0.8	0.6	0.3	0.3	0.4
12. Marine Products	2.9	3.2	3.1	1.5	1.0	1.2
13. Sugar	0.1	0.5	0.2	0.1	0.5	0.5
14. Meat and Meat Preparations	0.4	0.6	0.7	0.6	0.8	1.1
15. Other Agriculture and Allied Products	0.7	1.7	1.8	1.6	1.6	3.0
I.B *Ores and Minerals*	5.3	3.7	2.6	6.0	3.4	1.9
II. MANUFACTURED GOODS	71.6	74.7	77.1	70.4	62.9	60.9
II.A *Leather and Manufactures*	8.0	5.5	4.4	2.6	1.6	1.6
II.B *Chemicals and Related Products*	9.5	11.3	13.2	14.3	11.5	13.0
1. Basic Chemicals, Pharmaceuticals	6.8	6.8	8.2	8.9	7.7	8.8
2. Plastic and Linoleum Products	0.6	1.8	2.1	2.7	1.9	2.1
3. Rubber, Glass, Paints	1.7	2.1	2.1	2.0	1.4	1.7
4. Residual Chemicals	0.4	0.6	0.8	0.7	0.5	0.5
II.C *Engineering Goods*	12.4	13.8	15.3	21.1	23.1	21.8
1. Iron & Steel	0.9	2.2	2.3	3.4	2.0	2.1
2. Metals	2.5	2.6	3.5	4.1	3.4	3.3
3. Machinery and Instruments	3.8	2.6	3.5	4.9	4.7	5.1
4. Transport Equipment	2.2	2.9	2.2	4.2	6.4	6.1
5. Electronic Goods	1.3	2.1	2.4	2.1	3.3	2.7
6. Other Engineering Goods	1.7	1.4	1.3	2.3	3.4	2.5
II.D *Textile and Textile Products*	23.9	25.3	25.3	15.9	9.6	9.1
1. Cotton Yarn, Fabrics, Madeups, etc.	6.4	8.1	7.8	3.8	2.3	2.5
2. Natural Silk Yarn, Fabrics	0.7	0.4	0.7	0.4	0.1	0.1
3. Manmade Yarn, Fabrics	1.2	2.4	2.4	1.9	1.7	1.5
4. Manmade Staple Fibre		0.1	0.1	0.1	0.2	0.2
5. Woolen Yarn, Fabrics, Madeups, etc.	0.1	0.2	0.1	0.1	0.0	0.0
6. Readymade Garments	12.3	11.6	12.5	8.4	4.6	4.3
7. Jute & Jute Manufactures	0.9	0.6	0.3	0.3	0.2	0.1
8. Coir & Coir Manufactures	0.1	0.2	0.1	0.1	0.1	0.1
9. Carpets	2.1	1.8	1.3	0.8	0.4	0.3
II.E *Gems and Jewellery*	16.1	16.6	16.6	15.1	16.1	14.4
II.F *Handicrafts*	1.2	1.4	1.5	0.4	0.1	0.1
II.G *Other Manufactured Goods*	0.4	0.8	0.8	1.0	0.8	0.9
III. PETROLEUM PRODUCTS	2.9	1.4	4.2	11.3	16.5	20.3
IV. OTHERS (ALL COMMODITIES)	1.7	1.1	2.8	2.4	7.5	3.3
Total Exports/All Commodities	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors calculation based on "Handbook of Statistics on Indian Economy", prepared by Reserve Bank of India (RBI). RBI collects the trade data from DGCI&S, various issues.

One of the chief characteristics of Indian manufacturing sector is its dualistic structure i.e. the prevalence of a formal/organised [12] manufacturing sector which coexists with a large 'unorganised sector' (Kapoor, 2014). The organised manufacturing provides the bulk of value added (65 percent) but provided only limited employment, around 11 percent in 2010. On the other hand, the informal household manufacturing accounts for disproportionately large share in employment, but a very small share of manufacturing value added (Kapoor, 2014). Moreover, the share of organised sector in total employment is declining continuously since the 1990s (see Papola and Sahu, 2012). Since the workers in the formal manufacturing receive better wages, social security benefits and non-wage benefits and, generally, are more productive than the unorganized workers, there is a need to expand the employment potential in the organised manufacturing sector.

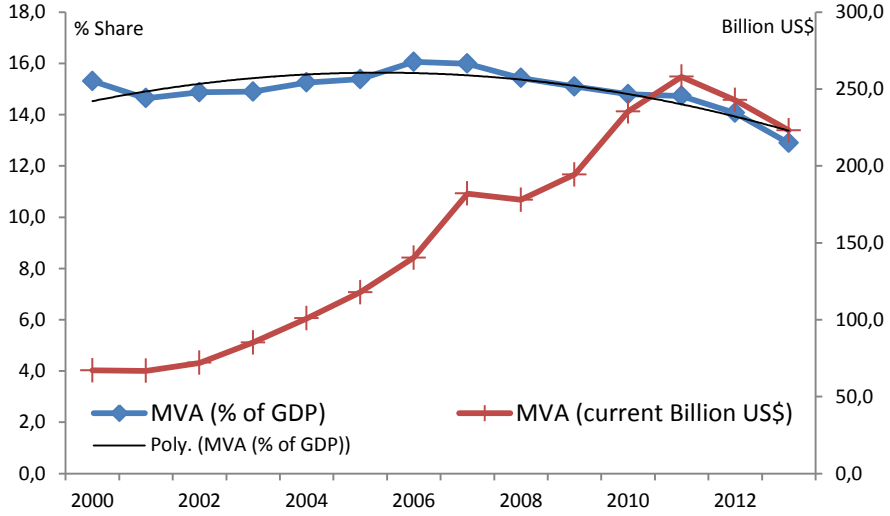
Although the organised manufacturing witnessed a significant growth of around 7.4 percent in value added for the period of 1992-2004, the employment registered only 1 percent growth rate (Kannan and Raveendran, 2009), reflecting the 'jobless growth' of the 1990s. However, recent studies have indicated that there is a turnaround of this apparent trend since the mid-2000. According to Kapoor (2014), the employment has registered a 4.6 percent per annum growth rates during 2000-2011. However, in terms of the quality of employment, the performance has been rather unsatisfactory. As shown by Goldar (2009b), there is a growing incidence of informal employment, especially contract workers in the total labour force. For instance, based on ASI data, Kapoor (2014) has shown that the share of contract labours in total employment has increased from 16 percent in 2000 to 26 percent in 2010. This is due to the high prevalence of the stringent labour regulations and an increasing import competition since liberalisation (see Goldar and Aggarwal, 2002). Further, studies by Goldar (2000) and Hasan *et al* (2013) has indicated that the Indian manufacturing employs relatively more capital-intensive production techniques. This is rather unusual for a country with its level of development and factor endowment. One the other hand, the employment growth in the unorganised manufacturing is relatively faster in the labour intensive industries (Goldar, 2009b).

[12] The organised manufacturing consists of factories employing 10 or more workers using power or 20 or more without the use of power. The Unorganised segment largely belongs to the household enterprises.

4.1 Structure of Employment of the organised Manufacturing

In this sub-section, a detailed account of organised manufacturing employment of India is given. The Figure 2 present the size of manufacturing sector in India's GDP during 2000-13. The share of manufacturing is stable around 15 percent for most of the period although there is a downward trend since 2009. For instance, the share has declined from 15 percent in 2009 to 13 percent in 2013. The downward trend is also visible in the absolute production figures as it declined steeply from US $258 billion in 2011 to US $223 billion in 2013.

Figure 2
Manufacturing Value Added in India's GDP (2000-13)



Source: Authors Calculation based on WDI online database

The decline in manufacturing in GDP can be attributed to the better performance of non-manufacturing activities especially services and the external demand shocks since the aftermath of global economic recession in 2008. This sluggish performance has ramification for India's employment scenario. In a comparative perspective, the manufacturing employment of India relative to the BRICS countries reveals that India is the second largest employment source country (see Table 7), with a share of 11 percent. In contrast, China has provided the major chunk of employment of around 73 percent, during 2000-07. In terms of growth rates, the

employment expanded around 4 percent per annum for India whereas for China, it is around 6 percent per annum. This shows a severe unequal distribution of employment structure of BRICS and the heavy dominance of China over other member countries.

Table 7
Manufacturing Employment in India vis-a-vis BRICS countries (2000-07) % Share

Year	Brazil	Russia	India	China	South Africa
2000	7.70	6.34	12.17	71.82	1.98
2001	7.81	6.49	11.50	72.32	1.88
2002	7.64	8.43	11.29	70.85	1.79
2003	7.99	7.89	10.83	71.63	1.66
2004	7.59	6.80	10.25	73.85	1.51
2005	7.35	6.27	10.62	74.40	1.35
2006	7.25	5.77	11.00	74.70	1.29
2007	7.04	8.42	10.36	72.89	1.29
Average Share (2000-07)	7.55	7.05	11.00	72.81	1.59
Growth Rates (2000-07)	4.75	12.65	3.74	6.37	-0.16

Source: Authors calculation from INDSTAT4 2014 ISICrev3, UNIDO

To examine the overall structure of manufacturing employment, we use the ASI data at 2 digit (aggregate) and 4 digit (disaggregate) level for the period of 2000-07[13]. Table 8 gives the distribution of total employment across major industrial categories. In terms of 2-digit industries, out of the 21 broad sectors, the largest employment generators are found in low technology intensive industries like food & beverages (17 percent) and textiles (16 percent) for the entire period. However, both these sectors have witnessed a continuous decline in employment since 2000. The employment share of medium technology intensive sectors like chemicals, metals, wearing apparel products have been stable over the years. Understandably, the high technology segments like office accounting machinery, transport equipments and electrical machinery have relatively low employment presence. However, in terms of average annual growth rates, these sectors have performed relatively better. On the other hand, the total employment growth of food and textiles, the largest employment sectors, has been relatively poor.

[13] We restricted the analysis up to 2007 as the industrial classification changed drastically since NIC 2008, which makes it difficult to compare it with an earlier version. Since employment trends are structural in nature, the broad trend is expect to hold in recent period.

Table 8

Structure of Employment in the organised Manufacturing in India: By 2-Digit NIC (% Share)

2-Digit	Description	2000	2003	2005	2007	Growth Rates
15	Food Products & Beverages	17.4	17.3	16.1	15.2	1.6
16	Tobacco Products	6.3	6.4	5.5	4.2	-2.2
17	Textiles	16.9	16.2	15.5	14.7	1.9
18	Wearing Apparel, Fur	4.3	5.1	6.3	6.4	9.9
19	Leather	1.8	1.9	2.0	2.2	7.3
20	Wood	0.6	0.7	0.6	0.7	4.3
21	Paper products	2.4	2.3	2.1	2.5	5.4
22	Printing, Publishing & Recorded Media	1.5	1.5	1.6	1.5	3.2
23	Coke, Refined petroleum & Nuclear Fuels	0.9	1.0	1.0	1.1	7.2
24	Chemical Products	10.5	9.9	9.6	9.1	1.6
25	Rubber & Plastic	3.3	3.7	3.7	3.6	5.1
26	Non-Metallic Mineral	5.8	6.0	6.7	6.8	7.1
27	Basic Metal	7.4	7.2	7.5	8.2	5.5
28	Fabricated Metal Products	3.9	3.7	4.3	5.3	8.9
29	Machinery & Equipments	5.6	5.3	5.4	5.7	4.1
30	Office accounting, Computer Machinery	0.3	0.3	0.3	0.3	6.7
31	Electrical Machinery	3.0	2.9	3.2	3.4	5.6
32	Radio, TV and Communication equipments	1.5	1.4	1.4	1.4	3.6
33	Medical, Optical, photographic & Watches	0.8	0.9	0.8	0.9	4.2
34	Motor Vehicles, Trailers	3.4	3.8	4.2	4.7	9.0
35	Other Transport Equipments	2.4	2.3	2.3	2.1	2.1
	Total Manufacturing	100.0	100.0	100.0	100.0	3.7

Source: Authors calculation based on ASI (CSO), *various issues*

In Table 9, the employment structure of the top 10 industries at 4-digit disaggregate level as well as their capital intensity is reported. These selected industries cover around 40 percent of total manufacturing employment. The data is reported for two periods, i.e., (a) 2000-07 based on NIC 2004, and (b) 2008-10 based on NIC 2008. The analysis further confirms the broad trend revealed at the aggregate level. For instance, in 2007, the top employment sectors such as textile fibers (9 percent), wearing apparel (6 percent), tobacco products (4 percent) and other food items (4 percent), all belongs to traditional industrial sectors (see Table 9a). Moreover, the employment growth rates of all these sectors except wearing apparel have declined during 2000-07. In general, the employment trend across industries has been either insignificantly low and stable or declining over the years. Similar trend is observed in the latest period based on NIC 2008 data. In recent period, the capital intensity has fallen across product groups (see Table 9b).

Thus, there is a need to understand the impact of international trade on manufacturing employment, especially in the context of ongoing economic liberalisation regime in India. The nature of the impact depends upon the level of development, production structure and factor endowment. These issues are dealt more formally in section 5.

Table 9
Share of Top 10 Industries in Total Manufacturing Employment (% Share)

(a) Industries based on 4-Digit NIC2004 classification (2000-07)

Sl No	4-Digit	Description	Employment Share (%)				Growth Rates (2000-07)	Capital Intensity	
			2000	2003	2005	2007		2000	2007
1	1711	Preparation and spinning of textile fiber	12.26	10.74	9.76	8.89	-0.8	100.0	106.6
2	1810	Wearing apparel	4.31	5.06	6.27	6.33	9.9	100.0	94.7
3	1600	Tobacco products	6.33	6.40	5.49	4.20	-2.1	100.0	101.1
4	1549	Other food products n.e.c.	4.53	4.65	4.21	3.76	1.1	100.0	117.3
5	2423	Pharmaceuticals, medicinal chemicals & botanical products	3.06	3.22	3.36	3.58	6.3	100.0	89.3
6	1531	Grain mill products	3.49	3.43	3.41	3.11	2.2	100.0	109.8
7	3430	Parts and accessories for motor vehicles & engines	2.16	2.60	2.94	3.33	10.5	100.0	85.7
8	1542	Sugar	4.16	3.67	3.02	2.92	-1.1	100.0	340.7
9	2693	Structural non-refractory clay and ceramic products	1.60	1.88	2.56	2.79	12.8	100.0	76.0
10	1730	Knitted and crocheted fabrics and articles	1.15	1.84	2.02	1.90	16.8	100.0	116.0
		Total Share in Manufacturing (%)	43.05	43.49	43.05	40.82			

Source: Authors calculation based on ASI (CSO), *various issues*

(b) Industries based on 4-Digit NIC2008 classification (2008-10)

Sl No	4-Digit	Description	Employment Share (%)			Growth Rates (2008-10)	Capital intensity	
			2008	2009	2010		2008	2010
1	1311	Preparation and spinning of textile fibres	5.88	6.19	6.16	9.2	100.0	92.3
2	2410	Basic iron and steel	5.77	5.52	5.77	6.9	100.0	121.3
3	1410	Wearing apparel, except fur apparel	5.99	5.91	5.39	1.2	100.0	69.8
4	2930	Parts and accessories for motor vehicles	3.43	4.26	4.56	23.2	100.0	71.4
5	2100	Pharmaceuticals, medicinal chemicals, etc.	3.64	3.81	3.97	11.4	100.0	90.5
6	1200	Tobacco products	4.32	3.84	3.47	-4.4	100.0	100.9
7	1079	Other food products n.e.c.	3.85	3.64	3.45	0.9	100.0	91.3
8	2220	Plastics products	2.69	2.78	2.84	9.8	100.0	74.8
9	1061	Grain mill products	3.07	2.94	2.83	2.6	100.0	79.3
10	2392	Clay building materials	2.57	2.71	2.78	11.0	100.0	65.0
		Total Share in Manufacturing (%)	41.23	41.61	41.23			

Source: Authors calculation based on ASI (CSO), *various issues*

5. Approach: Theoretical framework

The effect of trade on manufacturing employment can be decomposed into *Scale effect, Composition effect and Process effect.* The *Scale effect* quantifies the effect of trade on total manufacturing output. The *Composition effect* quantifies the effect of trade on the contribution of the each of the industries to the total manufacturing output. The *Process effect* quantifies the effect of trade on employment through changing labour coefficients (Sen, 2008).The overall framework for this formulation is based on the Heckscher-Ohlin-Samuelson theorem which underlines the profitability of increasing the production of goods based on abundant factor and thereby produce cost advantage relative to competitors. Therefore, if countries specialize in the goods which utilize the abundant factor then returns to that factor will rise with trade. If, the abundant factor is labour then trade will induce higher employment and rise in real wages. Further, with trading opportunities as industries expand, technological change can occur which leads to higher labour productivity. The linkage between trade and overall manufacturing employment is captured by the following definition.

$$L = Q\sum_{i} w_i \left(\frac{L}{Q}\right)_i \ldots (1)$$

where L is total manufacturing employment, Q is total manufacturing output, w_i = Qi/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 increases 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.Third,* trade can impact employment by changing the labour coefficients (L/Qi), i.e., labour required to produce a given output. This is referred to as *Process effect* of trade(Sen, 2008). As trade changes the quantity and nature of labour input, there will be changes in relative factor prices, and thus changes in factor substitution in production. Further, trade can induce technological transfers or

decrease X- inefficiency. 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*.

Under this overall framework, the *Scale effect* will be analysed for the manufacturing sector as a whole while the *Composition and Process effects* will be analysed at the industry and firm level. The aggregation of industries under the manufacturing sector will be the basis for employment generation at the sector level. To draw out the *direct* effects of trade on employment at the industry level, the study will examine (i) the changes in the structure of factor content in industries identified as export oriented and import oriented and (ii) trend in employment coefficients of exportables and importable industries. The *indirect* effect of trade on employment is captured through changes in the efficiency of labour use for which the labour demand equations at the industry level will be estimated.

(i) Estimating Direct Effects of Trade on Employment

To analyse the effect of different factors on changes in employment, *Growth Accounting Approach*(GAA) is used (see Sen, 2008). In this approach, changes in employment are 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. The decomposition is derived from the macro identity (see equation 2).

$$Q_{it} = D_{it} + X_{it} - M_{it} \ldots (2)$$

where,

Q= Domestic production of industry i at time t

D= Domestic demand of industry i at time t

X = Exports of industry i at time t

M= Imports of industry i at time t

Employment can be calculated as:

$$L_{it} = l_{it}(D_{it} + X_{it} - M) \ldots (3)$$

where,

Lit=employment in industry i at time t

lit = Lit/Qit and mit = Mit/Dit

Changes in employment between t=0 and t=1 can be decomposed into[14]:

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

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. To separate the *Scale effect from the Composition effect* of trade on employment, we further decompose equation (4). Specifically, the effect of trade on employment caused by changes in labour intensity of production across industries and through the expansion or contraction of output due to export expansion or import penetration can be done through the following decomposition of the second term on the right hand side of equation (4):

$$\sum l_{i1}\Delta X_i = l_{m1}\Delta X_m + (\sum l_{i1}\Delta X_i - l_{m1}\Delta X_m) \ldots\ldots (4.1)$$

Where $l_{m1} = \dfrac{\sum L_i}{\sum Q_i}$ average labour coefficient for the manufacturing sector and

$\Delta X_m = \sum \Delta Xi$ the total increase in manufacturing exports.

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[14] $\underline{L_{it}} = \underline{l_{it}}$

$Q_{it}M_{it} = m_{it}D_{it}$

$L_{it} = l_{it}Q_{it}$

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

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

dtdt dt

$= l_{it}\{\underline{d\,D_{it}} + \underline{d\,X_{it}} - m_{it}\underline{dD_{it}} - D_{it}\underline{dm_{it}}\} + Q\ \underline{d\,L_{it}}$

dtdt dt dt dt

$= l_{it}(1 - m_{it})\ \underline{d\,D_{it}} + l_{it}\underline{dX_{it}} - l_{it}D_{it}\underline{dm_{it}} + Q\ \underline{d\,l_{it}}$

dtdtdtdt

$= l_{it}(1 - m_{it})\ \underline{d\,D_{it}} + l_{it}\underline{dX_{it}} + l_{it}(mi_0 - mi_1)\ D_{it} + Q\ \underline{d\,l_{it}}$

dtdt dt

We have performed the decomposition effects for the two periods for total persons employed, total directly employed people, male labour, female labour, skilled and unskilled labourers. Total persons engaged includes directly employed and contractual people. For unskilled employment we have considered the workers and for skilled we have considered managerial and supervisory employees. It can be seen from equations (4) and (4.1) that the estimates for these labour types would differ due to differing labour coefficients. To the best of our knowledge, this type of analysis has not been tried in case of India.

(ii) Estimating the indirect effects of Trade on Employment Elasticity

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.

Trade openness can increase labour demand elasticity by two main channels. 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[15], i.e., labour demand is more elastic the greater the elasticity of demand for output. When output demand elasticity is high then output price changes leads to higher than proportionate 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.

[15]According to Marshall, the labour demand is more elastic the greater the elasticity of substitution, demand for output, supply elasticity of capital and labour share in total cost.

This is captured by an estimation of the labour demand equations at the industry level. Hasan, Mitra and Ramaswamy (2003) using state level data revealed that the labor demand elasticities increases with reductions in protection and the response is conditioned by the nature of labor institutions. In addition, Goldar (2009a) has found evidence that that downward trend in labour demand elasticity 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. 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[16]is used.

$$L_{it} = \alpha + \beta_1 w_{it} + \beta_2 Q_{it} + \phi Z_{it} \ldots\ldots (5)$$

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

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

$Q_{it}=A^{\gamma} K_{it}^{\alpha} N_{it}^{\beta}$ (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:

$Q_{it}= A^{\gamma} (\underline{\alpha N_{it}}. \underline{w_i})^{\alpha} N_{it}^{\beta}$ (2)

β c

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

$\ln N_{it} = \varphi_0 + \varphi_1 \ln (w_i/c) + \varphi_2 \ln Q_{it}$ (3)

where, $\varphi_0= -(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta) / (\alpha + \beta)$, $\varphi_1= - \alpha / (\alpha + \beta)$, $\varphi_2= 1 / (\alpha + \beta)$

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:

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

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

which implies:

$\ln N_{it} = \varphi^*_0 - \mu_0 T - \mu_1 \ln M_{it} - \mu_2 \ln X_{it} + \varphi_1 \ln (w_i/c) + \varphi_2 \ln Q_{it}$

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

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

Zit = degree of openness of industry i at time t

The degree of openness is captured using two proxies: Export- Output ratio (EO) level and Import penetration ratio (IM) at the industry level. The justification for this is that with trade liberalization, firms would have to compete with imports. If firms were not competitive then import penetration would be high. Similarly, with regard to exports, 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:

$$L_{it} = \alpha + \beta w_{it} + \beta_2 Q_{it} + \phi_1 IM_{it} + \phi_2 EO_{it} \ldots. \quad (6)$$

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 labour demand equations (equation 6 and its variants) are estimated after preparing a detail concordance tables between NIC and HS classification. This is explained in the following section.

6. Data Sources and Methodology of the Study

6.1 Data Sources

The study used disaggregated production and employment data on manufacturing sector from the Annual Survey of Industries (ASI) *various issues*. The ASI classifies industries as per the National Industrial Classification (NIC) prepared by the Central Statistical Organisation (CSO). As the definitions of industries changed over time, the analysis uses NIC 2004, which applies from 2004-08 and NIC 2008 for the period 2008-11. The NIC-2004 is based on ISIC revision 3.1 whereas NIC-2008 is based on ISIC revision 4. The concordance table of NIC-2004 and NIC-2008 shows that certain four digit classifications are partially included which causes incomparability of the data. Given the incompatibility of concordance of NIC 2004 and NIC 2008 at disaggregate level and change in the base period of price indices in 2004-05, we have considered two periods 2004-05 to 2007-08 and 2008-09 to 2011-12 to calculate the direct effects of trade via growth accounting approach. The trade data is collected from Ministry of

Commerce, government of India 'Export-Import databank and UN Comtrade. Since trade data follows the International Trade Classification- Harmonised (ITC-HS) and is reported in India by DGCI&S (Directorate General of Commercial Intelligence and Statistics), an industry-trade concordance was prepared. The industry data for the first period was matched with HS2002 trade classification and that for the second period it was matched with HS2007.The matching of trade and industry classification is given in Appendix I. Since trade data in case of India is available according to HS2002 from 2003-04 to 2007-08, we have used this period for the earlier period. WPI data at the industry-level has been revised with base 2004-05. Thus, the period for analysis has been selected for years 2004-05 to 2007-08.

6.2 Methodology of the Study

To estimate labour demand (equation 6), the study used a few alternative specifications. We constructed a variable 'open', which is the share of exports and imports in total output at the industry-level. In addition, year and industry group specific effects have been incorporated through year and industry group dummies. Year dummies account for factors that change over time and industry group specific effects which are invariant over time.

Panel data analysis endows regression analysis with both a spatial and temporal dimension. In our case, the regression equation has the following form:

$$L_{it} = \alpha + \beta w_{it} + \beta_2 Q_{it} + \phi_1 IM_{it} + \phi_2 EO_{it} \ldots\ldots (6.1)$$

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

IMit=Import to output ratio in industry i at time t

EOit= export to output ratio in 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. Alternative model proposed is as follows:

$$L_{it} = \alpha + \beta_1 w_{it} + \beta_2 Q_{it} + \phi Z_{it} \ldots (6.2)$$

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

Zit is constructed by summing exports and imports and dividing it by the output at the industry-level over time. This captures the impact of openness of the sector on labour demand.

Finally, industry-group specific and year effects have been included as follows,

$$L_{it} = \alpha + \beta w_{it} + \beta_2 Q_{it} + \phi_1 IM_{it} + \phi_2 EO_{it} + \phi_3 D_{1i} + \phi_4 D_{2t} \ldots (6.3)$$

$$L_{it} = \alpha + \beta_1 w_{it} + \beta_2 Q_{it} + \phi Z_{it} + \phi_3 D_{1i} + \phi_4 D_{2t} \ldots (6.4)$$

D1i and D2t represent the industry group and year dummies respectively. Equations (6.1 to 6.4) is estimated for alternative group of laborers and for two time periods 2004-05 to 2007-08 and 2008-09 and 2011-12. The demands for various types of labours (total persons engaged, workers, supervisors and managers, male and females) have been estimated separately to find out the differences in impact among these groups. Estimating demand for these groups can aid in formulating policies to reduce the biases in employment of certain type of labourers only. To our knowledge, this is the first study to have estimated the labor demand equations in the Indian context using the latest four-digit NIC data available. The concordance between NIC-four digit data and HS six digit is also a first attempt not found in existing studies. The details on variables used for the empirical analysis are given in the appendix II. The appendix III mentions the

industry groups used for the study .For all our specified models, the FGLS is used to estimate the coefficients as we found that the data was not homoscedastic (see Annex I for technical details).

One of the problems associated with estimating equations 6.1 to 6.4 is that wage enters both demand and supply equations for labor. Thus whether we are estimating the labor demand or supply is unclear. Again shocks to labor demand may cause shocks to wages resulting in association between wage and the error term in the labor demand equations leading to biased estimates. In order to get over this problem factors shifting the labor supply function which causes the wages to change are assumed to trace out labor demand function and wages are considered as exogenous (not impacted by shocks to labor demand) in the labor demand equation. Under these assumptions the above equations can be considered as representing labor demand equations. Following Nickell and Symons (1990) it can be argued that labor demand and labor supply depend on different measures of real wage rate. Labor demand depends on nominal wage deflated by producer's price index (measure we have used) since industry values productivity at its output price. Labor supply on the other hand depends on nominal wages deflated by consumer's price index as workers are guided more by purchasing power of their income. Thus by using appropriate measure of real wage we have taken care of the identification problem (Akhter and Ali (2007) and Slaughter (2001)).

7 Empirical Findings

7.1 Results based on Secondary Data

(a) Labour Demand Estimation Results

Table 10 gives the results of estimating the equations 6.1-6.4 with alternative specifications and periods. For each labour demand equation, the estimation is done for two separate periods i.e. one is for period I (2004-05 to 2007-08) and the second is for the period II (2008-09 to 2010-11). Each labour demand variable is estimated using four alternative models (see the second column in Table 10 numbered as 1 to 4).

As expected, for the *total labour demand* equation, the output and wage coefficients are positive and negative respectively, and are statistically significant in all specifications. Once the year and

industry dummies are included, exports to output ratio loses its statistical significance but openness significantly and positively affect the total labour demand. For the period 2008-09 to 2011-12 on the other hand, including industry group and time specific factors makes the impact of openness statistically insignificant. Many of the industry groups show positive impact on labor demand with respect to the benchmark industry group. The petroleum industry shows reduction in labor demand compared to the benchmark industry group food processing in the first period (2004-05 to 2007-08) and basic metals in the second period (2008-09 to 2011-12).

In case of *demand for workers*, we find differing results across periods. For the first period, the demands for workers are positively and significantly impacted by output, wage and export to output ratio and openness. These results carry through even when industry-group specific and year effects are considered. Hence, demand for un-skilled or semi-skilled laborers have increased due to trade liberalization in India during the first period. However, in the second period the impact of liberalization becomes statistically insignificant once the dummies were used. This may have been due to the global financial crisis driven lack of external demand causing insignificant demand for semi-skilled and un-skilled laborers. Petroleum and Computer hardware industries show negative impact on employment of workers with respect to the benchmark industries in the first period. Whereas in the second period, industries like beverages, chemical, computer hardware, electronic, food processing, and petroleum shows negative impact on demand for workers with respect to basic metals industry group. So a significant number of industry groups show negative impact on demand for workers in the second period.

In case of *demand for supervisory and managerial staffs*, we find strong positive impact of output and trade liberalization in the first period. The result remains unchanged when industry group and year factors are used. In the second period, the impact of exports to output ratio on demand for this category of employees is found to be negative when dummies have been included. Thus, more export oriented firms have shown lesser appetite for such laborers post-Crisis. Beverage, food processing and petroleum industry groups show negative impact on demand for such staff compared to the basic metals industry group.

Table 10
Panel Estimation Results (Dependent Variable: Labour Demand (L_{it}))

Dependent Variables (L_{it})	Models	Periods	Q_{it}	W_{it}	EO_{it}	IM_{it}	Z_{it}	Constant	Industry Effects	Time Effects	Observations
Demand for Labours	1	2004-08	0.82 (0.02)**	-0.89 (0.05) **	0.03(0.01) **	0.00 (0.02)		-0.38 (0.14) **	No	No	459
		2008-11	0.80 (0.02)**	-0.59 (0.04) **	0.02 (0.02)	-0.04 (0.02)**		0.48 (0.10) **			493
	2	2004-08	0.83 (0.01) **	-0.91(0.04) **			0.04(0.01) **	-0.47(0.11) **			460
		2008-11	0.82 (0.01) **	-0.63(0.03) **			-0.02(0.01)	-0.34(0.09) **			493
	3	2004-08	0.86(0.02) **	-0.87(0.05) **	0.02(0.02)	0.01(0.01)		-0.61(0.14) **	Yes	Yes	459
		2008-11	0.81(0.02) **	-0.52(0.05) **	0.01(0.02)	-0.01(0.02)		0.52(0.13) **			493
	4	2004-08	0.86(0.01)**	-0.88(0.05)**			0.04(0.01)**	-0.64(0.14) **			460
		2008-11	0.81(0.01)**	-0.53(0.05)**			-0.01(0.01)	0.54(0.13) **			460
Demand for Workers	1	2004-08	0.81 (0.02)**	-1.07 (0.06) **	0.06(0.02) **	-0.02 (0.02)		-1.00 (0.17) **	No	No	459
		2008-11	0.82 (0.02)**	-1.03 (0.06) **	0.06(0.02) **	-0.07 (0.02)**		-0.93 (0.16) **			495
	2	2004-08	0.83 (0.01) **	-1.15(0.05) **			0.04(0.01) **	-1.26(0.15) **			460
		2008-11	0.83 (0.01) **	-1.12(0.05) **			0.01(0.01)	-1.18 (0.15) **			495
	3	2004-08	0.85(0.02) **	-0.94(0.06) **	0.03(0.02)*	0.02(0.02)		-0.96(0.17) **	Yes	Yes	459
		2008-11	0.81(0.02) **	-0.91(0.06) **	0.02(0.02)	-0.02(0.02)		-0.68(0.18) **			495
	4	2004-08	0.85(0.01)**	-0.96(0.06)**			0.06(0.01)**	-1.02(0.16) **			460
		2008-11	0.81(0.01)**	-0.92(0.06)**			-0.01(0.01)	-0.69(0.17) **			495
Demand for Supervisors & Managers	1	2004-08	0.78 (0.02)**	-0.27 (0.06) **	0.04(0.02) **	0.01 (0.02)		0.78 (0.05) **	No	No	459
		2008-11	0.82 (0.02)**	-0.49 (0.05) **	-0.02 (0.02)	0.04 (0.02)**		-0.27 (0.11) **			495
	2	2004-08	0.79 (0.01) **	-0.30(0.05) **			0.04 (0.01) **	0.14 (0.12) **			460
		2008-11	0.80 (0.01) **	-0.44 (0.04) **			0.01 (0.01)	-0.15 (0.10) **			495
	3	2004-08	0.83(0.01) **	-0.37(0.06) **	0.03(0.01)	-0.01(0.01)		0.45(0.06) **	Yes	Yes	459
		2008-11	0.80(0.02) **	-0.59(0.53) **	-0.04(0.02)**	0.03(0.02)		-0.41 (0.14) **			495
	4	2004-08	0.83(0.01)**	-0.38(0.06)**			0.03(0.01)	0.43(0.06) **			460
		2008-11	0.80(0.01)**	-0.57(0.05)**			-0.00(0.01)	-0.35(0.13) **			495
Demand for Men Workers	1	2004-08	0.78 (0.02)**	-0.73 (0.06) **	0.05(0.02) **	0.01 (0.02)		-0.21(0.16) **	No	No	459
		2008-11	0.82 (0.01)**	-0.83 (0.04) **	-0.01(0.02)	0.03 (0.02)*		-0.36(0.10) **			493
	2	2004-08	0.79 (0.02) **	-0.76(0.05) **			0.04(0.01) **	-0.32(0.14) **			460
		2008-11	0.81 (0.02) **	-0.79 (0.33) **			-0.00 (0.01)	-0.24(0.90) **			493
	3	2004-08	0.84(0.02) **	-0.71(0.06) **	0.01(0.02)	0.02(0.02)		-0.64(0.16) **	Yes	Yes	459
		2008-11	0.82(0.01) **	-0.80(0.04) **	-0.03(0.01)	0.02(0.02)		-0.35(0.12) **			493
	4	2004-08	0.84(0.01)**	-0.71(0.06)**			0.03(0.02)	0.63 (0.16) **			460
		2008-11	0.82(0.01)**	-0.79(0.04)**			-0.01(0.01)	-0.28 (0.11) **			493
Demand for Female Workers	1	2004-08	0.95 (0.05)**	-2.45 (0.16) **	0.08(0.05)	0.10 (0.05)*		-5.54 (0.44) **	No	No	457
		2008-11	0.78(0.06)**	-1.07(0.11)**	0.17(0.06)**	0.07 (0.06)		-1.65 (0.34) **			487
	2	2004-08	0.94 (0.04) **	-2.45 (0.14) **			0.20 (0.05) **	-5.60 (0.38) **			458
		2008-11	0.85 (0.04)**	-1.88 (0.09) **			0.03(0.06)	-3.40 (0.28) **			487
	3	2004-08	0.93(0.05) **	-2.08(0.15) **	0.05(0.04)	0.09(0.04)*		-4.65 (0.42) **	Yes	Yes	457
		2008-11	0.78(0.04) **	-1.86(0.11) **	-0.02(0.04)	0.04(0.04)		-3.57(0.31) **			487
	4	2004-08	0.92(0.05)**	-2.08(0.15)**			0.14(0.04)**	-4.67(0.41) **			458
		2008-11	0.76(0.03)**	-1.85(0.10)**			-0.10(0.05)**	-3.18(0.32) **			487

Note: (a) The estimates are based on Feasible Generalized Least Squares (FGLS) method except model 1 for demand for female workers in for the period of 2008-11, which is estimated using Random Effects model. (b) Q_i=Real Output, W_i= Real Wage, EO_i=Export intensity, IM_i=Import intensity, Z_i=Openness. (c)** Significant at 5% level, * Significant at 10% level

Finally, the gender sensitivity of trade liberalization was estimated through separate models on *demand for men and women labor force*. In case of men during the first period, the impact of trade liberalization is found to be significantly positive. After the dummies are included, openness remains an important determinant of male employment in Indian manufacturing. During the second period, trade liberalization has no impact on demand for male laborers after accounting for industry-group specific and year effects. Industry groups like beverages, chemical, food processing and petroleum show negative impact on demand for male employees compared to the basic metals sector during the second period. In case of female employment, we have some interesting results. The demand for female employees is significantly positively impacted by import to output ratio and openness. The results remain unchanged even when industry group and year dummies are used in the first period. In the second period, female employment is negatively impacted by openness after accounting for year and industry group effects. In the first period industry groups like petroleum, fabricated metals, machinery and equipments, motor vehicles, basic metals and transport equipment negatively impacts female employment compared to the food processing sector. Year effect shows negative impact on such employment in 2007-08 compared 2004-05. In the second period, though years 2010-11 and 2011-12 shows positive impact on female employment compared to 2008-09.

(b) Results of Decomposing the Labor Growth

For total persons engaged, during the first period of 2004-05 to 2007-08, the changes in employment have a positive impact on labour-intensive exports whereas domestic demand and import penetration has a negative impact. During the second period (2008-09 and 2011-12), there is a reversal in trend with domestic demand positively influencing employment and net trade has a negative impact (Table A4.1 in Appendix IV). Further, improvement in productivity of labour has also hurt the employment. In case of *total directly employed*, we see a similar trends to that of total persons engaged, the only difference being that in the second period export is positive but, overall, the impact of trade is negative due to the adverse effect of import penetration. The m*ale employment* changes exactly matches that of total persons engaged in the two periods (Table A4.2 in Appendix IV). However, changes in *female employment* are positively impacted by labour-intensive exports and that dominates the negative impact of import penetration in the

second period. Therefore, the net impact of trade on female employment is positive for the second period. This result is different from all others we have estimated. In case of *skilled* and *unskilled* employment, we see no difference in the first period and match exactly with our overall results (see Table A4.3 in Appendix IV). However, for the second period, the impact of export growth on skilled labour is positive but not in the case of unskilled labour, although the overall impact of trade is negative as in the case of total persons engaged.

On further scrutinizing the sectoral differences on female employment compared to male employment in the two periods it is observed (see Appendix V) it is observed that in many sectors the impact is less negative in case of female employees. Menon and Rodgers (2009) shows that in case of Indian manufacturing sector, wage gap between male and female workers have increased due to trade in concentrated industries. Linking our result with this evidence, we can argue that the positive impact of trade liberalization on female employment may be related to this increasing wage gap. Given that the firms experienced reduced price-markups over marginal costs due to higher competitive pressure from trade liberalization (Krishna and Mitra, 1998), firms have used female workers instead of male workers to sustain profits. To corroborate this argument, we further looked at the industries classified as concentrated by Menon and Rodgers (2009) and matched them with the industries identified in Appendix V. It is found that most of the industries identified as having either positive or less negative impact on female employment (compared to male) are classified as concentrated by Menon and Rodgers (2009).

(c) Scale and Composition effects

Scale effects are related to competitiveness of countries where policy, geography and other endowments play a major role. It is also reflected in relative endowments which must support labour-intensive manufacturing for a country endowed with abundant labour so that the expansionary impact of trade increases overall employment. On the other hand, the *composition effect* reflects comparative advantage and captures shift towards more labour–intensive manufacturing where the labour-intensity of export sector is higher than that of domestic sector for a labour abundant country.

Calculations show that scale effect has been positive in India's case for both the periods. Thus given India's competitiveness, trade has led to more employment in both the periods (Table A4.4 in Appendix IV). However, in terms of composition effect, the impact is negative for both the periods (Table A 4.4 in Appendix IV). This implies that though overall trade had a positive impact on employment, manufacturing is moving away from employing labour-intensive techniques. Sen and Das (2015) also argues that the real-wage to rental ratio in India have gone up due reduced real price of capital because of tariff reductions on capital goods. On the other hand, inflexible labour laws have created disincentives for employing more labour.

Overall, we find that the impact of trade liberalization on employment has become insignificant since global economic crisis of 2008. We need additional analysis to understand this phenomenon. From secondary data analysis, we are getting only aggregate trends. However, has the impact become insignificant because of firm-level decision making, trade costs, shrinking of world demand, domestic policy ineffectiveness etc.? This is not testable using secondary data. Therefore, to answer these questions, the study utilizes the results from a detailed survey of firms.

7.2 Results from Primary Survey

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 pioneering paper of Melitz (2003), which extended the heterogeneous firm model of Krugman (1980), show that more productive firms' would export and the least productive would exit the market. As industries are exposed to trade induced competition, the inter-firm reallocations towards more productive firms will result. De Hoyos and Iacovone (2011) have shown that trade liberalization affects productivity at firm level through four channels, namely: (a) intensified market competition, (b) improved trade facilitation in trading intermediate products (c) export promotion, and (d) FDI.

The employment determinant model at the firm level is given in equations (7) and (8).

$$\ln Emp_i = \beta_0 + \beta_1 \ln Exp_i + \beta_2 \ln Wage_i + \beta_3 \ln T_i + \beta_4 NT_i + \beta_5 \ln Age + \beta_6 \ln(L/K)_i + \varepsilon_i \ldots\ldots(7)$$

$$\ln Emp_i = \beta_0 + \beta_1 \ln Exp_i + \beta_2 \ln Sale_i + \beta_3 \ln Wage_i + \beta_4 D_i + \beta_5 T_i + \beta_6 NT_i + \beta_8 (L/K)_i + \varepsilon_i \ldots..(8)$$

The independent variables being logarithm of exports (*Exp*), age of the firm (Age) and Wage for different employee groups in each of the models estimated. The impact of trade policy on firms would be captured by costs related to tariff (T), non-tariff Barriers (NTBs) and the logarithm of L/K ratio, which captures differing technologies across firms. It is measured by wages & salaries/capital employed. The employment variable would be different for each of the employee group types. Separate regressions have been run to find out the impact of trade on total employment, supervisors, workers, males and females. We have also estimated equation (8) to control for the impact of informality of the enterprises. Dummy variable D_i is equal to 1 for informal enterprises in the sample and 0 otherwise. The estimation carried out using survey data had two objectives:

First of all, to estimate the impact of tariff and non-tariff costs on labour demand in the manufacturing sector. Further, to estimate the effect in case of informal firms. Secondary data could not provide information regarding these aspects.

Table 11

Sampling Plan

Orientation	Type	Nos.	Sector	Nos
Export	Labour-intensive	100	Formal	40
			Informal	60
	Capital Intensive	25	Formal	25
Import-Competing	Labour-intensive	25	Formal	10
			Informal	15
	Capital Intensive	100	Formal	100

The data for the firm-level study is generated from a survey of 110 firms. We decided to distribute the whole sample into 50 percent export oriented and 50 percent import competing. The sectors are chosen as export oriented or import competing based on aggregate trends. However, a firm within an export oriented sector can actually be import competing. Therefore, it was decided that firms with more than 50 percent of its sales as exports within the export oriented sector would be considered as export oriented. In case of import competing, a firm is selected if within a sector, firm's export sales is negligible. The export-oriented sample is further

sub-divided into labour-intensive and capital-intensive. With the former comprising of 80 percent of the sample as in India labour-intensive firms are supposed to dominate the export oriented sectors. Labour-intensive is further sub-divided into formal and informal sector with the former consisting of 40 percent of the sample and the latter 60 percent. The sample distribution plan is presented in Table 11.

Table 12
Sample Descriptive Statistics

Variables	Minimum	Maximum	Mean	Std. Deviation
Age	3	115	30	27
Exports (INR)	300000	4627228000	286681531	566856320
Supervisor	1	25000	655	3450
Salary of Supervisors(INR per month)	2467	1440000	28357	165559
Worker	1	2500000	29117	269577
Wage of Workers(INR per month)	2500	1080000	17902	116583
Support Staff	1	2234850	208471	560711
Wage of Support staff(INR per month)	2000	60000	5896	12940
Total Permanent Employees	1	1451120	25752	169146
Male Employees	5	345000	4370	38566
Wage of Male(INR per month)	2500	111928	7800	11955
Female Employees	1	110	22	26
Wage of Females(INR per month)	5260	100000	10778	19922
Wage rate(INR per month)	2500	1494000	118331	195695
Labour to Capital Ratio	0.3	22	3	11
tariff costs (proportion)	0	0.60	0.16	0.11
Non-tariff costs (proportion)	0	0.30	0.07	0.07

Table 13
Responses to Qualitative questions by Import Competing Industries

Questions	Yes	No	
Has Trade Liberalization increased employment?		100%	
Has skilled employment gone up with respect to un-skilled?	71%	29%	
Has employment of women gone up due to trade liberalization?	15%	85%	
Do you get subsidies related to employment?	29%	71%	
Has production become more Capital-intensive due to trade liberalization?	57%	43%	
Has competition from outside the country forced you to change the production process?	71%	29%	
Do you face paucity of right kind of employees?	57%	43%	
	Scale	*Composition*	*Both*
Have employment increased due to scale effect, composition effect or both?	100%		

Table 12 presents the sample descriptive statistics. There is a lot of variation in the data due to the presence of informal sector firms. This is evident when we look at both the export and employment figures. We have divided the analysis into two parts. Table 13 shows the analysis of responses to the qualitative questions by the import competing firms. For the export-oriented

firms, we have run regressions to estimate the equations (7 and 8). The results of the regression estimates are given in Table 14.

Based on the responses collected, it seems that employment intensity in Indian manufacturing has declined. In the import competing sector, the employment of women have not gone up, production process have become more capital-intensive and competition from imports have forced producers to cut costs due to which employment intensity might have come down. The demand for skilled labourers has gone up but paucity of such labour has forced firms to become more capital intensive. Firms in the import competing sectors lack of supply of quality raw materials, especially imported. Too much paper work related to import of raw materials, delay by officials and low pricing of Chinese products have been cited as the major constraints. Among the remedies, majority wanted low interest loans, tax breaks, simplification of procedures for trade as policies that could increase output and hence employment. Firms wanted skill-development centers to create the right kind of labour forces. Finally, buyer-seller meets and Trade fairs were the other market extension services that according to the firms could ease the constraints in the import competing sectors.

Table 14
Estimation Results based on Firm Level Survey

Independent	Total employment		Supervisors		Workers		Males		Females	
Variables	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log of wage	-0.60**	-0.21*	-0.22**	-0.06	0.14	0.39**	-0.47**	-0.44**	-0.35*	-0.12
Log of exports	0.51**	0.23**	0.28**	0.09	0.25**	0.07	0.32**	0.19	0.49**	0.27**
Log of Tariff	0.04	0.16**	0.18*	0.20**	0.11	0.17*	0.20**	0.22**	0.41*	0.36
Log of Non-Tariff	0.20	-0.06	0.19*	0.07	0.10	-0.06	0.06	-0.04	-0.28*	-0.26**
Log of (L/K)	0.11	0.06	0.16*	0.14	0.01	-0.02	0.07	0.05	-0.09	-0.023
Log of Age	0.20	-0.14	0.01	-0.19**	0.39	0.07	0.08	-0.08	-0.27	-0.22
Informal Dummy		-1.94**		-1.15**		-1.49**		-0.97**		-0.97*
Constant	0.91	4.99**	-0.19	3.60**	-3.29	0.71	2.07	5.87**	-2.83	0.27
R^2	0.45	0.77	0.33	0.48	0.33	0.58	0.68	0.76	0.55	0.60

For the first set of regressions corresponding to equation 7, exports have a significant positive impact on employment across labour categories. Elasticity is highest for total employees followed by female employees. The estimation signs on wages are as expected except for workers, which is positive but insignificant. Surprisingly, Tariff costs, in general, have a positive impact on employment across firms. However, in terms of non-tariff barriers, it has a negative impact on female employment but impacted positively the employment of supervisors. This may be due to the demand for higher skills to tackle non-tariff barriers. When the dummy for the

informal sector (employees less than 20) have been taken (equation 8), the coefficient turns out to be significantly negative. This implies that compared to the formal sector firms, informal sector employed lesser number of persons. By design informal sector is defined by the number of employees less than 20 hence the sign of the coefficient is not giving any new information. However, once we control for informality the sign of the coefficient on wage of workers become positive and significant. Age of the firm's impact the employment of supervisors negatively.

8 Conclusion

The purpose of this study is to examine the impact of international trade on employment in the manufacturing sector of India. As trade liberalisation often involves structural adjustment and reallocation of productive resources, the economic reforms of India introduced in 1991 has significant implication on domestic employment structure. Since reforms, trade openness has increased considerably and the composition has gradually moved away from traditional and less technology intensive segments to medium technology product groups. Although India has abundant labour force, the nature of production is found to have biased towards capital-intensive method of production. Moreover, the bulk of employment is found in the unorganised informal sectors, although it contributes very little in overall manufacturing value added. The level of employment in the organised manufacturing is largely concentrated in traditional industries such as textiles and apparel, food and beverages. In this backdrop, the present study, using empirical methods, attempts to examine the direct and indirect impact of international trade on the structure of manufacturing employment during the years 2004-11.

To examine the indirect effect of trade on employment elasticity, the study estimated a labour demand model for two time periods, (a) 2004-07 and (b) 2008-11. The econometric results revealed that the industrial output has a significant and positive impact across industry groups as well as for different subsets of employees. The wage has a negative and significant effect on the demand for labours across manufacturing. In the case trade related variables, the export coefficient is found to have positive and significant impact for the demand for total workers. The result is found to be robust across specification and time periods. For rest of the labour categories, such as supervisors, men & women workers, the export orientation is found to have a weak impact. In most of the labour demand equations, we find a significant negative impact of import

penetration, although the result is less robust across estimation specifications. Further, the degree of openness is found to have a positive impact on labour demand during the first period of analysis. The inclusion of industry and time effects is found to have significant impact on the trade openness among total labour force, workers and female labours in the first period of the sample.

The growth accounting exercise, which disentangle the direct impact of trade on employment reveals that exports has a positive role in labour growth across different categories of employees. The effect of import penetration on various categories of labour demand is negative and, similarly, the domestic demand pressure retards labour growth in the first period.. Female workers seem to have been preferred over their male counterparts post-crisis. In terms of trade induced scale and compositional effects, we find that the former is prevalent in the aggregate manufacturing. However, the compositional changes reveal that trade openness has increased the use of capital-intensive production techniques and has an adverse impact on labour employment.

The primary survey results indicated the employment intensity has declined over the years, especially for the female employees. This is more pronounced in the import competing sectors. Firms are found to use capital-intensive production replacing productive labourers. Similarly, the demand for skilled workers has increased in recent period. The results further support the earlier observation based on secondary data that exports has a positive impact whereas wages acted as a deterrent to labour employment. The impact of trade barriers depended upon the type of protective instruments. In general, the demand for various types of employees are found to be respond positively to tariff barriers while NTBs are found to reduce female employment but increased the demand for skilled workers, especially in the informal manufacturing sector.

9. Policy Implications

The findings of the present study have significant *implications for public policy*. We find that increasing trade specialisation since reforms has been biased towards skill intensive and capital augmenting production processes, although India's relative cost advantage lies in labour intensive production techniques. Secondly, lack of right skills have been highlighted by firms in our survey. Thirdly, the results though broadly similar show trade liberalization as having

differing impact across skilled vs. unskilled and male vs. female. Fourthly, demand for labor in general came down post-crisis.

Policies suggested are as follows:

- Emphasis should be on providing incentives to labor-intensive sectors. Not only those based in urban areas but also those rural household-based industries which can absorb low-skilled and un-skilled workforce with special emphasis on female workers. Incentives can be in terms of tax-breaks, subsidized inputs, initial training, credit availability etc.

- Focus on increasing competiveness. This is to mostly to compete with countries like China. Productivity enhancing activities like increasing skill through formal and vocational institutions. National Skill Development Corporation is a good initiative in this regard. Our results show that productivity enhancement is a viable way of increasing labor-intensity in the rising export sectors. Thus large scale implementation of this programme may help in increasing labor intensity in manufacturing.

- Value-chain-based approach may increase labor absorption. Even if labor-intensity reduces in capital goods and intermediate goods sector dominated by large and medium firms' ancillary industries may increase employment of semi-skilled and un-skilled workers. Hence providing facilities in the vicinity of the large industries to develop such clusters can also increase employment. Competitiveness may differ across different parts of the value chain. Activities which can competitively be taken up can thus be emphasized and exports of same may be incentivized.

- Attracting FDI into basic infrastructure and facilities like industrial parks can go a long way in creating gainful employment. This can provide space for labor-intensive industries like textiles, food-processing which can employ a large number of female and unskilled workers along with others.

- Facilities provided under 'Make in India' can help develop large scale enterprises which can reap the benefits of economies of scale. Lower unit costs can generate employment given initial fixed investments.

- Lastly, to take care of post-crisis impact on employment sustaining domestic demand should be emphasized. Even though India was relatively unaffected by the Global financial crisis it led to fall in export. Preparedness for another crisis through sustaining domestic demand would require sound macro-economic policies along with other policies already mentioned. Reducing interest rates, controlling fiscal deficit and easing business environment through proactive measures are being emphasized in the policy circles.

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Appendix I

Matching Trade and Industry Data

In India the international trade data have been classified based on the World Customs Organizations Harmonized system (HS), while the domestic economic activity has been classified using the National Industrial classification system. This creates a potential difficulty when linking trade and production data, as the harmonized system classifies products solely on physical characteristics and national industrial classification classify products based on physical characteristics and type of economic activity.

The following data tables is obtained from the sources listed below

Sl No	Data Table	Source
1	NIC 2004 Classification	Ministry of Statistics and Programme Implementation http://mospi.nic.in/Mospi_New/site/inner.aspx?status=2&menu_id=129
2	HS 2007	Directorate General of Commercial Intelligence and Statistics http://www.dgciskol.nic.in/
3	Correspondence between HS2002 and HS2007	United Nations, Department of Economics and Social Affairs http://unstats.un.org/unsd/cr/registry/regdnld.asp
4	Correspondence between HS2002 and ISIC 3.1	United Nations, Department of Economics and Social Affairs http://unstats.un.org/unsd/cr/registry/regdnld.asp
5	Correspondence between ISIC3.1 and ISIC4	United Nations, Department of Economics and Social Affairs http://unstats.un.org/unsd/cr/registry/regdnld.asp

The algorithm that is followed for creating the concordance table for the project is as follows.

1. Correspondence table HS 2002 and HS2007 was taken as base file and the ISIC 3.1 codes from correspondence table HS2002 and ISIC3.1 were matched.

2. The resulting table now contained correspondence between HS2002, HS2007 and ISIC 3.1

3. Since we had a correspondence file that matched ISIC 3.1 to ISIC 4, (as mentioned in table above), the ISIC 4 was now matched to the file created at step two.

4. The resulting file now contained concordance of codes between HS2002, HS2007, ISIC3.1 and ISIC4.

5. ISIC 4 codes were now matched with the NIC codes that is followed by India, and the description matching was done manually deciphering the meaning of each categories of products and commodities listed.

Appendix II

Variables used for estimating indirect effects of Trade Liberalisation on Employment

Sl. No.	Variables	Source	Adjustment
1	Persons	ASI	logarithm of Persons
2	Workers	ASI	logarithm of Workers
3	Supervisor	ASI	logarithm of Supervisor
4	Men	ASI	logarithm of Men
5	Women	ASI	logarithm of Women
5	wagertd	ASI and DEA	Wages and Salaries divided no. of persons employed. Then deflated by industry-specific WPI. Logarithm of the deflated value
6	wageword	ASI and DEA	Wages and Salaries for workers divided no. of workers employed. Then deflated by industry-specific WPI. Logarithm of the deflated value
7	wagesupd	ASI and DEA	Wages and Salaries for supervisory and managerial workers divided no. of supervisory and managerial staff employed. Then deflated by industry-specific WPI. Logarithm of the deflated value
8	expout	ASI, DEA and Ministry of Commerce, Government of India	deflated imports divided by deflated output
9	impout	ASI, DEA and Ministry of Commerce, Government of India	deflated exports divided by deflated output
10	open	ASI, DEA and Ministry of Commerce, Government of India	deflated exports plus deflated imports divided by deflated output

Note: ASI: Annual Survey of Industries, DEA: Department of Economic Affairs

Appendix III

Industry Groups

Industry Groups 2004-05 to 2007-08		Industry Groups 2008-09 t0 2011-12	
Code	Industry	Code	Industry
1	Food Processing	1	Basic Metals
2	Beverages	2	Beverages
3	Tobacco	3	Chemical Products
4	Textiles	4	Computer Hardware
5	Wearing Apparel	5	Electronic and Optical
6	Leather Products	6	Electrical Machinery
7	Wood Products	7	Fabricated Metal Products
8	Paper and Paper Products	8	Food Processing
9	Printing	9	Furniture
10	Petroleum	10	Leather Products
11	Chemical Products	11	Machinery and Equipment
12	Rubber Products	12	Motor Vehicles
13	Non-Metallic Minerals	13	Non-Metallic Minerals
14	Basic Metals	14	Other Manufacturing
15	Fabricated Metal Products	15	Other Transport Equipment
16	Machinery and Equipment	16	Paper and Paper Products
17	Computer Hardware	17	Petroleum
18	Electrical Machinery	18	Pharma
19	Communication Equipment	19	Printing
20	Medical, Optical and Watches	20	Publishing
21	Motor Vehicles	21	Repair and Maintenances Equipment
22	Other Transport Equipment	22	Rubber Products
23	Furniture	23	Sound Recording and Musical Products
24	Recycling	24	Textiles
		25	Tobacco
		26	Waste Collection and Treatment
		27	Wearing Apparel
		28	Wood Products

Appendix IV

Results of Labour Growth Decomposition

Table A4.1 Results of Decomposition of Employment Growth in thousands

Sources of Growth	2004-05 to 2007-08		2008-09 to 2011-12	
	Total Persons	Directly Employed	Total Persons	Directly Employed
Total Employment	1935.667	776.924	3020.287	1298.3
Domestic Demand	-52124897.54	-28814828.39	226763018	100591060.9
Productivity Growth	-1162.35	-890.29	5358.62	1861.17
Export Growth	66475487	37390903	-8944167	21288818
Import Penetration	-14347462	-8574408	-217821190	-121880442
Net Employment from Trade	52127996	28816496	-226765357	-100591624

Table A4.2 Results of Decomposition of Employment Growth in thousands

Sources of Growth	2004-05 to 2007-08		2008-09 to 2011-12	
	Female	Male	Female	Male
Total Employment	131.88	644.953	126.147	1172.15
Domestic Demand	-8567912.03	-20246740.1	-15797935	116388996
Productivity Growth	-175.72	-714.627	43.86	1817.31
Export Growth	9684950	27705754	29161090	-7872272
Import Penetration	-1116731	-7457655	-13363073	-108517369
Net Employment from Trade	8568220	20248100	15798017	-116389641

Table A4.3 Results of Decomposition of Employment Growth in thousands

Sources of Growth	2004-05 to 2007-08		2008-09 to 2011-12	
	Skilled	Un-skilled	Skilled	Un-skilled
Total Employment	176.49	1564.83	349.38	2378.39
Domestic Demand	-6388424.33	-38731167.63	30557399.3	162993918
Productivity Growth	-122.6	-844.09	515.31	4335.16
Export Growth	6448073	51342003	552043	-6914861
Import Penetration	-59349	-12608427	-31109608	-156081013
Net Employment from Trade	6388723	38733577	-30557565	-162995874

Table A4.4 Scale and Composition Effects of Export Change in thousands

Effects	2004-05 to 2007-08	2008-09 to 2011-12
Scale Effect	75386140.9	85153908.5
Composition Effect	-8910683.8	-94098075.3

Appendix V
Sectoral Differences in Female Employment compared to males due to exports

2004-05 to 2007-08		2008-09 to 2011-12	
Higher positive Employment Change of females	*Lower negative changes in female employment*	*Higher positive Employment Change of females*	*Lower negative changes in female employment*
Manufacture & Processing, preserving of fish products, macaroni, noodles, and similar farinaceous products, other food products n.e.c, tobacco products, wearing apparel, other chemical product n.e.c.	Manufacture of malt liquors, soft drinks, Dressing and dyeing of fur, wooden containers, coke oven products, plastics in primary forms and of synthetic rubber, office, accounting and computing machinery, medical and surgical equipment, industrial process control equipment, watches and clocks, bicycles, cement.	Manufacture & Processing, and preserving of fruit and vegetables, prepared animal feeds, articles of fur, man-made fibers	Processing and preserving of meat, of vegetable and animal oils and fats, grain mill products, bakery products, sugar, prepared meals and dishes, Distilling, malt liquors, tobacco, knitted fabrics, made-up textile articles, other textiles n.e.c, wearing apparel, knitted apparel, Tanning of leather, footwear, veneer sheets of plywood, wooden containers, other products of wood, articles of paper and paperboard, coke oven products, refined petroleum products, plastics and synthetic rubber, soap and detergents, other chemical products n.e.c, pharmaceuticals, cement, finishing of stone, basic iron and steel, basic precious and other non-ferrous metals, Casting of iron and steel, structural metal products, steam generators, cutlery and general hardware, fabricated metal products n.e.c., communication equipment, electro medical equipment, magnetic and optical media, electric motors, electronic wires and cables, wiring devices, engines and turbines, pumps, and valves, office machinery and equipment, general-purpose machinery, machinery for mining and construction, other special-purpose machinery, parts and accessories for motor vehicles, Building of ships and floating structures, railway locomotives and rolling stock, air and spacecraft, machinery, weapons and ammunition, motorcycles, bicycles and invalid carriages, furniture, of sports goods, medical instruments, Other manufacturing n.e.c, disposal of non-hazardous waste, Other publishing activities

Appendix VI

Survey Questionnaire

1. Name of the Organization:
2. Year of Incorporation:
3. Name of Respondent:
4. Designation:
5. Address:
6. Phone number:
7. Profit/Loss (Rs.)

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Amount (Rs Crores.)					

8. Product Profile

Products	2009-10		2010-11		2011-12		2012-13		2013-14	
HS Code:										
Domestic Sales (Rs. Crores)										
Exports Total (Rs. Crores)										
Destination-wise (Rs. Crore)	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.
1.										
2.										
3.										
4.										
Products	2009-10		2010-11		2011-12		2012-13		2013-14	
HS Code:										
Domestic Sales (Rs. Crores)										
Exports Total (Rs. Crores)										
Destination-wise (Rs. Crore)	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.
1.										
2.										
3.										

4.										
Products	2009-10		2010-11		2011-12		2012-13		2013-14	
HS Code:										
Domestic Sales (Rs. Crores)										
Exports Total (Rs. Crores)										
Destination-wise (Rs. Crore)	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.	Volume	Price Per unit in Rs.
1.										
2.										
3.										
4.										

Instruction: Additional Sheet for additional products

9. Employment (Nos.)

9a. Type of Employees

Type of People	2009-10		2010-11		2011-12		2012-13		2013-14	
	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)
Executive and above										
Supervisor										
Worker										
Support Staff										

9b.

Type of People	2009-10		2010-11		2011-12		2012-13		2013-14	
	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)
On long term Contract										
On Short-term Contract										
Daily Employees										

9c.

Type of People	2009-10		2010-11		2011-12		2012-13		2013-14	
	Nos.	Salary/Wage	Nos.	Salary/Wage	Nos.	Salary/Wage	Nos.	Salary/Wage	Nos.	Salary/Wage

		(per Month Rs.)		(per Month Rs.)		(per Month Rs.)		(per Month Rs.)		(per Month Rs.)
Male										
Female										

9d.

Type of People	2009-10		2010-11		2011-12		2012-13		2013-14	
	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)	Nos.	Salary/Wage (per Month Rs.)
R&D Staff										
Non-R&D Staff										

10. Balance Sheet Information (Rs. Crores)

Account Head	2009-10	2010-11	2011-12	2012-13	2013-14
Gross Value Added					
Wages & Salaries					
Interest Payments					
Electricity charges					
Other energy Consumption					
Raw Materials					
Import of Inputs					
Royalty Payments					
License Fees					
Capital Employed					
Capital Stock (as on 31stMarch)					
R&D Expenditure					

11. Trade Costs (as a percentage of Value)

a) Items	2009-10	2010-11	2011-12	2012-13	2013-14
b) Tariff					
c) Technical Barrier to trade					
1. Technical regulation					
2. Standards					
3. Conformity assessment Procedures					
d) Logistic costs					
1. C&F Costs					
2. Shipping Agent					
3. Insurance costs					
e) Finding Buyers					
1. Online Portals					

2.	Attending Trade Fairs					
3.	Agency costs					
f)	Un- anticipatory Cost					
1.	Congestion Surcharge					
2.	Winter Surcharge					
g)	Any Other costs					
1.						
2.						
3.						

12. Do you think Trade Liberalization has increased employment opportunities in the Manufacturing Sector in India?

Yes ☐ No ☐

If "No" what according to you are the plausible reasons?

a.

b.

c.

d.

13. Has employment for more skilled among the laborers gone up?

Yes ☐ No ☐

Reasons for your answer:

a.

b.

c.

d.

14. Has employment opportunities for women gone up due to trade liberalization?

Yes ☐ No ☐

i)If “Yes” in which sectors and roles?

a.

b.

c.

d.

15. Are there fixed costs to export products?

Yes ☐ No ☐

If “Yes” list them

a.

b.

c.

d.

16. Do you think more productive among the firms in your industry has survived in the export market?

Yes ☐ No ☐

Give reasons for your answer

a.

b.

c.

d.

17. In the Indian context are large firms more productive?

Yes ☐ No ☐

Give reasons for your answer

a.

b.

c.

d.

18. What according to you are the major barriers to trade in India?

a.

b.

c.

d.

19. Do you get any subsidies related to employment?

Yes ☐ No ☐

If "yes "list some of them

a.

b.

c.

d.

20. Has production become more capital intensive due to trade liberalization?

Yes ☐ No ☐

21. Has competition from other countries forced you to change the way you organize production?

Yes ☐ No ☐

22. Do you face paucity of right kind of employees?

Yes ☐ No ☐

If "yes" what are the areas where there is a gap between requirement and availability?

a.

b.

c.

d.

23. What do you think should be the initiatives taken by the government to boost employment in this sector?

a.

b.

c.

d.

ANNEX I

The model of demand for labour can be represented by the following simplified version.

$$y_{it} = \alpha + X_{it}\beta + \nu_i + \varepsilon_{it}, \quad \text{…. (A1)}$$

where y represents the dependent indicator variable, α is the constant, X is the vector of dependent variables, β is the corresponding vector of coefficients on the dependent variables, $\nu_i + \varepsilon_i$ is the residual. , ν_i is the industry-specific time invariant residual. $\varepsilon_i$is the overall residual capturing unobserved effect that changes across products and over time. Whatever be the properties of ν_i and ε_i, if equation (A1) is true, it must be true that,

$$\bar{y} = \alpha + \overline{X_i}\beta + \nu_i + \bar{\varepsilon_i}, \quad \text{…… (A2)}$$

where expressions under bar denote means across time. If the panel is unbalanced (number of observations differ across variables) with this formulation that will be taken care off as the mean is computed for the number of observations separately for each variable. Thus, the concern about the missing values we had echoed earlier in this chapter will not pose any problem for panel data models. Subtracting equation (A2) from (A1) we have,

$$(y_{it} - \bar{y_i}) = (X_{it} - \overline{X_i})\beta + (\varepsilon_{it} - \bar{\varepsilon_i}) \quad \text{….. (A3)}$$

Equations (A1), (A2) and (A3) provide the basis for estimating β. The fixed effects estimator uses equation (A3) to estimate β by least squares method and is also known as the within estimator. The between estimator amounts to using least squares method to estimate β. The random effects estimator is a matrix weighted average of the estimates produced by the between and within estimators. In effect, the random effects estimator turns out to be equivalent to estimation of

$$(y_{it} - \theta\bar{y_i}) = (1-\theta)\alpha + (X_{it} - \theta\overline{X_i})\beta + [(1-\theta)\nu_i + (\varepsilon_{it} - \theta\bar{\varepsilon_i})] \quad \text{…… (A4)}$$

Where θ is a function of σ2ν and σ2ε. If σ2ν= 0, meaning νi is always 0, θ = 0 and equation (A1) can be estimated by OLS (Ordinary Least Squares) directly. Alternatively if σ2ε= 0, meaning $\varepsilon_{it} = 0$,1 and the within estimator returns all the information available. In our analysis, we have mainly used Feasible Generalized Least Squares (FGLS) method given the nature of data set used to run the various regressions.

However, in many panel data sets cross-sectional units have different error variances across panels. In such a situation generalized least squares (GLS) methods must be used. The RE models uses GLS methods with the assumption no heteroscedasticity. The value of the parameters β will depend on the following expression in the absence of homoscedasticity.

$$(X'\Omega^{-1}X)^{-1}X'\Omega^{-1}y \quad \text{..... (A5)}$$

Where Ω is the relevant variance-covariance matrix of the residuals not equal to identity in the presence of heteroscedasticity. The estimation procedure in GLS is based on the assumption that Ω is known. However, since in many cases Ω is not known GLS cannot be used. The FGLS developed by Parks (1967) and Kmenta (1971; 1986) should be used in such cases. It is "feasible" because it uses an estimate of variance-covariance matrix, avoiding GLS assumption that Ω is known. Thus, a consistent estimator of Ω has to be found out in order to substitute it in equation (A5). The Parks-Kmenta method combines the assumptions concerning serial correlation, contemporaneous correlation and panel heteroscedasticity of errors. That is,

$$\begin{aligned} E(\varepsilon_{it}^{\ 2}) &= \sigma_{ii} \\ E(\varepsilon_{it}\varepsilon_{jt}) &= \sigma_{ij} \quad \text{---- (A6)} \\ \varepsilon_{it} &= \rho_i \varepsilon_{it-1} + \eta_{it} \end{aligned}$$

In other words, this approach deals with error complications by specifying a model for heteroscedasticity (first equation in A6), contemporaneous correlation (second equation in A6) and a model for serial correlation using an AR (1) process (third equation in A6). The estimates of ρ and σ will give us a consistent estimate of Ω. Before running the regressions, we have tested for heteroscedasticity through the *hettest* command in STATA. This command uses the Cook-Weisberg test (1983) for testing heteroscedasticity[17]. For all our specified models, the FGLS is used to estimate the coefficients as we found that the data was not homoscedastic.

[17] This tests the hypothesis that the error variances are all equal versus an alternative that the error variances are a multiplicative function of one or more variables. We use the regress command to run the model, which then provide the required predicted values of the dependent variable y. Once heteroscedasticity is confirmed, we re-run our model using FGLS procedure assuming heteroscedastic panels.