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The present study investigates into the impact of trade, foreign investment, and technology on three different employment patterns in India's organized manufacturing sector. These employment patterns cover three disadvantage categories of workers viz., women vis-à-vis men workers, contract vis-à-vis regular workers and unskilled vis-à-vis skilled workers. A conceptual and empirical framework has been developed linking these employment patterns to trade, foreign investment, and technology, and tested for a sample of Indian industries. The research suggests that trade has been employment promoting for women and unskilled workers while it has remain neutral between contract and regular workers. The impact of foreign investment has been observed to be negative for contract and unskilled workers. The overall impact of technology encompassing in-house R&D, foreign technology imports, and capital-intensity has been mostly negative for women and unskilled workers but positive for contract workers.

JEL Classification: *Employment Patterns; Trade; Foreign Investment; Technology*
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1. Introduction

The Indian economy is passing through a phase of 'jobless growth[1]'. The national output has accelerated much ahead of employment constricting the employment generating effect of output during the 1990s as compared to the past (Planning Commission 2001)[2]. Similar to the economy wide trend, the Indian manufacturing has also exhibited a declining trend in employment growth rate and elasticity. The rate of employment growth in manufacturing has marginally slowed down from 2.14 percent in 1983-94 to 2.05 percent in 1994-2000[3]. This decelerating trend in employment generation has led to a general concern in India about the impact of economic reforms on employment. It is widely held that the process of economic reforms including trade liberalization implemented in the 1990s and withdrawal of state from many production activities are the main factors for employment deceleration. The forces of competitive pressure generated by free imports and entry of large number of foreign enterprises may have forced small sized Indian firms to go out of the business and compelled large sized firms to improve their productivity by shifting to capital-intensive and skilled biased technologies, consequently reducing the scope for employment expansion. Therefore, the above view identified trade,

[1] Indian Express (2004) 'Unemployment threatens India's economic boom', April 19, 2004.
[2] For each percent increase in national output, the employment has gone up by only about 0.15 percent during 1993-94 to 1999-2000, down from 0.41 witnessed during 1983 to 1993-94. Source: Table-3.1, pp-46, Report of the Task Force on Employment Opportunities, Planning Commission, Government of India, July 2001.
[3] This measure of employment growth rate is based on usual principal and subsidiary status (UPSS). Ibid, Table-2.5, pp.22.

foreign investment and technical change as three important channels for lower employment performance in Indian manufacturing. There have been several studies investigating the exact impact of trade, technology and foreign investment on the level employment in Indian industries like Singh and Agarwal (1999), Goldar (2002), Pradhan, Abraham and Sahoo (2004) and Banga (2005). However, how these forces affect the patterns of employment is yet to receive any attention.

Trade, technology or foreign investment, not only affect the level of employment performance but also can change patterns of employment. The issue of employment must take into account how the impact of trade, technology, or foreign investment is distributed among different groups in the labour market. Do women workers suffer disproportionately from trade as compared to men workers? Does trade result in more contractualization of employment? Or, how does trade affect the non-skilled workers relative to the skilled workers? These questions can also be asked for technology or foreign investments and have a critical bearing on employment problems in a labour-surplus economy like India. The issues of employment opportunities for women, contract and unskilled workers are also important because these groups are weakest group vis-à-vis their counterparts in the labour market with a higher level of job insecurity, low wages, poor working conditions and vulnerability to exploitation. An understanding of the impact of trade, technology and FDI on such disadvantage category of workers is further useful for government policies aimed at managing employment in an era of increasing globalization.

The objective of present study is to investigate the impact of trade, foreign investment and technology on employment patterns in India's organized manufacturing sectors in the reform period. Section 2 examines the industrial distribution of various patterns of employment like gender, contract, and unskilled workers. The theoretical link between employment patterns and these three factors are explored in section 3. Then empirical models were developed and tested for a sample of Indian organized industries in section 4. Section 5 includes a brief summary of main findings from the study and policy implications.

2. Industrial Patterns of Employment

Women Employment Pattern

The industrial patterns of women employment in Indian organized manufacturing in the period 1995-96 to 2001-02 have been summarized in Table-1. Three stylized facts about women

employment can be discernable. First, it is characterized by a high degree of concentration. A few leading sectors, at 3-digit level of industrial classification, accounted for rather a very high disproportionate share of total women employment. The top three industries (out of a total of 37 industries) together make up for more than 70 percent of the total women employment in 2001-2002. These industries are other food products (24 percent), tobacco products (23 percent) and wearing apparel (23 percent). Other chemical products with 8 percent and spinning, weaving and finishing of textiles with 7.6 percent of employment share are other industries contributing significantly to female employment. Second, majority of these women-employment-contributing industries (except other chemical products) are manufacturers of low-technology products based on labour-intensive production processes. The international market for these products is highly contested with competitiveness driven largely by low prices. Female workers with their low bargaining power seem to have provided a source of competitiveness for industries based in a labour abundant country like India. Third, industrial concentration in female employment has increased since the late 1990s. Between 1995-96 and 2001-02 the employment share of top three women-employment-contributing industries has increased by 16 percentage-points from 54 percent to 70 percent.

Compared to men, women make up a very low proportion in employment in the organized manufacturing sector. For every 100 male workers employed, on an average, just 28 female workers are employed in 2001-02. However, it is encouraging that female employment as a percent of male employment has been growing and became more than doubled between 1995-96 and 2001-02 from 13 percent to 28 percent. Of the total 37 industries, there are just two industries (tobacco products and wearing apparel) that employed more female workers than male workers in 2001-02. Other industries have provided less employment opportunities to women than men and in only three industries namely footwear, other food products and leather, where women had at least half of the employment opportunities enjoyed by their male counterparts.

Table-1 Inter-industry Patterns of Female Employment in Indian Organized Manufacturing, 1995-96 to 2001-02

NIC 1998	Industry	As a Percent of Total Female Employment			As a percent of Male Employment		
		1995-96	2001-02	Difference (Column 4 minus 5)	1995-96	2001-02	Difference (Column 7 minus 6)
151	Meat, fish, fruit, vegetables, oils	1.85	0.61	-1.24	13.98	16.35	2.37
152	Dairy products	0.19	0.16	-0.03	2.88	3.62	0.74
153	Grain mill products, starches and starch products	2.47	0.19	-2.28	9.88	8.56	-1.32
154	Other food products	19.06	23.88	4.82	30.06	52.52	22.46
155	Beverages	0.46	0.39	-0.07	9.62	8.64	-0.98
160	Tobacco products	19.55	23.47	3.92	150.37	375.73	225.36
171	Spinning, weaving and finishing of textiles	7.19	7.55	0.36	4.51	7.22	2.71
172	Other textiles	1.18	0.70	-0.48	12.88	16.95	4.07
181	Wearing apparel,	15.50	23.04	7.54	89.18	202.99	113.81
191	Leather; luggage, handbags saddlery	0.84	1.12	0.28	15.29	49.45	34.16
192	Footwear	3.46	3.30	-0.16	59.10	80.82	21.72
201	Saw milling and planning of wood	0.49	0.00	-0.49	6.75	6.43	-0.32
210	Paper and paper product	0.70	0.28	-0.42	4.36	3.14	-1.22
221	Publishing	0.69	0.05	-0.64	3.75	1.87	-1.88
231	Coke oven products	0.29	0.19	-0.1	4.01	9.19	5.18
241	Basic chemicals	0.28	0.09	-0.19	1.39	0.75	-0.64
242	Other chemical products	10.28	8.08	-2.2	28.86	44.65	15.79
243	Manmade fibers	0.01	0.01	0	0.17	0.44	0.27
251	Rubber products	0.32	0.38	0.06	2.63	4.95	2.32
252	Plastic products	0.61	0.32	-0.29	5.34	7.51	2.17
261	Glass and glass products	0.22	0.14	-0.08	3.63	3.67	0.04
269	Non-metallic mineral products n.e.c.	4.81	0.71	-4.1	15.03	4.73	-10.3
271	Basic Iron and steel	0.87	0.63	-0.24	1.28	2.28	1
281	Structural metal products, tanks, reservoirs and steam generators	0.51	0.02	-0.49	1.47	0.68	-0.79
291	General purpose machinery	0.47	0.19	-0.28	0.99	1.83	0.84
293	Domestic appliances n.e.c	0.31	0.16	-0.15	5.37	7.77	2.4
300	Office, accounting and computing machinery	0.37	0.17	-0.2	25.08	25.47	0.39
311	Electric motors, generators and transformers	1.05	0.14	-0.91	4.34	3.29	-1.05
321	Electronic valves and tubes and other electronic components	2.67	0.85	-1.82	25.50	34.41	8.91
331	Medical appliances and instruments and appliances for measuring	0.23	0.34	0.11	7.33	14.78	7.45
332	Optical instruments and photographic equipment	0.06	0.09	0.03	11.50	28.87	17.37
333	Watches and clocks	0.95	0.37	-0.58	46.16	38.41	-7.75
341	Motor vehicles	0.34	0.12	-0.22	1.39	1.57	0.18
351	Ships and boats	0.22	0.00	-0.22	0.88	0.08	-0.8
359	Transport equipment n.e.c.	0.25	0.13	-0.12	1.59	1.25	-0.34
361	Furniture	0.03	0.01	-0.02	1.22	0.94	-0.28
369	Manufacturing n.e.c	1.25	2.07	0.82	16.97	39.16	22.19
	Total	100	100	0.00	13.01	28.39	15.38

Note: The employment data for 1995-96 is in terms of NIC 1987 and has been mapped into NIC 1998 using the concordance Table-1 provided in the appendix. Further, as the data for 1995-96 covers the factory sector unlike that for 2001-02 which covers the census sector, a caution has to be borne in mind. Nevertheless, since the census sector

constitutes about 60 percent of total factory sector employment (for 2001-02); the employment pattern between these years can be broadly compare keeping in mind the above limitation.

Source: Computation based on (i) Annual Survey of Industries 1995-96, Volume-I (ii) Annual Survey of Industries 2001-2002 Statistics on Employment and Labour Cost in Census Sector.

Contract Employment Pattern

Similar the case of women employment, a concentrated pattern is observed in the industrial distribution of contract workers. However, as compared to female employment, the nature of concentration is relatively less in contract employment. Nearly 39 percent of total contractual employment in Indian manufacturing is absorbed in one industry, namely, tobacco products in 2001-02 (Table-2). Non-metallic mineral products (7.2 percent), iron and steel (6.6 percent), other food products (5.7 percent), spinning, weaving and finishing of textiles (5.6 percent) and other chemical products (5.5 percent) are other industries that had contributed at least about employment share of 5 percent. As in the case of women employment, low technology industries are found to be major employers of contract workers in Indian organized manufacturing. Further, the industrial concentration of contract employment has increased between 1995-96 and 2001-02. The top three industries that accounted for 27 percent of employment share in 1995-96 now claimed for more than 52 percent of total contract employment in 2001-02. Remaining 48 percent share is distributed among a large number of other industries.

As can be seen from Table-2, the contractual system of labour is widely prevalent among the organized manufacturing industries. Indian manufacturing as a whole employed 27 contract workers for every 100 regular workers in 2001-02. Between 1995-96 and 2001-02, the ratio of contract workers to regular workers has grown from 17.7 percent to 27.2 percent. The use of contract relative to regular workers has grown significantly between above periods for most of the individual industries. The industry groups such as tobacco products and manufacturing of meat, fish, fruit, vegetables and oils have, in particular, generated more jobs for contract workers than regular workers. Other important contract-labour-intensive industries are office, accounting and computing machinery, mill products, beverages, non-metallic mineral products and ships and boats.

The increasing reliance of organized manufacturing on contractual employee arrangement may be due to the labour restructuring process that Indian enterprises undertaken in response to an intense competition in the 1990s. Large Indian enterprises in the organized sector realized that it

is possible to achieve maximum competitiveness just relying on a relatively small core group of permanent or regular employees who will provide niche business functions covering technical, managerial, human resource and business leadership. This core group is supported by another group of temporary/contract workers who are employed to meet company's changing demand for labour. This strategy helped Indian enterprises to have greater flexibility in dealing with labour in otherwise strict labour regulations existing in India. In addition, it has assisted them to substantially reduce their costs as contract workers generally have lower wages and are not eligible for medical, retirement and other benefits that accrue to regular workers.

Table-2 Inter-industry Patterns of Contract Employment in Indian Organized Manufacturing, 1995-96 to 2001-02

NIC 1998	Industry	As a Percent of Total Contract Employment			As a percent of Regular Employment		
		1995-96	2001-02	Difference (Column 4 minus 5)	1995-96	2001-02	Difference (Column 7 minus 6)
151	Meat, fish, fruit, vegetables, oils	2.87	3.79	0.92	28.54	107.03	78.49
152	Dairy products	0.79	1.48	0.69	17.81	40.36	22.55
153	Grain mill products, starches and starch products	4.90	1.54	-3.36	26.82	78.04	51.22
154	Other food products	3.31	5.67	2.36	6.02	10.06	4.04
155	Beverages	0.87	2.43	1.56	25.26	60.39	35.13
160	Tobacco products	23.82	38.65	14.83	109.86	159.99	50.13
171	Spinning, weaving and finishing of textiles	16.87	5.62	-11.25	16.83	6.16	-10.67
172	Other textiles	0.66	0.83	0.17	9.65	21.12	11.47
181	Wearing apparel,	0.46	1.43	0.97	2.08	5.13	3.05
191	Leather; luggage, handbags saddlery	0.16	0.38	0.22	3.84	13.86	10.02
192	Footwear	0.57	0.86	0.29	9.14	14.31	5.17
201	Saw milling and planning of wood	0.58	0.00	-0.58	11.31	10.74	-0.57
210	Paper and paper product	2.46	3.34	0.88	22.09	43.97	21.88
221	Publishing	0.35	0.09	-0.26	2.76	4.55	1.79
231	Coke oven products	1.00	0.22	-0.78	19.64	11.94	-7.7
241	Basic chemicals	2.88	4.00	1.12	21.45	38.68	17.23
242	Other chemical products	4.64	5.50	0.86	15.17	25.85	10.68
243	Manmade fibers	0.30	0.58	0.28	7.21	20.58	13.37
251	Rubber products	0.56	0.73	0.17	6.69	11.14	4.45
252	Plastic products	0.78	1.03	0.25	9.68	27.74	18.06
261	Glass and glass products	0.68	0.88	0.2	16.49	27.97	11.48
269	Non-metallic mineral products n.e.c.	9.94	7.17	-2.77	40.59	56.35	15.76
271	Basic Iron and steel	10.53	6.59	-3.94	22.89	28.76	5.87
281	Structural metal products, tanks, reservoirs and steam generators	2.84	1.24	-1.6	12.17	45.19	33.02
291	General purpose machinery	2.07	1.01	-1.06	6.41	11.55	5.14
293	Domestic appliances n.e.c	0.46	0.20	-0.26	11.44	11.29	-0.15
300	Office, accounting and computing machinery	0.33	0.61	0.28	26.95	87.96	61.01
311	Electric motors, generators and transformers	0.98	0.51	-0.47	5.85	13.79	7.94
321	Electronic valves and tubes and other electronic components	0.58	0.33	-0.25	6.68	12.06	5.38

331	Medical appliances and instruments and appliances for measuring	0.06	0.13	0.07	2.51	6.08	3.57
332	Optical instruments and photographic equipment	0.01	0.01	0	2.16	3.95	1.79
333	Watches and clocks	0.04	0.03	-0.01	1.87	2.43	0.56
341	Motor vehicles	1.18	0.48	-0.7	7.16	7.31	0.15
351	Ships and boats	0.48	0.52	0.04	2.86	55.30	52.44
359	Transport equipment n.e.c.	0.49	0.97	0.48	4.52	11.37	6.85
361	Furniture	0.09	0.33	0.24	5.91	28.11	22.2
369	Manufacturing n.e.c	0.41	0.84	0.43	7.11	14.03	6.92
Total		100	100	0.00	17.60	27.21	9.61

Note: The employment data for 1995-96 is in terms of NIC 1987 and has been mapped into NIC 1998 using the concordance Table-1 provided in the appendix. Further, as the data for 1995-96 covers the factory sector unlike that for 2001-02 which covers the census sector, a caution has to be borne in mind. Nevertheless, since the census sector constitutes about 60 percent of total factory sector employment (for 2001-02); the employment pattern between these years can be broadly compare keeping in mind the above mentioned limitation.

Source: Computation based on (i) Annual Survey of Industries 1995-96, Volume-I (ii) Annual Survey of Industries 2001-2002 Statistics on Employment and Labour Cost in Census Sector.

Unskilled Employment Pattern

Table-3 illustrates the industrial distribution of unskilled employment in Indian manufacturing. This information has been calculated from the unit level NSSO (National Sample Survey) data, 50th and 55th round on employment/unemployment survey. In defining skill, all workers aged 15 to 64 years who have completed schooling of higher secondary and above are taken as skilled workers and workers with below this specified education level are classified as unskilled workers. It should be noted the data presented in Table-3 covers both organized and unorganized sector, hence have a much larger coverage than the ASI.

Among all the three aspects of the employment pattern considered here, the unskilled employment is the least concentrated at 3-digit level of NIC industrial groups. The employment share of top three industries in total unskilled employment was just 35.4 percent in 1993-94 and has declined to 31.6 percent in 1999-00. The unskilled employment pattern is dominated by such industrial groups as spinning, weaving and finishing of textiles (16 percent), structural metal products (8.5 percent), other food products (6.9 percent), wearing apparel (5.9 percent) and tobacco products (5.1 percent).

In terms of relative employment generation, this is the only employment pattern where Indian manufacturing has employed relatively more unskilled workers as compared to skilled workers. For every 100 skilled workers, on average, 129 unskilled workers are employed in 1999-00. A total of 19 industries out of 36 industries that had provided more number of employment to

unskilled workers as compared to skilled workers. Manufacture of tobacco products has been the largest employer of unskilled workers generating as high as 872 employment for each 100 employment created for skilled workers. This result is consistent with the hypothesis that countries tend to intensively use the factor that is available abundantly in the inputs bundle. As unskilled labour is cheap and abundant in India, in majority of Indian industries unskilled workers still comprise of a sizable chunk of total labour force. It is also important to note that unskilled-workers-intensive industries are mainly low technology industries where lower price derived from use of cheap labour is the major source of competitive advantage in the market place.

However, this relatively higher employment opportunity for unskilled workers is shrinking in the 1990s. In 1993-94 about 157 unskilled workers got employment as compared to 129 unskilled workers in 1999-00 for a given 100 skilled workers employment in Indian manufacturing. For 26 individual industries the unskilled relative to skilled employment can be seen to have fallen between these periods with negative sign for change in percentage point.

Table-3 Inter-industry Patterns of Unskilled Employment in Indian Manufacturing, 1993-94 to 1999-00

NIC 1998	Industry	As a Percent of Total Unskilled Employment			As a percent of Skilled Employment		
		1993-94	1999-00	% Change	1993-94	1999-00	% Change
151	Meat, fish, fruit, vegetables, oils	1.19	1.85	0.66	169	135.15	-33.85
152	Dairy products	0.56	0.81	0.25	94.26	73.22	-21.04
153	Grain mill products, starches and starch products	2.23	2.66	0.43	337.79	220.62	-117.17
154	Other food products	8.25	6.9	-1.35	281.71	171.23	-110.48
155	Beverages	0.91	1.26	0.35	168.64	257.01	88.37
160	Tobacco products	5.87	5.09	-0.78	967.88	871.54	-96.34
171	Spinning, weaving and finishing of textiles	21.14	16.19	-4.95	289.11	249.28	-39.83
172	Other textiles	4.2	4.68	0.48	238.43	282.23	43.8
181	Wearing apparel,	6.02	5.88	-0.14	296.65	204.14	-92.51
191	Leather; luggage, handbags saddlery	0.64	1.34	0.7	149.91	182.95	33.04
192	Footwear	1.01	1.59	0.58	171.95	187.51	15.56
201	Saw milling and planning of wood	2.36	2.98	0.62	521.5	500.11	-21.39
210	Paper and paper product	2.14	1.96	-0.18	229.37	113.74	-115.63
221	Publishing	2.23	3.22	0.99	107.03	99.69	-7.34
231	Coke oven products	0.65	0.63	-0.02	87.1	55.59	-31.51
241	Basic chemicals	1.55	1.5	-0.05	60.53	58.96	-1.57
242	Other chemical products	4.43	3.92	-0.51	91.29	62.52	-28.77
251	Rubber products	0.99	1.5	0.51	79.24	75.34	-3.9
252	Plastic products	1.9	2.37	0.47	120.74	113.7	-7.04
261	Glass and glass products	0.6	0.92	0.32	184.77	223.92	39.15
269	Non-metallic mineral products n.e.c.	4.51	3.51	-1	244.54	164.9	-79.64
271	Basic Iron and steel	4.89	3.81	-1.08	114.51	65.31	-49.2

281	Structural metal products, tanks, reservoirs and steam generators	5.35	8.47	3.12	121.94	134.11	12.17
291	General purpose machinery	4.41	3.75	-0.66	80.62	67.47	-13.15
293	Domestic appliances n.e.c	0.47	0.44	-0.03	35.36	68.33	32.97
300	Office, accounting and computing machinery	0.08	0.05	-0.03	25.92	8.05	-17.87
311	Electric motors, generators and transformers	1.81	3.85	2.04	58.17	65.81	7.64
321	Electronic valves and tubes and other electronic components	0.71	0.45	-0.26	28.6	27.15	-1.45
331	Medical appliances and instruments and appliances for measuring	0.08	0.04	-0.04	23.57	14.95	-8.62
332	Optical instruments and photographic equipment	0.08	0.08	0	65.27	144.62	79.35
333	Watches and clocks	0.23	0.07	-0.16	66.28	33	-33.28
341	Motor vehicles	0.72	1	0.28	64.38	47.47	-16.91
351	Ships and boats	0.62	0.01	-0.61	36.18	3.93	-32.25
359	Transport equipment n.e.c.	1.18	1.45	0.27	67.07	86.35	19.28
361	Furniture	1.23	1.26	0.03	290.73	227.12	-63.61
369	Manufacturing n.e.c	4.78	4.49	-0.29	297.37	183.55	-113.82
Total		100	100	0.00	157.36	128.84	-18.13

Source: Computation based on the individual records of the National Sample Survey Organisation, Employment and Unemployment Survey, 193-94 (50th Round) and 1999-00 (55th Round)

3. Trade, Foreign Investment, Technology and Patterns of Employment: Theoretical Linkages

In the neoclassical labour markets based on perfect competition, workers are assumed to be homogeneous. However, in real world situations, workers are basically non-homogeneous in character. They vary by training, skill, experience, gender, and nature of employment. Given this fact, three types of employment pattern are distinguished in the study. These are employment by gender, by contract vis-à-vis regular workers and by skilled vis-à-vis unskilled workers. Meaning of gender pattern is quite obvious in that it measure employment of women workers relative to men workers. Contract workers are defined as all those who were not employed directly by an employer but through the contractor. These workers include those employed with the knowledge of the principal employer as well as without his knowledge. Regular workers are persons directly employed by the employer. Hence, the ratio of contract workers to regular workers measures the contractual employment patterns in Indian industries. Skilled/unskilled workers are defined with reference to workers level of educational attainment. Skilled workers include all workers aged 15 to 64 years who have completed schooling of higher secondary and above. Worker falling below the specified level of educational qualifications are grouped as unskilled workers. The ratio of unskilled to skilled workers has been taken to capture inter-industry differences in skill patterns of employment.

In what follows, we are briefly discussing the impact of trade, foreign investment, and technology on these patterns of employment.

3.1 Trade and Patterns of Employment

As trade is increasingly becoming important component of national output, it can be expected to affect the pattern of employment simply because demand for labour is a derived demand from output. The liberalization measures undertaken by countries at multilateral, regional and bilateral level over the past two decades have significantly improved the role of trade in labour market outcomes. As far as gender pattern of employment is concerned trade is predicted to affect employment of women differently than men. This is mainly because labour market behaviour of women is different from men. As compared to men, women's participation in the labour market as paid workers is constrained by two major factors (Fontana 2003). They have a primary role in reproductive process as mothers and caregivers to the family (resulting in time and space constraints, e.g. maternity leave, time spend in child etc.) and also face socio-cultural barriers in improving their competitive advantages as workers through skill and knowledge accumulation. Women have disproportionately less access to education, health facilities, and less access to and control over economic resources. As a result of these factors, women make up a greater proportion among the less-skilled workers and that is also in few labour-intensive manufacturing industries like textile, apparel, leather, toys, and food processing.

Trade may affect women employment relative to men employment in both positive and negative ways. If trade results in increased import competition for women-intensive sectors including small-scale and informal sectors, then women may suffer from disproportionately larger employment losses. This may be true for Indian economy, as labour-intensive products constitute a larger proportion of total exports that are facing increasing competition from least developed countries. On the other hand, if trade results in expansion of export-oriented sectors, which are labour-intensive in India according to Heckscher-Ohlin theory, then this may results in more employment opportunities for women as they work for low wages and in poor working conditions. If trade, both export promotion and import competition results in capital-intensive and skill-biased production process then women are likely to loose employment as they have low level of skill and knowledge. In another way import competition may lead to higher women employment if enterprises replace male workers by female workers to reduce cost as latter work for lower pay than former. A study based on two developed countries, Germany and Japan, investigating the effects of manufacturing trade expansion on men and women's employment

found trade had a more negative effect on women's than men's manufacturing employment in Japan and a roughly equal effect in Germany (Kucera 2001). Because trade involves positive and negative outcomes on gender, the nature of overall impact on gender patterns of employment is uncertain.

The impact of trade on unskilled workers relative to skilled workers can be argued to be largely negative. As improving skill-base becomes a key competitive strategy of the firms' to meet the import challenges and to improve export performance, the likely result seems to be a shift in the skill mix by the substitution of unskilled workers in favor of skilled workers. This phenomenon is known as the trade induced skill-biased technological change. Earlier empirical results on the impact of trade on relative demand for unskilled vis-à-vis skilled workers are however mixed. While Lee and Schluter (1999) failed to find any role of trade in the changes in demand for skilled and unskilled labor during 1972-92 in the case of the US, Revenga (1995) for Mexico manufacturing and Oscarsson (2000) for Swedish manufacturing found that import liberalization/competition did play a role. The reduction in Mexico's tariff levels during the period 1985-87 is observed to be associated with a slight shift in the skill mix in favor of non-production workers (a proxy for skilled workers). The import competition during 1975-93 is shown to have a significant negative effect on the employment of both labour groups in the Swedish manufacturing sector but the effect was larger for non-production workers than for production workers (a proxy for unskilled workers). In a recent study Sánchez-Páramo and Schady (2003) for five Latin American countries (Argentina, Brazil, Chile, Colombia, and Mexico), found strong evidence of increases in the demand for skilled workers exception being Brazil. They identified trade as an important transmission mechanism for this increase in the demand for the most skilled workers.

The trade can also change the composition of workers by contract vis-à-vis regular workers. Usually cutting down the labour costs has been the firm's immediate response to the competition from abroad caused by the trade liberalization like import tariff reductions. Replacing regular workers with contractual workers turn out to be the most preferred option as the costs associated with regular workers are relatively higher as they are regulated by labor market legislation. Regular workers are entitled to several benefits and employment security, as compared to contractual workers who are not covered by the legal framework for social protection. The study done by Currie and Harrison (1997) on Morocco shows that the implementation of trade liberalization programme led to the hiring of more temporary workers by Mexican firms.

3.2 Foreign Investment and Patterns of Employment

Inward FDI can be an important contributing factor in changing the patterns of employment in a host country. There are two reasons for this expectation. First, foreign affiliates are a different group of firms than the domestic enterprises in terms of knowledge-intensiveness. The traditional theory of industrial organization, as initially proposed by Hymer (1960) and extended by many others, predicts that foreign investment in a host country occurs only when the overseas firm has a set of firm-specific intangible assets like technology, skills, brand names, etc. These assets provide some competitive advantages to the investing firms over the local enterprises through local production rather than exporting or licensing. Studies have confirmed that foreign firms typically are more productive, more capital intensive, employ more skilled workers, and pay higher wages than otherwise their domestic plants (e.g. Agarwal 1976, Doms and Jensen 1998, Jenkins 1990). Given these differential behaviour, entry of foreign firms tends to produce differential outcomes for different groups in the labour market. Foreign investment with its skill-biased and capital-intensive technolgouies can be predicted to shift employment structure by increasing the relative demand for skilled workers. Foreign firms also shift the employment patterns via technology spillovers that they generates in the host country (Driffield and Taylor 2000). These spillovers in turn increase the relative demand for skilled workers in the domestic firms, further strengthening the aggregate impact of FDI on employment pattern. In this context, FDI can assumed to be a source of lesser employment opportunities for women relative to men as women constitute a larger proportion of unskilled workers while male dominate skilled workers. The high-skilled nature of production in foreign affiliates can further be inferred to employ more of regular workers with required skills and pay higher to reduce cost of lossing them.

3.3 Technology and Patterns of Employment

Since last 70 years or so, technology is known to substitutes the workers in favour of physical capital (labour-saving bias of technical change) especially in labour-scarce countries as well as to disproportionately increase the demand for skilled workers (Acemoglu 2002, Berman, Bound and Machin 1998, Berman and Machin 2000). Moreover, the physical capital and skill are observed to be complementary in nature (e.g. Goldin and Katz 1998). Therefore, technological changes in the forms of new capital goods or process and product innovation have redefined the nature of skills required for works. The pattern of employment changes as new technologies work to redesign workforce by varying the demand for different category of workers according to their observed differences in knowledge intensiveness. In Indian context, Unni and Rani

(2005) have shown that technical change in the manufacturing sector has been skill-biased in the period between 1993-94 and 1999-00 thus, increasing the relative demand for skilled worker.

Technical development is also gender specific and asymmetrically affect women and men in the labor markets. Technological change tends to reduce work opportunities for women as they have few skills to match the requirement of new production technologies. While women are slow in acquisition and upgrading of skills due to the social bottlenecks they face and their disproportionately greater role in the reproductive sector, technical change is likely to deskill them in labour market by increasingly rendering their exiting skills irrelevant for new employment opportunities. Technological change can also have strong impact on the pattern of employment between regular and contract workers. The impacts can work in both positive and negative way for contract workers. The emergence of flexible organization, production and business practices based on new technologies is inherently pushing firms to keep their niche business functions to a selected group of regular 'knowledge workers' while shifting other production activities away from formal to informal workforce (directly or through contractor). This phenomenon of increasing use of contract workers is further becoming a strengthening trend for circumventing labour regulations and lowering labour costs. Technological change can work in negative way for contract workers if it causes firms to employ more of regular workers to ensure that skills and quality of human capital required by new technologies doesn't migrate to competitors. Okada (2004) in a case study of 50 component suppliers in Indian auto industry noted a significant change in the patterns of skills employment and found that these firms are increasingly choosing regular long-term employment practices over hiring casual workers on account of introduction of new forms of work organization and for meeting the requirements of improved products and process quality standards. Therefore, the nature of the aggregate impact of technological change on contract pattern of employment can be positive or negative depending on the relative strength of these rival effects.

4. Methodology of Analysis

4.1 The Empirical Framework

The starting point of our empirical model is the fact that the changes in the pattern of employment are an outcome of long-term employment strategy followed by business enterprises. The composition of workers by skills, gender or nature (i.e. regular vis-à-vis contractual type) may not be expected to change substantially in the short-run. In this context, the impact of our causal variables like trade, foreign investment or technology can be assumed to affect different patterns of employment in a cumulative manner. This assumption implies that fluctuations in trade performance like export intensity on yearly basis doesn't lead a firm to change its composition of workers in a corresponding fashion.

Accordingly, the existing patterns of employment like the ratio of unskilled to skilled workers for a particular year, say in 1999-2000, can be arguably a result of an inter-temporal labour adjustment process that has taken place in Indian manufacturing for many preceding years during 1990s. Technology, trade or foreign investment might have played significant role in that process by shifting the relative labour demand function for one type of workers against another. In particular, in our model we ask the question- do the past cumulative values of a causal variable for a specified period can explain the current pattern of employment. For example, the cumulative R&D intensity from 1990-91 to 1998-99 has been specified as an independent variable for explaining the pattern of employment relating to the year 1999-2000. For employment pattern of 2000-01 and 2001-02, the cumulative figures of R&D intensity from 1990-91 to 1999-00 and from 1990-91 to 2000-01 have been used respectively. Perhaps this is a simple way to investigate whether the R&D activities in Indian industries during 1990s has played any role in the patterns of employment that characterizes Indian industries today.

Apart from trade, foreign investment and technology, the relative differences in labor demand between different types of workers (e.g. male and female workers) also depend on the relative wage rate. The employment ratio of female to male workers may decrease if the wage rate of female workers rises faster as compared to that of male workers. Given the feasibility and extent of interchangeability between the two types of workers, firms may benefit substantially by employing more of cheap male workers than costly female workers. Hence, we can predict a negative relationship between the ratios of wage rate of female to male workers and the relative employment of the two categories of workers.

Inter-industry differentials in the pattern of employment can also be related to the average size and age of enterprise. As large size firms are leader in innovation and have sufficient financial resources, they are likely to employ more of skilled workers per unskilled workers as well as provide them with employment security (regular employment) and higher pay incentives designed to minimize labor turnover. Women workers embodying relatively lower skills may be negatively affected. The theoretical link between the age of firm and the skill pattern of employment is clear in that a younger generation of firms employing new vintage of capital goods and new organizational strategy are like to hire more of skilled workers than unskilled workers. Thus, higher firm age is expected to favourably affect the unskilled to skilled employment ratio. The new genre of younger firms can also be assumed to have relatively less gender differences in employment than firms that have been in business for longer. This is partly because of rising women literacy in recent years and lessening of social restrictions on women's participation in paid employment. Firm age may also play an important role in the contract pattern of employment, as younger firms are likely to rely on more regular workers than contract workers, as they are adopter of new technologies.

Table-4 lists together nine of our independent variables along with their hypothesized impact on different kind of employment patterns. Trade has been split into two components namely exports and import as a percent of value-added. Technology is represented by three variables such as in-house R&D, foreign technology import and capital intensity. The in-house R&D expenditure incurred as a percent of value-added is taken as a measure of the sector's indigenous technology acquisition. The technology payments made overseas for licenses, patents, knowhow, and technical assistance as a percent of value-added is used as the measure of foreign technology import. The capital to labour ratio is taken as an indicator of a sector's embodied technology acquisition. Foreign investment has been measured as the average share of foreign promoters in total equity holding across firms in the industry. These independent variables, except the relative wage rate and capital intensity, are introduced as one year lagged cumulative figure for a specified period. Such a specification has double advantages. First, it removes any potential causality that exists from the dependent variable to independent variables. Second, the cumulative value of independent variable best captures its long-term impact on employment pattern. In the empirical model, these seven independent variables are specified to linearly affect the dependent variable, namely the ratio of one set of workers to another in a pattern of employment (for example in the case of gender it is a ratio of female to male workers).

Table-4 List of Independent Variables

Independent variable	Proxy	Hypothesized Effect on Employment Patterns
Trade	Import (IMP)	• Ambiguous (?) for gender pattern • Negative (-) for unskilled pattern • Positive (+) for contract pattern
	Exports (EXP)	• Ambiguous (?) for gender pattern • Negative (-) for unskilled pattern • Negative (?) for contract pattern
Technology	In-house R&D (RDINT)	• Negative (-) for gender pattern • Negative (-) for unskilled pattern • Ambiguous (?) for contract pattern
	Foreign technology import (FTINT)	• Negative (-) for gender pattern • Negative (-) for unskilled pattern • Ambiguous (?) for contract pattern
	Capital-intensity (KLINT)	• Negative (-) for gender pattern • Negative (-) for unskilled pattern • Ambiguous (?) for contract pattern
Foreign Investment	Average Foreign Ownership (FDI)	• Negative (-) for gender pattern • Negative (-) for unskilled pattern • Negative (-) for contract pattern
Firm Size	Average Sales (SIZE)	• Negative (-) for gender pattern • Negative (-) for unskilled pattern • Negative (-) for contract pattern
Firm Age	Average Age in Years (AGE)	• Negative (-) for gender pattern • Positive (+) for unskilled pattern • Positive (+) for contract pattern
Relative Wage Rate	Relative Wage Rate (W_a/W_b)	• Negative (-) for all patterns

Note: Gender employment pattern is ratio of female to male workers. Unskilled employment pattern is the ratio of unskilled to skilled workers. Contract employment pattern is the ratio of contract to regular workers.

The basic model used in the study takes the following specification:

$$\left(\frac{L_a}{L_b}\right)_{jt} = \alpha_0 + \alpha_1 IMP_{jt^*} + \alpha_2 EXP_{jt^*} + \alpha_3 RDINT_{jt^*} + \alpha_4 FTINT_{jt^*}$$

$$+ \alpha_5 KLINT_{jt} + \alpha_6 FDI_{jt^*} + \alpha_7 SIZE_{jt^*} + \alpha_8 AGE_{jt^*} + \alpha_9 \left(\frac{W_a}{W_b}\right)_{jt} + u_{jt} \qquad (A)$$

Where the subscripts "a" and "b" stand for employment of two kinds of workers in the given employment pattern (e.g. female and male workers in the case of gender pattern of employment), "j" and "t" represent *j*th industry and *t*th year. "t^*" stand for the cumulative years up to 't-1' year. L is the size of employment measured as the number of man-days worked. W is the wage rate calculated as the wage cost per man-day worked. IMP and EXP respectively denote the import and export as a percentage share of value-added. KLINT is the capital intensity defined as fixed capital stock employed per unit of labour. RDINT and FTINT respectively represent the percentage share of value added devoted to the in-house research and

development (R&D) and importing foreign technology (measured as technology payments made abroad). FDI is the average percentage share of foreign ownership in the total equity holding in the industry. SIZE is the industry-wise value of average sales (Rs. Crore) and AGE is the average age of firms in number of years.

Data Sources

The data used in the empirical analysis originate from several sources. The industry level average foreign ownership, R&D intensity, foreign technology import intensity, export intensity, firm size and age were constructed from Prowess Database (2002) of the Centre for Monitoring Indian Economy (CMIE). The database provides several firm-level financial indicators like sales, R&D, value-added, etc., on about 4000 manufacturing enterprises. It also provides industry-level aggregates but it has its own industrial classification markedly different from standard industrial classification, namely NIC. This has led us to develop an industrial concordance for mapping Prowess into NIC 1998 classification at 3-digit level. This concordance assigns Prowess firms into different NIC category by utilizing the firm-level 'economic activity' classification available in the dataset at a more detailed level of dis-aggregation. For some firms the activity classification was not reported in the Prowess and in that case we relied on the Prowess industrial category to group them into the appropriate NIC classification.

Information on employment (number of mandays worked) and wage rate (wages per manday worked) for women, men, contract, and regular workers for 1999-2000, 2000-01 and 2001-02 has been taken from various reports of the Labour Bureau, Government of India, on *Statistics on Employment & Labour Cost in Census Sector*. Data on skilled and unskilled employment (number of mandays worked per week) and their wage rate (wages per manday worked in a week) for 1993-94 and 1999-00 has been calculated from individual records of the Employment and Unemployment Survey (50^{th} and 55^{th} Rounds) of the National Sample Survey Organisation (NSSO)[4]. It is important to note that this information on skilled and unskilled employment relate to the total manufacturing sector in India including unorganized sector. As the skill data is separately not available for organized manufacturing sector we are constrained to use these available information. However, as in the calculation of skill and unskilled employment we have only included the regular workers excluding causal workers. As the casual workers form the main chunk of employment in unorganized sector, exclusion of the same partially correct biases

[4] I am thankful to Jeemol Unnni and Uma Rani for making available skill and unskilled employment data and providing trade-production concordance between HS and NIC.

due to the inclusion of unorganized sector in the survey in measurement of skill workers for organized manufacturing.

The industry level capital intensity was taken from various ASI (Annual Survey of Industries) reports of the Central Statistical Organization (CSO). Statistics on India's import at 4 digit HS (Harmonized System) classification were obtained from the India Trade database of the CMIE. Using a trade-production concordance developed in-house at GIDR mapping HS 1996 into ISIC Rev 3, the trade data were matched into production data. For calculating import intensity, the industry-wise value-added taken from ASI reports of the CSO has been used as denominator.

4.2 Estimations and Results

The specified model A is estimated separately for each of the three patterns of employment by the pooled OLS method with robust standard errors correcting for heteroscedastic variance in the residuals. Year-specific dummies are included in the estimation in order to control for any intertemporal shifts. In every estimation, a few of the influential observations have been deleted using Cook's distance statistic (Cook 1977) which are above the cut-off point given by 4/n where n is the number of observations. These data points unduly influence the magnitude and significance of regression coefficients because of interactions between high leverage points and their large residuals. Tests of multicollinearity in the form of variance inflating factor (VIF) has been conducted among independent variables which reveals that it is not a problem in our sample. Panel data estimation has not been attempted due to limited number of years, only three years for gender (1999-2000 to 2001-02) and contract employment pattern and only two years for skill pattern of employment (1993-94 and 1999-00).

Tables-5, 6 and 7 summarizes the findings of estimations for gender, contract and skill pattern of employment. Along with the usual regression coefficients, fully standardized coefficients (known as "beta" coefficients) are also furnished[5]. These scale-free standardized coefficients are useful in comparing relative strength of different independent variables in explaining the dependent variable. Overall all the estimated models for gender, contract and skill employment patterns are significant by their individual F-statistics and respectively explain about 26, 24 and 51 percent of variations in the dependent variable. Considering the cross-sectional heterogeneity

[5] These coefficients are obtained by running the model to the standardized dataset i.e., observations of all variables are subtracted from their respective sample mean and then are divided by their respective sample standard deviation.

in the data, these values of R-square appear to be reasonable. Employment patterns wise results are discussed below.

Gender Pattern

In explaining the gender pattern of employment the two trade variables, namely IMP and EXP come up with a negative and positive signs respectively. While the coefficient for IMP remains insignificant, that of EXP achieves a modest level of statistical significance. This suggests that trade through export activities in Indian organized manufacturing is likely to generate more employment opportunities for female workers as compared to male workers and hence tends to be positively correlated with the female employment ratio. This result seems to corroborate the prediction of the Heckscher-Ohlin theory as India's export basket is heavily dominated by the exports of labour-intensive goods. It appears that the expansion of these export-oriented sectors in a relatively labour abundant country like India crucially depend upon the wage cost advantage by employing more of women workers as compared to their male counterparts. The gender pattern of employment seems to be insensitive to the import channel of trade.

All the three measures of technology, namely RDINT, FTINT and KLINT are observed to have an adverse effect on the gender pattern of employment but only the impact of KLINT turns out to be statistically significant. Therefore, technology in the form of mechanization of production process is the single most important factor contributing towards lower female to male worker ratio. Other things holding constant, higher fixed capital per workers has led to a lower scope for female employment relative to male employment. The disembodied forms of technology through in-house R&D and foreign technology import are generally not important factors contributing to the gender gap in employment pattern in Indian manufacturing.

FDI has a predicted negative effect but it fails to reach an accepted level of statistical significance. This would indicate that foreign investment does not affect the gender pattern of employment in Indian manufacturing, once controlled for the impact of other factors. AGE has got significantly negative impact on the gender pattern. Thus, this supports the prediction that start-ups business enterprises provide relatively higher employment opportunities to women relative to men workers than older enterprises. SIZE has a significantly positive influence on gender pattern, differing from the postulated negative effect. It appears that larger firm in Indian industries have followed a non-discriminatory approach in hiring policy as far as gender is concerned and as compared to small size enterprises they seems to have provided more employment opportunities to female workers relative to their male counterparts. The relative

wage rate comes up with a predicted negative sign and is statistically significant. This implies that women and men workers are substitutable and firms are likely to employ less of women workers when their wage rate ascends more rapidly than the wage rate of men workers.

Table-5 Impact of Trade, Technology, and Foreign Investment on Gender Pattern of Employment

Dependent variable: Ratio of man-days worked by women to men worker		
Independent Variable	Coefficients (t-value)	Fully Standardized Coefficients
IMP	-0.000025 (0.95)	-0.0423
EXP	0.000457* (1.73)	0.1422
RDINT	-0.000266 (0.02)	-0.0014
FTINT	-0.004516 (0.64)	-0.0540
KLINT	-0.807548*** (3.26)	-0.2563
FDI	-0.001584 (0.64)	-0.0522
AGE	-0.006732** (2.57)	-0.2808
SIZE	0.000163* (1.81)	0.1502
W_a/W_b	-0.202281*** (2.75)	-0.2345
2001YDummy	0.019333 (0.52)	0.0475
2002YDummy	0.008825 (0.24)	0.0211
Constant	0.470488*** (4.15)	
F(11, 125)	4.24	
Prob > F	0.0000	
R-squared	0.26	
Observations	137	
No. of Industries	48	

Note: Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; 2000 has been treated as base year in the estimation.

Therefore, the results established that the employment gap between women and men workers is largely contributed by a set of five variables namely EXP, KLINT, AGE, SIZE and W_a/W_b with their respective nature of influence. From policy perspective it is useful to know the relative contribution of these variables to the existing gender gap in employment. In this case the absolute values of standardized coefficients are quite helpful. AGE turns out to be the variable accounting for the most variance in gender pattern, followed by KLINT, W_a/W_b, SIZE and EXP

Contract Pattern

The estimates for IMP and EXP have respectively come up with a negative and positive signs. However, none of these are statistically significant; suggesting that the contract pattern of employment in Indian organized manufacturing is not significantly related to trade in either form. Among three measures of technology, disembodied form like RDINT and FTINT have a negative sign and the negative effect of the former turns out to be significant in statistical terms. It suggests that technological activities in the form of in-house R&D tend to provide relatively less employment opportunities for contract workers relative to regular workers. This phenomenon is understandable because processing and production of technology-intensive products necessitate that firms employ a group of regular skill workers. Further, R&D activities require employment of scientists, engineer, and other technical manpower on a regular basis altering the employment pattern. Unlike the impact of disembodied channel of technology, the embodied channel measured by KLINT has a positive impact on the relative employment of contract workers. It appear that more capital-intensive production processes may have made possible for enterprises to keep the niche business functions with themselves through a group of regular workers while outsource other functions to another set of workers on the basis of a contractual arrangement.

FDI has performed as per the prediction and has a strong negative effect on contract employment pattern. The entry of foreign firms, therefore, appears to be an important factor for reducing relative employment opportunities for contract workers. The impact of AGE in determining variations in the contract employment pattern turned out to be statistically insignificant. SIZE has a predicted positive sign and is weakly significant. This implies that the relative employment opportunities of contract workers shrink as the firm size expands. The inter-industry variations in the ratio of contract to regular workers seem to be not related with the differences in wage rates between these workers. W_a/W_b has a negative effect but it is not significantly different from zero.

Table-6 Impact of Trade, Technology, and Foreign Investment on Contract Pattern of Employment

Dependent variable: Ratio of man-days worked by contract to regular worker		
Independent Variable	Coefficients (t-value)	Fully Standardized Coefficients
IMP	-0.000020 (1.09)	-0.0396
EXP	0.000756 (1.04)	0.2042
RDINT	-0.033578** (2.50)	-0.1828
FTINT	-0.000309 (0.04)	-0.0037
KLINT	0.713627*** (3.97)	0.3786
FDI	-0.005876* (1.66)	-0.1944
AGE	0.001854 (0.73)	0.0785
SIZE	-0.000028* (1.68)	-0.1174
W_a/W_b	-0.098395 (1.07)	-0.1104
2001YDummy	0.046712 (1.49)	0.1149
2002YDummy	0.095986** (2.47)	0.2324
Constant	0.179587* (1.84)	
F(11, 127)	17.73	
Prob > F	0.0000	
R-squared	0.24	
Observations	139	
No. of Industries	50	

Note: Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; 2000 has been treated as base year in the estimation.

In the case of contract patterns a total of four factors- RDINT, KLINT, FDI and SIZE- are observed to be the significant contributors. A comparison of absolute value of standardized coefficients reveals that KLINT has been the strong predictor of the employment gap between contract and regular workers. It is followed by FDI, RDINT and SIZE in that order.

Unskilled Pattern

The relationship between trade and unskilled employment pattern is observed to be largely positive for Indian organized manufacturing. Both the IMP and EXP turn out with a positive sign and is significant for IMP. The performance of IMP contradicts the postulated negative relationship. This positive role import competition suggests that Indian industries have relied more on unskilled workers rather than skilled workers to meet the import challenges. The main

motivation may be to reap cost advantage, as wage rate of unskilled is far lower than that of skilled workers. For 1999-00, unskilled worker had a weekly wage rate of Rs. 78.3 that is nearly half of the wage rate of skilled workers (Rs. 164.2).

All the three measures of technology have predicted negative signs and are significant in the case of FTINT and KLINT. This is an interesting result, which suggests indigenous technological efforts in a labour-surplus economy like India may have least skill-bias employment effect when compared to foreign technology imports and capital-intensity. The main sources of the observed skill-biased technological change in Indian manufacturing by Unni and Rani (2005) appear to have largely led by greater mechanization and imports of foreign technologies rather by indigenous R&D.

Foreign investment seems to be a major factor in shifting employment pattern in favour of skilled workers in organized section of Indian manufacturing. FDI has a predicted negative sign and is statistically significant. It seems that foreign firms with their capital-and skill-intensive technologies tend to employ more of skilled workers relative to unskilled workers. AGE also emerged as another factor contributing significantly and positively to the unskilled pattern. Other things being equal, increases in firm age increases relative employment of unskilled workers. This result is consistent with the hypothesis that younger enterprises having new technologies are likely to employ less of unskilled workers per skilled workers as compared to older enterprises who may be slow in adopting the new technologies. SIZE, although has a negative sign is statistically not different from zero.

The relationship between relative wage rate and unskilled pattern is observed to be positive and significant which is not in accordance with prior postulation. This positive association might have been due to two factors. First, Indian industries seems to have employed more of unskilled workers even when their relative wage rate has increased marginally as there is still a large gap between the wage rate of unskilled and skilled workers. Second, supply of unskilled workers is near elastic in India whereas that of skilled workers is inelastic at a point of time and given the shortages of skilled workers might have led industries employ more of unskilled workers available abundantly. While these two factors may have contributed towards a positive relationship between relative wage rate and skill pattern, further research is needed to fully understand the issue.

For unskilled patterns a total of six variables are found to be significant predictors- IMP, FTINT, KLINT, FDI, AGE and W_a/W_b. Among these variables, FTINT has been observed to possess the

largest absolute value in the standardized coefficient vector. Thus, the most of the variations in unskilled to skilled employment ratio can be ascribed to imports of disembodied foreign technology. In terms of relative contribution, AGE comes next followed by W_a/W_b, FDI, IMP and KLINT.

Table-7 Impact of Trade, Technology, and Foreign Investment on Unskilled Pattern of Employment

Dependent variable: Ratio of man-days worked by unskilled to skilled worker		
Independent Variable	Coefficients (t-value)	Fully Standardized Coefficients
IMP	0.000984** (2.25)	0.1540
EXP	0.002635 (1.42)	0.1520
RDINT	-0.108160 (1.55)	-0.1268
FTINT	-0.253208*** (2.80)	-0.3154
KLINT	-2.877667* (1.86)	-0.1241
FDI	-0.041266** (2.38)	-0.2060
AGE	0.031066** (2.22)	0.3037
SIZE	-0.001169 (0.92)	-0.1033
W_a/W_b	0.578278** (2.54)	0.2698
2000YDummy	0.073750 (0.39)	0.0455
Constant	0.830805** (2.21)	
F(10, 47)	16.61	
Prob > F	0.0000	
R-squared	0.51	
Observations	58	
No. of Industries	31	

Note: Robust t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; 1994 has been treated as base year in the estimation.

5. Concluding Remarks

Employment pattern measuring disparity in employment opportunities among different groups in the labour market has been a major policy issue across countries including India. With the implementation of economic reforms since 1991, India's openness to trade, foreign technology and FDI has been increasing significantly. In this context of increasing globalization, analyzing how the employment effects of trade, technology and FDI are distributed among different

groups like women vis-à-vis men workers, contract vis-à-vis regular workers and unskilled vis-à-vis skilled workers has become particularly relevant.

The study begins by analyzing industrial distribution of different pattern of employment in Indian organized manufacturing. Women employment is characterized by a high degree of industrial concentration in a handful of industries. The magnitude of concentration has grown by a considerable extent since late 1990s, with increasing number of women workers being absorbed in those few sectors already over-representing them. When compared to employment opportunities between women and men workers, Indian organized manufacturing has a very high level of employment disparity with women workers getting just one-fourth of what their men counterparts get, although this disparity is observed to be decreasing during recent years.

Contract workers in Indian organized manufacturing are observed to be heavily concentrated in just one industry (tobacco products) but are widely spread among rest of the industries. As observed in the case of women workers, there industrial concentration has been rising for contract workers since late 1990s. The reliance of Indian industries on contract workers has increased with increasing hiring of contract workers relative to regular workers between 1995-96 and 2001-02. However, the gap between contract and regular workers in terms of number of employment is still high with contract workers getting jobs just one-fourth of what regular workers are receiving.

Unlike women workers and contract workers who show a high degree of concentration in a few industries, unskilled workers are found more evenly distributed across industries. They form a majority in total industrial workforce as well as in individual industries. In terms of relative employment generation, there has been a tendency of Indian industries shedding unskilled workers in favour of skilled workers in recent years.

After discussing the industrial pattern of different workers, we proceeded to examine the role of trade, technology and FDI in affecting three chosen patterns of employment. An empirical framework was developed which included six variables of our interest, two of them relate to trade (export and import), three concerns to technology (R&D, foreign technology imports and capital intensity), and one measuring foreign investment. Besides, the firm size, age and relative wage rate has been integrated in the empirical framework. Then the model was estimated for a sample of Indian industries and a number of interesting findings were obtained. Table-8 provides a summary of key findings on the role of different independent variables in affecting employment patterns in Indian organized manufacturing.

Table-8 Summary results on independent variables explaining employment patterns

Independent variable	Proxy	Sign of coefficients and their significance level		
		Employment Patterns		
		Gender	Contract	Skill
Trade	Import (IMP)	(-)	(-)	(+)**
	Exports (EXP)	(+)*	(+)	(+)
Technology	In-house R&D (RDINT)	(-)	(-)**	(-)
	Foreign technology import (FTINT)	(-)	(-)	(-)***
	Capital-intensity (KLINT)	(-)***	(+)***	(-)*
Foreign Investment	Average Foreign Ownership (FDI)	(-)	(-)*	(-)**
Firm Age	Average Age in Years (AGE)	(-)**	(+)	(+)**
Firm Size	Average Sales (SIZE)	(+)*	(-)*	(-)
Relative Wage Rate	Relative Wage Rate (W_a/W_b)	(-)***	(-)	(+)**
Year Dummy	2000YDummy			(+)
Year Dummy	2001YDummy	(+)	(+)	
Year Dummy	2002YDummy	(+)	(+)**	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

As far as generating employment opportunity is concerned trade seems to have an overall positive impact on women relative to men workers and unskilled relative to skilled workers. While exports are behind increased women employment, imports are driving unskilled employment. The segregation of workers between contract and regular appears to be least affected by trade. Therefore, trade has been an important factor that has benefited two vulnerable groups in Indian labour markets namely women and unskilled workers by relatively improving their access to employment opportunities.

The analysis provides partial support for the argument that technology has a gender-bias in the labour market. While none of the negative effects of indigenous R&D and foreign technology imports were significant as explanators, capital intensity was significant with its negative sign. This suggests that only in the form of automation that technological change affects women workers unfavorably as compared to men workers. In the case of contract workers, technology through indigenous R&D plays a negative role but through capital intensity it has perform positively. Summing up both these negative and positive effect using their standardized coefficients, which are respectively -0.1828 and 0.3786, results in a net positive effect of 0.1958. Thus, the overall effect of technology seems to be positive for contract workers relative to regular workers. For unskilled workers the impact of technology in the form of foreign technology imports and capital intensity has been mostly negative.

The empirical findings on FDI are in tune with the predictions built in the analytical framework. Foreign investment with its skill-biased technologies was found to have a negative role on the contract and skill employment pattern in Indian organized manufacturing. Entry of foreign

firms, thus, can be seen to squeeze relative employment opportunities of contract as well as unskilled workers.

Firm age has emerged as a crucial factor affecting the gender and skill patterns of employment. Indian industries with older firms seem to have a lower preference to employ women as compared to men workers. They also have a higher recruitment drive for unskilled workers when compared to skilled workers. These results are in accordance with our prediction that start-ups with their new vintage of capital equipments and management strategies have been more dependent on skilled workers than unskilled workers. It may be that older firms are relatively slow in replacing their old capital equipments and in adopting new management practices. Large firm size is found to be associated with relatively higher employment opportunities for female than male and with relatively lower jobs for contract workers than regular workers.

Relative wage rate has been an important contributing factor in the employment disparity between female and male workers. Results indicate that Indian industries tends to employ more female workers only when their wage rate get depressed further down than wage rate of their male counterparts. This strongly support the hypothesis that women's employability as a worker rest significantly on low pay that they receive. However, increasing relative wage rate and unskilled pattern have been positively related, suggesting that Indian industries continue to employ more of unskilled workers even though they are becoming relatively costly compared to skilled workers.

What are the likely policy implications that emerge from this study? India's implementation of economic reforms has generated vocal reactions from different trade unions, political groups affiliated to both left and right ideologies (e.g. Swadeshi Jagaran Manch), and a section of academic professionals alike. They had expressed concerns that reduction of import tariffs signals dying of labour-intensive domestic firms and thus significant employment losses. Particularly, weaker worker groups in the labour markets like women, contract and unskilled workers are predicted with harmful future from import competition. This study shows that such apprehensions have not become reality for these groups and in fact the net effect of trade has been potentially beneficial for them at least in the case of organized sector of Indian manufacturing.

Two of the disadvantaged workers groups namely women and unskilled workers seems to have been negatively affected by specific modes of technological change. Promotion of in-house R&D as a means of technological improvement appears to be the best strategy to ensure that

women and unskilled workers do not get negatively affected. Measures encouraging imports of foreign technology and/or physical capital accumulation seems to have been detrimental for women and/or unskilled workers. Therefore, India need to prepare an incentive-based technology policy which favour indigenous R&D over technology imports from abroad or capital goods accumulation to ensure that jobs environment for women and unskilled workers does not turn hostile.

Foreign ownership has a strong negative impact on contract and unskilled workers. Hence, government should identify sectors where levels of FDI are significant. Then the role of government should specifically target contract and unskilled workers operating in such sectors with a view to promote their skills through special training programmes and centers from them. Enhancing the endowment of skills possessed by contract and unskilled workers is the best way of ensuring that foreign investment does not produce a negative impact on their employment opportunities.

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Appendix

Table-1 Concordance between 3 Digit NIC 1998 and 3 Digit NIC 1987

1998 NIC (3 digit)		*NIC 1987 (3 digit)*
Description	***Code***	***Code***
Meat,Fish,Fruits,Veg oil & Fats	151	200+202+203+210+211+212
Dairy Products	152	201
Grain Mill	153	204+217+218
Food Products	154	205+206+207+209+213+214+215+219
Beverages	155	216+220+221+222+223
Tobacco	160	225+226+227+228+229
Spinning,Weaving,Finishing	171	231+232+233+234+235+240+241+242244+245+247+250+251+252+253+254+255+256+236+243+246+248+257+258+259
M Other textiles	172	261+262+263+264+267+268+269+260
Apparel	181	265+266+292+964+294+295+296
Leather Products	191	290+293+299
Footwear	192	291+311
Wood	201	270+271+272+273+274+275+277+279
Paper & Paper Products	210	280+281+282+283
Publishing & Recording	221	284+285+286+287+288+289
Petroleum Products and fuel	231	318+319+314+315+316+317
Basic chemicals	241	300+301+302
Other chemical products	242	208+303+304+305+307+308+309
Man-made fibers	243	306
Rubber Products	251	310+312
Plastic Products	252	313
Glass Products	261	321
Non-Metal Mineral Products	269	320+321+322+323+324+325+326+327+329
Basic Iron and Steel	271	330+331+332+333+334+335+336+338+339+337
Structural Metal Products	281	340+341+352+343+344+345+346+349
General Purpose Machinery	291	356+391+354+359+393+397+399+350+351+353+357+390+392
Domestic Appliance	293	355+364+388
Office Equipment	300	358+367
Electrical Machinery	311	360+395+361+362+363+369
TV, radio, video	321	368+365+396+366
Medical Appliances	331	380
Optical Instruments/Photograph equip	332	381
Watches - Clocks	333	382
Motor Vehicles	341	373+374
Ships, Rail, Air	351	370+371+372+377
Motor Cycle-carts	359	375+376+378+379
Furniture	361	276+277+342
Other Manufacturing	369	383+384+385+386+387+389