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Working Paper No. 106

**THE DIFFERENTIAL IMPACT OF JAPANESE AND U.S. FOREIGN
DIRECT INVESTMENTS ON EXPORTS OF
INDIAN MANUFACTURING**

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Foreword

One of the debated issues in the literature of development economics is the role played by the inward foreign direct investment in export performance of developing countries. Since the beginning of the decade of 1990s, the Indian government has adopted various liberalised the policy regarding foreign direct investment (FDI) and tried to remove various impediments. Earlier studies have found that FDI has not played any significant role in export-promotion of Indian industries. This study aims to find whether FDI has led to diversification of export in Indian manufacturing sector in the post reforms period. It also examines whether the source (nationality) of Foreign Direct Investment (FDI) matters with regard to its impact on the exports of the host country. The impact of FDI on export intensity is examined separately in the traditional export sectors and non-traditional export sectors of Indian industries. Both industry level and firm level analyses have been undertaken. The paper shows that FDI has a positive and significant impact on the export-intensity of non-traditional export sector leading to export diversification. The impact is shown to differ with respect to the source of FDI. U.S. FDI is found to have a positive and significant impact on the export-intensities of the industries in the non-traditional export sector, while the impact of Japanese FDI is not significant. The study concludes that an important impact of foreign direct investment in India is that it has led to export diversification in the post reforms period.

This paper was presented in the Fourth Annual Global Development Conference on “Globalisation and Equity”, hosted by the Government of Egypt, on January 19-21, 2003. The paper received the First Prize in the Medal category under the theme “Trade and Foreign Direct Investment”.

Arvind Virmani
Director & Chief Executive
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July 2003

The Differential Impact of Japanese and U.S. Foreign Direct Investments on Exports of Indian Manufacturing

Rashmi Banga

I Introduction

The Indian government in the post-liberalisation period has slowly but steadily tried to facilitate the inflow of foreign direct investment (FDI) into different sectors of the economy. The success stories of East and South East Asian countries suggest that FDI is a powerful tool of export promotion. However, studies have shown that the impact of FDI on export performance of industries will vary not only with respect to the conditions specific to the host economy but also according to the type of FDI or the motive of FDI and the type of industries that FDI enter. Studies for the Indian economy have found that FDI in India have not entered the export-oriented industries and have little impact on the exports of India¹. It has therefore been concluded that FDI in Indian manufacturing has been domestic market oriented and not efficiency seeking in nature (Sharma 2000, Kumar 1995, Aggarwal and Goldar 1999).

However, the impact of FDI in the non-traditional export sector has not been examined separately. A close examination of the share of industries in world exports (Table 1) reveals that the share of Indian industries in non-traditional export sector has in fact increased in the post reform period. These are also the industries where foreign direct investments have entered (Table 2). It is therefore possible that FDI has led to a diversification of India's exports. Also, the earlier studies have, in general, ignored the country-of-origin of FDI in determining the impact of FDI on exports. Literature posits that FDI from different sources differ with respect to their ownership advantages and may internalize different locational advantages in the host country. FDI from different countries have therefore been found to differ with respect to their pattern, size, structure

¹ Siddharthan 1999, Aggarwal 2000, Kumar 1998, Kumar and Siddharthan 1997.

and impact. Given the vast literature on the differences between Japanese and U.S. FDI it is possible that FDI from the two source countries may differ in their impact on exports of the host country.

The paper therefore has two main objectives. First, it aims at examining whether FDI has led to a diversification in India's exports by influencing export-intensity in the non-traditional export sector. Secondly, it aims at analyzing the differences in the impact of FDI from Japan and U.S on the export-orientation of Indian industries and firms.

The analysis is undertaken in two steps. First, industry-level analysis is undertaken for 74 disaggregated industries for the period 1995-96 to 1999-2000. The analysis is carried out separately for traditional export sector and non-traditional export sector. The differential impact of Japanese and U.S. FDI is studied at the industry level. Secondly, a firm-level analysis is undertaken for 1,717 firms, for the same period, to study the impact of Japanese and U.S. FDI on the export-intensity of the firms. Separate analyses are also undertaken for 669 firms in traditional export sector and 1,048 firms in the non-traditional export sector.

The paper is divided into seven sections. Section 2 discusses the analytical structure of the paper. Section 3 provides some empirical evidence on the impact of FDI on exports. Section 4 postulates some hypotheses regarding the impact of FDI on Indian exports. Section 5 discusses the sample, variables and the model used in the study. Section 6 presents three sets of results, i.e., empirical results for the industry-level analysis and the firm-level analysis.

II FDI and Exports: Analytical Structure

The role played by FDI in export-promotion in developing countries has been found to be ambiguous and crucially dependent on the motive behind such investments. The proponents of the positive role played by FDI in export promotion have, in general, categorised this role into four different categories, following Helleiner (1973). FDI

promotes growth of exports depending on its different production characteristics i.e.,

- local raw material processing, or
- converting import-substituting industry to exporting, or
- developing new labour-intensive final product exports, or
- developing labour-intensive processes and component specialization within vertically integrated international industries.

In the first category, i.e., processing of locally produced raw-materials, MNCs may have better export potential than indigenous firms in developing countries, because of their business contacts abroad, their marketing skills, superior technology both in product and processes, and their greater know-how in general. The same MNCs advantages should also be important when countries try to convert import-substituting industries to exporting (for empirical evidence see Blomstrom and Lipsey, 1993). However, in case of developing new labour-intensive final product it is felt that the domestic firms can become significant exporters even without the help of MNCs. But the success stories of many developing countries in exports of light consumer goods show that foreign firms help in providing the access to foreign markets and international links with the final buyer (Blomstrom 1990). It also provides knowledge about foreign market conditions-for instance, foreign preferences regarding design, packaging, product quality, etc (see Keesing and Lall, 1992). Exports of labour-intensive components within vertically integrated industries are almost by definition dependent on the participation of MNCs.

Corresponding to the above categorization, more recent studies have tried to categorize the impact of FDI on exports in terms of the investment motives of the FDI.

Following, Dunning (1989) FDI has been characterised as:

- Resource-Seeking FDI
- Efficiency-Seeking FDI
- Export-Oriented FDI

- Market-Seeking FDI
- Technology-Seeking FDI

It has been found that if the motive behind the investments of FDI is to by-pass trade barriers in the host country, then it is highly unlikely that such investment would result in improving export-performance. However, if FDI is initiated by the country' s comparative advantage, then it may contribute positively to the export growth. Thus, resource-seeking, efficiency-seeking and export-oriented FDI would promote exports while market-seeking FDI and technology-seeking FDI may not be a catalyst to export growth.

Apart from the type of FDI and the motives behind FDI, the policies followed by the government and the stage of development of the economy have also been found to influence the role played by FDI in export performance of LDCs. Studies have found that if structural transformations occur in the economy following changes in the government policies then this would lead to changes in the pattern of country' s FDI(Dunning 1981, 1993). This is because the structural transformations affect the competitive advantages (Ownership advantages) of foreign investors relative to those of local firms, relative competitiveness of local bound resources and capability of the country (Locational advantages), and the propensity of the foreign and local firms to utilize the ownership advantages internally rather than through market (Internalisation advantages).Thus with government intervention the configuration of these advantages change which gets reflected on the FDI position in the country and this may affect the role played by FDI in export performance of the sectors of the economy.

The stage of development of the economy may also alter the configuration of these advantages and the role played by FDI in the country. According to Dunning' s IDP theory (Investment Development Path Theory), an economy' s development is expected to evolve through a sequence of four or five stages (see Dunning 1994). In the first stage of underdevelopment FDI is mainly concentrated in the extractive or primary resources because of underdeveloped infrastructure. The second stage of development leads to

import-substituting manufacturing FDI since this stage is characterised by development of local markets and other locational advantages in the form of protection. In the third stage of development, it is expected that, since the local firms would by now have acquired higher technological skills therefore efficiency seeking and export oriented FDI would come into more technology intensive manufacturing sectors. In the final stage the domestic firms reach a level where inward FDI investments are evenly balanced by outward FDI flows. These stages are roughly similar to Ozawa' s scheme (see Ozawa 1992) of four stages of development of FDI position of a country i.e., "factor driven", "investment driven", "innovation driven" and "wealth driven."

Thus, there is little doubt that FDI can make an important contribution to export promotion, when, given a conducive policy environment, either the host country has very specific resources that can be complemented by elements produced by foreign firms or it has entered the third stage of development. In other cases, however, the boost provided by the FDI to exports from the host country is less obvious since local firms may also be able to put together the required package efficiently and FDI itself may be market seeking.

Is Source of FDI Important :

The importance of the source of FDI in export promotion was first discussed by Kojima (1973). Kojima argued that there is an inherent difference in FDI originating in the West and in Japan and therefore source of FDI plays an important role in determining the impact of FDI on exports. According to the theoretical framework developed by Kojima (1973, 1975, 1978, 1982) American FDI originates from capital exporting country' s advantaged industry into the host country' s disadvantaged industry. Therefore, FDI is a substitute for trade but in the case of Japanese FDI the host country' s production frontier expands in such a direction that the comparatively advantaged industry expands and the comparatively disadvantaged industry contracts, thus enhancing the basis for trade. However, Kojima' s approach has been criticized on various grounds. It is considered to be a static approach that ignores vertical specialization within the industrial sector (Dunning 1981). Many of the arguments made by early commentators, such as

Ozawa (1979), who emphasized the importance of relative factor endowments in driving Japanese FDI have also not withstood the test of time and empirical examination (for criticisms see Hill 1988; Hill, 1990; Ramstetter, 1987). Along with this the importance of global trends to which all firms must respond regardless of home base, inspires caution in any attempt to make *a- priori* comparisons between Japanese FDI and US FDI.

However, the above criticisms of Kojima' s theory does not negate the view that FDI from different sources may be different and may therefore differ in their impact on exports promotion in the host country. The debate about whether significant differences exist between Japanese and US FDI has a long if not altogether distinguished history. Also, the characteristics of Japanese corporations displayed in their domestic operations have been regarded as unique (Aoki 1988; Womack, Jones and Roos 1991) and it has been argued that if these characteristics are changing at all they are doing so only slowly (Yamamura 1990; Yamamura 1994). This suggests that it is likely that the operations of Japanese FDI will continue to differ from those of US FDI. This is vastly supported by the empirical evidence that has found fundamental differences in the pattern, organisation and role played by these FDI in the host economies.

One of the reasons put forward in the theory for the differences in Japanese and U.S. FDI is that in the American economy there exists a dualistic structure in industry i.e., i) innovative and oligopolistic industries, or, in brief, new industries; and ii) traditional industries (textile, steel, agriculture, etc.) which are price competitive and technologically stagnant. The U.S. foreign investment successively takes place mostly from within the first group, i.e., new industries of the capital and knowledge-intensive type move abroad through U.S. FDI before they are standardised. It can therefore be said that the U.S. direct investment is based heavily on a comparative advantage in the generation of innovation and is associated with oligopoly (Vernon 1979). On the other hand, the share of small and medium firms (SMEs) is greater in Japanese FDI as compared to the U.S. FDI and investments from these SMEs is more likely to be driven by location-specific advantages such as cheap labor. The Japanese FDI is therefore more likely to concentrate in labour-intensive sectors (JETRO 1995). This process has been

described by Kojima as a “catching-up product cycle” contrasting with the “product-cycle hypothesis” of Vernon (Kojima 1978).

The empirical evidence vastly supports this argument. Kojima (1991) has compared the industrial pattern of direct investment from Japan and the U.S. for some of the Asian countries (Korea, Hong Kong, Singapore, Taiwan, Indonesia, Philippines, Malaysia and Thailand) and for the whole of Asia. He found that the U.S. FDI followed a remarkably uniform industrial pattern across countries and across time while the industrial pattern of Japanese FDI differed significantly between resource-abundant countries and resource-scarce countries and also over time. Schroath, Hu and Chen (1993) have empirically tested the country-of-origin effects for China and found them to be significant with respect to the industrial pattern of FDI. Dunning (1995) has compared the patterns of Japanese and U.S. owned economic activity in Western European manufacturing industry. He estimated the Japanese Concentration Coefficient (JCC) and found that Japanese investment is more prominent than U.S. investment in textiles, wood-related products, electrical and electronic equipment and transportation equipment in Western Europe. The pattern of foreign direct investment in the host country has therefore been found to differ according to the country-of-origin of the FDI.

Kumar (1998) has argued that export-platform production by MNE affiliates, which is geared to their home markets, is different in nature from that which served the third countries. The paper examined the determinants of export-oriented production by the US and Japanese MNEs abroad. His results showed that the home-market oriented production by US FDI in the host countries was essentially cost saving in nature and was motivated to benefit from international differences in factor prices and raw material costs, on the other hand, resulted from the strategic decision of the MNEs to restructure in pursuit of enhancing their efficiency. This requires a more liberal trading regime than the home-market-oriented production. Such FDI is likely to be directed towards countries that have good infrastructure facilities, a science and technology base and a skilled work force; in other words, towards countries relatively more advanced among the LDCs.

Thus from the above theoretical and empirical evidence it can be concluded that Japanese and U.S. FDI have been found to differ with respect to their orientation, pattern of investment and organisation . It can therefore be expected that their impact on the host economy' s exports may also differ.

III FDI and Exports: Empirical Evidence

The role played by FDI in the export promotion in developing countries has been extensively debated by many theoretical and empirical studies. (for a detailed survey see Jenkin 1991, Dunning 1993, Caves 1996, Kumar and Siddharthan 1997). MNEs have evidently played an important role in rapid growth of manufactured exports of Asian newly industrialising countries viz., Taiwan, Singapore, Hong Kong, Malaysia, (Nayyar, 1983). Empirical studies, however, have reported mixed findings on the role of MNEs in expansion of manufactured exports of developing countries (see Dunning 1993, Kumar, 1994). Among LDCs, some studies have found positive effects (Haddad 1996, Willmore 1992, Lall & Mohammed 1983). Other studies have found that firms with foreign equity stakes export more if they are in high technology industries, but not otherwise (Aggarwal 2000, Harrison 1996, Kumar & Siddharthan 1994). In still other studies, FDI effects vary by industry (Jain 1995, Athukorala et al 1995, Lall 1986). Thus, the contributions of MNEs to the expansion of exports in developing countries varies a great deal depending on the type of FDI, pattern of FDI, government policies and the capabilities of the economy.

The Indian economy in the 1990s underwent a structural change following the economic reforms of 1991. The impact of FDI on exports in the new regime has now drawn attention of many economists and studies have tried to re-analyse the role of FDI in the post reforms period (Siddharthan and Nolan, 2000, Siddharthan 2001, Agarwal and Goldar 1999, Aggarwal 2000, Sharma 2000, Pailwar 2001) These studies have tried to analyse the role of FDI in export expansion in the Indian economy taking into account the impact of technology transferred, the extent of R&D activities undertaken by the foreign firms, the industrial distribution of FDI and the import of knowledge capital by

foreign firms. The study by Siddharthan (2001) argues that the role and nature of FDI is likely to change drastically in response to the needs of the new technology and the WTO regime. During the 1970s and 1980s most FDI was targeted towards host country markets and for using the host country as an export platform to export to the home country. These were mainly in response to trade barriers, effective rates of protection and preferential tariffs. However, under the WTO regime, the roles of tariff and non-tariff protection, and tax laws will diminish drastically and efficiency-seeking FDI, establishing manufacturing units overseas with a view to export to third countries will expand fast.

Siddharthan and Nolan (2000) show that exports of MNE affiliates are greater for firms that import more explicit technology from the purchase of licenses and payments of royalties, and that have larger foreign equity stakes that bring more tacit technology transfer and complementary FDI advantages. Classical domestic export determinants do not matter for this group of firms. In contrast, the explanation of export performance for firms in other strategic groups is different. For these firms, larger firm size, greater capital intensity, and more exposure to foreign markets contribute to greater exports.

The study by Sharma (2000) using annual data for 1970-98 showed that the demand for Indian exports increases when its export prices fall in relation to world prices. Furthermore, the real appreciation of the rupee adversely affects India' s exports. Export supply is positively related to the domestic relative price of exports and higher domestic demand reduces export supply. Foreign investment, however, appears to have statistically no significant impact on export performance although the coefficient of FDI has a positive sign. Aggarwal (2000) showed that in the open regime MNE affiliates performed distinctly better than local firms in the export markets and foreign firms enjoyed a greater competitive advantage over local firms in the high-tech industries. The empirical results of Agarwal and Goldar (2000) shows that in a simultaneous framework of determining technology growth intensity, growth of the firm, level of technical efficiency and export intensity, the foreign equity participation variable was not statistically significant in determining export intensity in the post reform period. Pailwar (2001) has shown that the rate of growth of exports of FDI companies has not only declined in the post reform

period but they are also suffering from low export intensity.

The above empirical evidence on the role of FDI in manufactured export promotion in the Indian economy in the post reform period is ambiguous. However, one common criticism that applies to all the above studies is that these studies have considered aggregated FDI ignoring the source of FDI. The literature shows that FDI from Japan and US might differ with respect to their size, financial structure, industrial pattern, type of technology transferred and mode of technology transfer to the host country and as a result may have different ownership advantages vis-à-vis the host country; and may therefore internalise different transaction costs. Thus, FDI from Japan and US may play a different role in the export promotion in the Indian economy in the post reform period. The aim of this paper is to bring out differences in the role played by Japanese FDI and U.S. FDI in the manufactured exports in the Indian economy during the period 1995-2000. The paper also aims at examining the role played by FDI in promotion of exports in the non-traditional export sector. Both the industry level and the firm level analyses are undertaken, for 74 disaggregated industries and 1,717 firms.

IV FDI and Indian Exports: Some Hypotheses

The Indian economy opened up its market in the beginning of the last decade (especially from July 1991) by lowering tariff and non-tariff barriers (NTBs), and liberalizing investment policy. One of the objectives of the current reforms of policies was to remove impediments for export-oriented manufacture in general and to attract MNEs to locate efficiency-seeking FDI in the country. These investments could help India in expanding manufactured exports by using her as export platform. However, as already discussed, studies show that the majority of the inward FDI aim to explore India's sizeable and expanding domestic market and has not significantly contributed to exports. It is felt that it may be too early to expect such efficiency seeking FDIs to start flooding the country. Also, in an era of stiff competition among developing countries to attract export-oriented FDIs, liberalization of policies alone may not be sufficient to attract export-oriented FDI. (see Kumar 1994 for empirical evidence).

However, studies have not yet tried to examine whether FDI has led to any diversification in Indian exports, that is to say whether in the non-traditional export industries has FDI encouraged exports. Given the ownership advantages due to which the FDI have entered the industries it is expected that the same ownership advantages also give the foreign firms higher comparative advantage vis-à-vis the domestic firms to export. From this we derive our first hypothesis

First Hypothesis: FDI in India have not been attracted to traditional export-oriented industries but they have led to diversification in India's exports.

To examine the impact of FDI on exports we first analyse the inter-industry pattern of FDI and the export intensity of different industries. The industrial pattern of FDI in India (Table 2) shows that foreign shares are high in electrical (especially electric equipment, electronic components and electronic consumer goods), chemical, pharmaceuticals, automobiles and automotive components, engineering, glass and glass products, cigarettes, domestic appliances and food-processing industries. These results are broadly consistent with those reported by Athreye and Kapur (1999). However, the traditional export-oriented industries according to their share in world exports, (see Table 1) are mainly, tea, leather and leather manufactures, gems and jewelry, garments, iron ore and metalliferrous ores, and medicinal and pharmaceutical products. Though all the traditional export industries, with the exemption of tea and gems & jewelry have received some foreign participation, it can be said that the traditional export-oriented industries have not received FDI in a big way and FDI has more or less concentrated in non-traditional export sector. It is interesting to note that the share of almost all the non-traditional industries in world exports has increased since 1990. The share of total exports of India in World exports has also increased from 0.5% to 0.6% since 1995.

Given the higher levels of technological skills, marketing skills and international orientation of MNCs, it can be expected that FDI in the non-traditional export sector have led to higher exports and therefore helped in diversifying Indian exports.

Second Hypothesis: Japanese and US FDI are likely to have differential impact on the export intensity of the industry.

Japanese and U.S. FDI are not only expected to differ with respect to their industrial pattern; but within the same sector they are also expected to have different levels of comparative advantages in different types of activities. Their industrial pattern is expected to differ because of the type of FDI that originates from Japan and US differ. As discussed earlier, the U.S. FDI is based heavily on comparative advantage in the generation of innovations and therefore are associated with oligoplistic firms, On the other hand, Japanese FDI have a larger share of small and medium sized firms that are likely to be drawn by locational specific advantages.

The change in comparative advantage of US and Japan in manufactured goods has been examined by Balassa and Nolland (1990). The econometric estimations revealed the transformation of Japan' s comparative advantage from unskilled labour into human capital and R&D intensive manufactured products with its position in regard to physical capital-intensive products being approximately maintained overtime. There is some evidence that Japan and US have specialised in different industries according to their comparative advantage. Kodama and Honda (1986) estimates a cross section model which classifies industries according to three patterns of R&D activities. The fundamental insight of the model is that the rapidity of technical innovation in an industry can be characterised by the likelihood of "survivability" of a given research project as it moves from exploratory research to investment for production. Three typologies are developed. In the "traditional pattern" the likelihood of project cancellation, once investment for production has begun, goes to zero. In the "science based pattern" the likelihood of project cancellation remains constant throughout the life of the project. In between these extremes, is the "high-tech pattern" in which the likelihood of project cancellation declines as the project progresses, but the probability of termination always remain non-zero. Even at the point of investment, the introduction of competing technologies may lead to termination of the project.

This perspective has the implication for the pattern of specialisation within the high-tech areas. Science-based industries such as chemicals will be dominated by large firms, which can finance the basic science research necessary for the innovation. This may help explain why Japan still has not developed a strong comparative advantage in chemicals despite Japan' s abundant endowments in human and physical capital. Japan' s unexpected weakness in chemicals has been identified by Dixit(1987). Conversely, Japan has fared better in high-tech pattern industries where research is more products specific, and management of research activities more important.

Thus, sources of FDI may have different industrial patterns depending on their comparative advantage. US FDI in manufacturing is usually undertaken in most technologically sophisticated industries with not yet standardised products that are more capital-intensive in nature while Japanese FDI generally enter industries that are less capital-intensive producing standardised products that are less technology-intensive. Within the same sector, the two may differ with respect to their levels of technology, modes of transferring technology and they might be undertaken by different size of firms. It is therefore possible that they have differential impact on the exports.

Third Hypothesis: In the Indian economy, U.S. firms are likely to have higher comparative advantage in the non-traditional export sector as compared to the Japanese firms.

The current literature on international trade has emphasised the role of technology in trade (Kumar and Siddharthan, 1997, Wakelin 1997). It is expected that an enterprise, which enjoys the better endowment of a technology and knowledge base, is more likely to be export oriented in comparison to others. Subsequent to entering the export market, the firm may have to spend more on in house R&D and technology imports to remain globally competitive. Thus, higher the level of technology at which a firm operates, given the international demand, higher will be its comparative advantage vis-à-vis other firms in the industry to export. It is expected that since US FDI are mainly in high-tech

industries in the non-traditional export sector and are undertaken by large firms they bring in higher levels of technology as compared to Japanese firms, which are generally concentrated in medium-tech industries and are undertaken by small and medium sized firms. And within the same industry, US firms and Japanese firms may still lead to differential impact on export-intensity of the industry depending on their level of technology and type of R&D activities undertaken by their affiliates. The higher level of technology at which the US firms are likely to operate and the type of technology they are likely to bring as compared to the Japanese firms makes them more capable of exporting in the same sector of the host country vis-à-vis Japanese firms. Thus, it is expected that the impact of foreign investment on local exports can vary across sectors and within each sector, between low-tech foreign firms and high-tech foreign firms.

V Sample, Variables and Methodology: Industry Level And Firm Level Analysis

Sample

In order to estimate the export intensity at both industry and the firm level, we have collected data from corporate data base *Capitaline*, produced by Capital Markets Ltd, an Indian information services firm. The database provides panel data for about 7,000 companies that are listed on an Indian stock exchange as well as some unlisted companies. This is supplemented with data taken from various issues of Annual of Survey of Industries (ASI), various issues of National Accounts Statistics and some publications of Ministry of Industry. Industry level analysis uses a balanced panel of 74 three-digit level industries for the years 1995-96 to 1999-2000 while the firm level analysis is based on data of 1,717 firms for the above period.

Variables

Many studies have used the sales of foreign firms to total sales in the industry as a proxy for foreign presence. However, this is the market share of foreign firms, which may not truly capture the extent of presence of foreign firms in an industry. Foreign firms

in large industries may have smaller market share. Also, the market share of foreign firms is likely to be correlated with the exports of the firms. Therefore, the variable used in the study for foreign presence is the proportion of foreign equity invested to total equity invested in the industry at the industry level and foreign equity invested in the total equity of the firms at the firm level. The variables representing foreign presence therefore are:

- a) Foreign equity as a ratio of total equity invested in the industry (FEQ)
- b) Japanese Equity as a proportion of total equity invested in the industry (JEQ)
- c) US Equity as a proportion of total equity invested in the industry (USEQ)
- d) Foreign equity as a ratio of total equity invested in the firms (FE)
- e) Japanese Equity as a proportion of total equity invested in the firms (JE)
- f) US Equity as a proportion of total equity invested in the firms (USE)

The export intensity of the industry (EXPINT) is found to be related to some industry-specific variables like capital intensity in the industry; R&D intensity of the industry, imports of knowledge capital goods in the industry; outward-orientation of the industry and policy regulations controlling the industry. To examine the impact of FDI on the export intensity of the industries it becomes important to control for the following variables.

Industry specific variables

- a) Size of the Industry, total fixed assets / number of firms in the industry (SIZE)
- b) Effective Rate of Protection in the industry (ERP)
- c) Capital-Labour Ratio in the industry (K/L)
- d) R&D intensity of the industry (R&D)
- e) Advertisement Intensity (ADVT)
- f) Skill intensity, i.e., number of high-salaried employees / total number of employees (SKILL)
- g) Gross profitability in the industry with a lag (GP)
- h) Extent of vertical-integration in the industry (VI)
- i) Concentration Ratio of the industry. (CR4)

- j) Capital imports by the industry (IMPCAP)
- k) Imports of Spares and stores in the industry (IMPSPS)
- l) Payments for royalty and technical fees in the industry (ROY)
- m) Import of Embodied technology in industry (IMPEMD), ($IMPEMB = IMPCAP + IMPSPS$)

For the firm level analysis it is expected that the export intensity of the firms ($EXPINT_F$) is dependent on both industry-specific as well as firm-specific variables like size of the firms, age of the firms, R&D intensity of the firms, etc. To control for firms-specific variables the following variables are considered:

Firm specific variables:

- a) Size of the firm i.e., log of sales of the firms ($SIZE_F$)
- b) Capital-Intensity of the firm (KI_F)
- c) R&D Intensity of the firm i.e., R&D expenditure/sales ($R\&D_F$)
- d) Advertisement intensity in the firm ($ADVT_F$)
- e) Gross profitability in the firm in the lag period (GP_F)
- f) Capital imports by the firm ($IMPCAP_F$)
- g) Imports of Spares and stores by the firm ($IMPSPS_F$)
- h) Payments for royalty and technical fees by the firm (ROY_F)

The data on foreign equity invested for the years 1994-95 and 1995-96 has been constructed using ratio of the dividends paid in foreign exchange by the firms to total dividends paid. This may also include the dividends paid to foreign institutional investors. However, it is not expected to be large for this period. The ERP series estimated by NCAER for the years 1995-96 to 1998-99 has been used. One of the limitations of the *Capitaline* database is that it does not include fully foreign-owned firms or joint ventures that are not listed on any Indian stock exchange.

Methodology

The Model estimated is as follows:

$$X_{jt}=f((ERP_t, SIZE_t, K/L_t, R\&D_t, ADVT_t, SKILL_t, GP_{t-1}, VI_t, CR4_t, IMPCAP_t, IMPSPS_t, ROY, FP_{jt}))$$

Where X_{jt} is the export-intensity of the j th industry in period t ;

Where $t= 1995-96, 1996-97, \dots 1999-2000$; $j = 1, 2, \dots 74$, FP_{jt} is foreign presence.

In this equation, FP_{jt} is the variable that captures the effect of FDI. In some equations, foreign equity as a proportion of total equity invested in the industry (FEQ) is used to capture the effect of FDI. In other equations, JEQ and USEQ are used so as to capture the differential effect of Japanese and U.S. FDI. Exports are further divided into exports from traditional sector and non-traditional sector. A similar model is adopted to examine the impact of FDI at the firm level. To take into account the fluctuations in the world demand for exports and industry-specific effects that are not captured by the model, time dummies as well as industry dummies are introduced.

The usual panel data estimation techniques are applied for estimating the impact of FDI on export-intensity of the industries. While the *Tobit* model, using (0,1) as limits is used for the analysis at the firm level. The application of Tobit model is appropriate because many of the firms may have zero values for exports.

VI Empirical Results

The empirical analysis proceeds in two steps. First, an industry level analysis is undertaken to examine the impact of FDI; Japanese FDI; and U.S. FDI on the export-intensity of the industry; Next, firm-level analysis is undertaken to test the impact of presence of foreign, Japanese and U.S. equity on the export-intensity of the firm. These analyses are undertaken separately for traditional export sector, non-traditional export sector and aggregate manufacturing sector. Panel data estimation techniques are used for the industry-level analysis while Tobit model is estimated for the firm-level analysis. The

Lagrangian multiplier test has been carried out on the regressions and heteroscedasticity consistent standard errors are reported in the results.

Industry-Level Analysis: Empirical Results

The industry-level analysis is undertaken for 52 industries in the non-traditional export sector and 22 industries in the traditional export sector and total of 74 disaggregated industries in the manufacturing sector for the period 1994-95 to 1999-2000.² Table 3, 4 and 5 presents the results for industries in non-traditional export sector, traditional export sector and aggregate manufacturing sector respectively. Table 6 presents the correlation matrix. The correlation matrix shows that export intensity of the industry is negatively correlated to foreign equity, Japanese equity and U.S. equity in the traditional export sector as well as for the aggregate manufacturing sector. However, for the non-traditional export sector the correlation between U.S. equity and foreign equity in the industry and export-intensity of the industry is positive.

Using the random effect model, as supported by the Hausman statistic, we find that the impact of FDI on the export-intensity of the industry in non-traditional export sector (Table 3, column 6) is positive and significant. The results remain qualitatively the same in the OLS model. The export-intensity is found to be higher in industries, which have low protection; are labour-intensive with low level of skills; higher profitability (in the lagged period) and have lower royalty payments³.

However, FDI is not found to have a significant influence on export-intensity of industry in traditional export sector (Table 4, column 5, FEM) and is found to be insignificant for all industries in aggregate manufacturing sector (Table 5, column 6

² The industries whose average share in the world exports in 1985 and 1990 is more than 1% are taken to be industries in the traditional export sector.

³ Following transaction costs analysis, FDI will dominate as the mode of foreign market entry when transaction costs through the external market are high and internalization is preferred, whereas licensing will be the preferred mode in cases where transaction costs through the market are low. In this view, FDI and licensing are alternatives or substitutes. The interaction between FDI stake and license payments affecting exports may therefore be negative.

REM). The result for all industries taken together is consistent with the results of earlier studies for all industries, which have also found that FDI has not played any role in improving export performance of the industries. However, the results support our hypothesis that FDI has led to a diversion in exports from India.

The results on the impact of Japanese and U.S. FDI on the export-intensity of the industry in non-traditional export sector, traditional export sector and taking all industries together are reported in Tables 3,4,and 5 (column 1,2,3) respectively. The results of FEM, as supported by the Hausman statistics, show that in the non-traditional export sector (Table 3) U.S. and Japanese FDI have differential impact on the export-intensity of the industry after controlling for other industrial characteristics like size of the industry, R&D intensity, skill level, profitability, etc. The U.S. FDI has a positive and a significant impact while Japanese FDI do not have a significant effect and also has a negative sign. The other industrial characteristics leading to higher export-intensity are low protection, higher labour-intensity, low R&D intensity, low level of skills, and high profitability in the lagged period. The result seems probable since the industries where US FDI are prominent are industries like chemicals, pharmaceuticals, personal care and electrical. These industries are also the industries whose share in the world exports has increased after 1995 (Table 2). However, we find that the impact of Japanese and U.S. FDI in the traditional export sector (Table 4, column 2) and taking all industries together (Table 5, column3) is not significant.

Thus, the industry level analysis support our hypotheses that FDI has led to the diversification of Indian exports and Japanese and U.S. FDI have differential impacts on the export intensity of the industry. The results show that U.S FDI have a positive impact on exports in Indian industry while Japanese FDI does not have a significant impact. This is contrary to Kojima' s hypothesis (1973). However, the results are consistent with those found by Encarnation (1999) for the two decades, 1970s and 1980s. He found that Japanese multinationals have been less reliant on their foreign subsidiaries' sales to generate international trade in Asia than have American multinationals.

Firm Level Analysis: Empirical Results

To analyse the reasons as to why US FDI have higher influence on export-intensity of the industries in the non-traditional sector unlike Japanese FDI, it becomes important to follow up the industry-level analysis with firm-level analysis. Since Japanese firms and U.S. firms have concentrated in different industries in Indian manufacturing, it becomes difficult to have any meaningful comparisons of U.S. and Japanese firms in terms of their characteristics in Indian industries. We therefore first examine the characteristics of Japanese firms and U.S. firms in the few industries where both Japanese and U.S. firms are simultaneously present, namely, auto-ancillaries, chemicals, domestic appliances, electric equipment and electronic components. Table 7 presents a comparison of mean of different characteristics of 47 Japanese firms and 60 U.S. firms along with the t-test for equality of means. The comparison shows that in the above listed industries U.S. firms differ significantly from Japanese firms in terms of a number of characteristics. U.S. firms are, on an average, larger firms as compared to Japanese firms; they are more capital intensive; have higher imports of capital goods and higher R&D intensity. However their imports of spares and stores and royalty payments are lower than the Japanese firms. The U.S. firms also have higher export-intensity as compared to Japanese firms but this difference is not statistically significant. However, recent data released by BBI reflects that export-intensity has been found to differ across source countries of FDI. The export-intensity of sales was found to be highest for U.K., which is mainly concentrated in the traditional export sector. The export-intensity of sales was reported to be higher for U.S. as compared to Japan.⁴

To see the impact of these differences in the characteristic of the firms on their trade patterns a correlation matrix is presented in Table 8. We find that U.S. equity in firms is positively correlated with the export-intensity of the firms, rate of growth of the exports, import of capital goods, spares and stores and royalty payments; while Japanese equity in the firms is negatively correlated with export-intensity of the firms, rate of

⁴ According to RBI bulletin, (Finances of FDI Companies), U.S. companies were reported to have export-intensity of sales as 8.7% in 1996-97; while that of Japan was 6.6%.

growth of exports and import of capital goods however, it is positively correlated with import of spares and stores and royalty payments.

The correlation between the export-intensity of the firms and U.S. equity in the firms in the non-traditional export sector (Table 6) is also found to be positive while it is found to be negative and low with Japanese equity in the firms. To compare the level of technology at which the Japanese and U.S. firms operate an index of Level of Technology, using proportion of imports of capital goods, R&D expenditures, import of raw-materials, import of spares and stores and royalty payments to total sales is estimated with the help of the Principal Component Analysis. The factor score matrix is presented in Table 9. The average index of Level of Technology for the period under consideration is estimated to be 0.147 for the U.S. firms, 0.050 for the Japanese firms and 0.046 for the domestic firms. This shows that the U.S. firms as a whole operate at a higher level of technology as compared to the Japanese firms in the non-traditional export sector. The result is consistent with the findings of Kodama and Honda (1986) who found that within the high-tech sector U.S. firms concentrate in science based industries while Japanese firms concentrate in pattern based industries, which have lower level of technology.

Tables 10,11,12 present the results of the Tobit model estimation for non-traditional export sector, traditional export sector and the entire manufacturing sector respectively. Table 10 presents the results for the non-traditional export sector. The model is estimated for 1,448 firms for the period 1994-95 to 1999-2000. Five time dummies are included to control for fluctuations in world demand for exports. To control for the policy variables effective rate of protection in different industries has been included. The results show that firms with higher U.S. equity have higher export-intensity (columns 3,4). Export-intensity is also found to be higher for firms in industries that have lower protection; lower capital-intensity; higher skill intensity; higher profitability; higher imports of raw-materials, capital goods, spares and stores; and higher royalty payments. We find that in the traditional export sector, (Table 11, columns 1, 2) neither U.S. equity nor Japanese equity significantly influences the export-intensity of the firms. Foreign equity is found to be positively associated with export-intensity of firms in

non-traditional export sector. Taking the entire manufacturing sector, (Table 12), we find that foreign equity and U.S. equity does have a positive influence on the export-intensity of the firms.

VII Conclusion

In the last decade the Indian government has adopted various structural reform measures and has made several changes in the regulatory framework to attract foreign direct investment in India. The role that FDI can play in promoting exports, either directly or indirectly, has been recognised and various policies have been adopted to attract export-promoting FDI. However, in spite of various incentives, the country has not been able to attract FDI in the export-oriented areas. This has led to the belief that FDI has not played any significant role in export-promotion of India. However, the main findings of the study are that FDI has to some extent led to diversification of India' s exports. The study also brings out the significance of the source-country of the FDI in influencing exports.

The study undertakes both industry-level as well as firm-level analyses for the period 1994-1995 to 1999-2000. The industry-level analysis uses the panel data for 74 disaggregated manufacturing industries. The analysis is carried out separately for traditional and non-traditional export sectors. The results show that FDI has a significant effect on the export-intensity of industries in the non-traditional export sector and therefore has, to some extent, led to diversification in India' s exports. The impact of FDI on exports, however, differs with respect to the source-country of FDI. U.S. FDI are seen to have a positive and significant effect on export-intensity of industries in non-traditional export sector, while the impact of Japanese FDI is not significant. In the traditional export sector, FDI has no impact on the export-intensity of the industry. At the firm level, panel data for 1,717 firms is used and Tobit model is estimated. The results arrived at are similar to the industry-level results and therefore support our results regarding the role played by FDI in the traditional and non-traditional sectors and the differential impact of FDI with respect to the country-of-origin of FDI. Differences in the inter-industry

pattern; and within the same industry, higher level of technology and more networking within the host country by U.S. firms vis-a-vis Japanese firms seem to be some of the probable reasons for the differential impact of Japanese and U.S. FDI.

In the context of the growing importance of FDI in the developing economies and existing competition amongst these countries in attracting FDI, it is important for an economy to formulate policies that not only encourage FDI but are also conducive to maximising the contribution of FDI to the growth of the economy. In this respect, with regards to the Indian economy, the study draws attention of the policy makers to the differential impact of Japanese and U.S. FDI, in particular their impact on the exports of non-traditional export sectors of the Indian industries. The study finds that the impact of FDI on exports of non-traditional exports sector is larger those of traditional export sector. This emphasises the need to formulate favorable export policies with respect to the non-traditional export sectors where foreign direct investments concentrate the most. Also, one of the reasons found for this differential impact was lack of integration of Japanese firms with the domestic firms. This highlights the importance of formulating appropriate fiscal and tariff policies to encourage greater vertical integration of FDI in the host economy. These policies would help to maximise the contribution of FDI in the industrial growth of the economy. Thus, the study strongly puts forward the case for taking into account the heterogeneity of FDI while analysing any aspect of FDI and while formulating FDI policy.

Table of Definitions

Industry-specific variables	
R&D	ratio of research & development expenditure to total sales.
K/L	ratio of gross block to employee cost
SKILL	number of high-salaried employees / total number of employees
EXP	ratio of exports to total sales
SIZE	total fixed assets / number of firms in the industry
CR4	four firm concentration ratio
ADVT	ratio of advertisement expenditure to total sales
ERP	effective rate of protection
IMPDT	ratio of import of disembodied technology
GP	Gross profitability in the industry with a lag
VI	Extent of vertical-integration in the industry
IMPCAP	Capital imports by the industry
IMPSPS	Imports of Spares and stores in the industry
ROY	Payments for royalty and technical fees in the industry
IMPEMD	Import of Embodied technology in industry
Firm-specific variables	
SIZE _F	Size of the firm i.e., log of sales of the firms
R&D _F	R&D Intensity of the firm i.e., R&D expenditure/sales
XI _F	Export Intensity of the firms
KI _F	Capital-Intensity of the firm
ADVT _F	Advertisement intensity in the firm
GP _F	Gross profitability in the firm in the lag period
IMPCAP _F	Capital imports by the firm
IMPSPS _F	Imports of Spares and stores by the firm
ROY _F	Payments for royalty and technical fees by the firm

**Table 1: India's Share (%) in World Exports by Commodity Divisions and Groups
(in US \$million)**

<i>Traditional Export Industries</i>	1985	1990	1995	1997	1998
Tea	26.2	22.1	14.5	18.5	16.4
Iron ore and concentrates	7.8	7.6	6.2	4.9	4.6
Metalliferous ores and metal scrap	2.4	2.1	1.5	1.3	1.4
Dyeing, tanning and colouring materials	0.8	1.2	1.1	1.4	1.3
Medicinal and Pharmaceutical Products	0.8	1.2	1	1.1	1
Leather and Leather Manufactures	8.3	6.3	3.3	2.8	2.9
Textile Yarn, Fabrics and made-up articles	2.1	2.1	2.9	3.3	3.3
Pearls, prrecious and semi-precious stones	9.6	9.8	11.8	10.6	10.7
Articles of Apparel and clothing accessories	2.3	2.3	2.6	2.3	2.3
Vegetables and fruits	1.4	0.8	1	1.1	1
Tobacco and manufactures	1.8	0.8	0.5	0.9	1
<i>Non Traditional Export Industries</i>					
Manufactures of Metals	0.4	0.5	0.6	0.6	0.6
Machinery and Instruments	0.1	0.1	0.1	0.1	0.1
Transport Equipments	0	0	0	0.1	0.1
Iron and Steel	0.1	0.3	0.7	0.9	0.8
Electrical Goods	0	0	0.1	0.1	0.1
Road Vehicles	0.1	0.1	0.2	0.2	0.1
cereals and cereal preparations	0.6	0.6	2.7	1.5	1.6
organic chemicals	0.1	0.3	0.7	0.9	0.9
inorganic chemicals	0.1	0.2	0.3	0.4	0.4
Essential oils, and perfume materials, soaps etc	0.7	0.1	0.5	0.5	0.4
plastic materials, artificial resins, cellulose & others	0	0	0.1	0.1	0.1
Chemical materials and products	0.2	0.2	0.4	0.6	0.6
Total Exports	0.5	0.5	0.6	0.6	0.6

Note: The industries whose average share in the world exports in the period 1985 to 1990 is more than 1% are taken to be industries in the traditional export sector. Source: Economic Survey (2000-2001)

TABLE 2. Percentage distribution of foreign, Japanese and U.S. equity in Indian manufacturing

INDUSTRY	Foreign direct investment	Foreign direct investment from U.S.	Foreign direct investment from Japan
Abr.& Grnding Wheel	0.2	0	0
Air-conditioners	0.55	2.47	0.63
Alumin & Al. Products	0.25	0.64	0
Auto Ancillaries	9.84	6.47	18.14
Auto-LCV/HCV	13.33	3.77	12.75
Auto-M Cycle/Mop	1.68	0	9.12
Auto-Scooter/3Wh	0.07	0	0
Auto-Tractors	0.04	0.1	0
Bearings	2.8	5.1	0
Breweries	0.46	0.32	0
Cables-Power	0	0	0
Cables-Telephone	0.42	0	0.94
Casting & Forging	0.79	0	0.61
Cement Products	0.39	0	0.76
Ceramic-Tiles /San.	0.05	0.18	0
Chemicals-organic	6.35	10.63	0.07
Chemicals-inorganic	1.65	6.06	3.6
Chlor Alk/Soda Ash	0	0	0
Cigarettes	2.71	1.82	0
Compres/Dril Eqp	1.23	5.6	0
Computer-Hardware	1.07	0	0
Computer-SW-	1.84	4.18	0.4
Cycles & Access.	0.04	0	3.03
Detrgnt/ Intermdt	0.27	0	0
Diamond Cut/Jewelry	0.07	0.32	0
Domestic Appliances	3.36	1.45	2.52
Dry Cells	0.05	0.73	1.54
Dyes & Pigments	0.15	0.33	0.92
Electric Equip	3.01	2.68	4.19
Electrod-Graphi	0.09	0	1.09
Electrod-Weld Eqp	0.32	0	0
Electronic-Comp.	5.75	8.72	4.1
Electronic-Cons.	8.91	2.19	18.62
Engineering	3.56	4.75	2.84
Engines	1.53	3.53	0
Ent Etron Med	0.04	0	0
Fasteners	0.48	0	0
Fertilizers	0	0	0
Food-Processing	4.33	3.28	0
Glass & Gl. Products	2.6	0	9.02
Leather/Leather Prod	1.02	0	0
Molded Luggage	0.78	0.18	0
Packaging	1.94	3.22	0.09
Paints/Varnish	0.1	0	0

Paper	0	0	0
Personal Care	2.04	4.07	0
Pest/Agro	0.6	0.66	0
Petrochemicals	0.96	0	0
Pharm-Ind-B Drug	0.2	0.85	0
Pharm-Ind-Formul	0.03	1.15	0.09
Pharm-others	2.3	8.68	0
Photo & Allied	0.29	0.52	0
Plastic Products	0.56	0.04	0.09
Print & Stnary	0.1	0	0
Pumps	0.28	0	0
Refrac/Intermedi	0.77	0.52	1.01
Solvent Extract	0.4	0	0
Steel	1.34	0.78	0
Steel -Pig Iron	0	0	0
Steel -Sponge Iron	0.59	0.25	0
Sugar	0	0	0
Tea	0	0	0
Telecomm-Equip	0.35	0.68	0
Text-Composite	0.29	0	0.43
Text-Cott. Blend	0.55	0	1.2
Text-Jute-Yarn/P	0	0	0
Text-Machinery	0.69	0	0.58
Text-Manmade	1.11	0	1.57
Text-Processing	0.09	0	0
Text-Products	0.96	0.68	0
Text-Silk	0.15	0	0
Text-Spg/Syb/Bln	0.33	0	0
TranLineTow/Eqpt	0	0	0
Tyres	0.9	2.4	0.05
TOTAL	100	100	100

Source: *Capitaline*

Note: Average for the period 1995-96 to 1999-2000 is taken.

Table 3: Impact of Japanese FDI, U.S. FDI and aggregate FDI on export intensity of industries in non-traditional export sector

VARIABLES	OLS 1	FE M 2	RE M 3	OLS 4	FE M 5	RE M 6
Constant	0.19 0.67	-	0.102*** 3.35	0.12 0.41		0.081*** 2.44
FEQ	—	-	-	0.031*** 2.29	0.06*** 2.71	0.04*** 2.51
JAPEQ	0.01 1.03	-0.003 -0.184	-0.002 -0.193			
USEQ	0.03*** 2.53	0.029*** 2.53	0.028*** 2.64			
ERP	0.00*** -2.18	-0.0002*** -2.45	-0.0002**8 -2.87	-0.0002** -1.78	-0.0001*8 -1.83	-0.0001*** -2.22
SIZE	0.00 -0.65	-0.0004 -0.348	-0.00005 -0.444	-0.0001 -0.976	-0.00002 -0.157	-0.00005 -0.419
KI	0.00*** -2.41	-0.001** -1.74	-0.001** -1.81	-0.001*** -2.34	-0.002** -1.95	-0.001** -1.8
R&D	-1.47 -1.15	-0.727 -0.811	-0.788*** -9.23	-0.994 -0.799	-0.479 -0.567	-0.583 -0.719
ADVT	-0.53* -1.71	-0.306 -0.558	-0.458 -1.08	-0.478 -1.53	-0.26 -0.478	-0.406 -0.967
SKILL	0.09 1.34	-0.17*** -2.23	-0.12* -1.76	0.093 1.32	-0.2*** -2.57	-0.143*** -2.01
GP	0.72 10.06	0.289*** 4.74	0.33*** 5.82	0.693*** 9.82	0.272*** 4.5	0.322*** 5.59
VI	0.00 0.20	0.00003 0.839	0.0004 0.734	0.00003 0.04	0.00003 0.893	0.00003 0.765
CR4	0.01 0.53	0.024 1.06	0.022 1.1	-0.001 -0.089	0.016 0.717	0.01 0.744
IMPCAP	-0.02 -0.16	-0.048 -0.622	-0.045 -0.61	-0.02 -1.157	-0.042 -0.573	-0.382 -0.528
IMPSPS	-0.42 -2.35	0.09 0.718	0.058 0.484	-0.363*** -2.02	0.063 0.509	0.03 0.319
ROY	3.56 1.49	2.66 1.45	2.6 1.47	3.89* 1.61	2.99* 1.64	2.92* 1.66
Adj.R ²	0.27	0.84	0.19	0.27	0.85	0.17
N	312	312	312	312	312	312
LM	398.38***			407.15***		
HAUSMAN	16.06			16.15		
F Test	9.46***			9.91		

Notes: 1.autocorrelation corrected estimates are presented

2.*indicates significant at 10%** indicates significant at 5%*** indicates significant at 1%.

3.Hausman statistic tests Random Effects Vs. Fixed Effects

4. for notations see Table of Definitions

Table 4: Impact of Japanese FDI, U.S. FDI and aggregate FDI on export intensity of industries in traditional export sector

VARIABLES	OLS 1	FEM 2	REM 3	OLS 4	FEM 5	REM 6
Constant	0.71*** 5.65		0.51*** 5.19	0.77*** 5.87		0.61*** 6.12
FEQ	—	-	-	-0.05 -1.38	-0.1** -1.92	-0.07** -1.91
JAPEQ	-0.02	0.04	-0.004			
USEQ	-0.61	0.717	-0.099			
	-0.01	-0.04	-0.04			
	-0.53	-0.68	-1.12			
ERP	0.00	-5E-05	-0.0006	-0.001	-0.00008	-0.0009
	-0.93	-0.007	-0.947	-1.12	-0.115	-1.3
SIZE	0.0004***	-0.0009	-0.0002*	-0.0007***	-0.0009	-0.0002***
	-6.40	-0.573	-1.97	-6.62	-0.557	-2.6
KI	-0.01***	-0.003	-0.004***	-0.006***	-0.003**	-0.004***
	-3.58	-1.56	-2.44	-3.71	-1.73	-2.84
R&D	23.05***	14.19	11.94	24.05***	14.26	12.74**
	2.12	1.5	1.56	2.4	1.53	1.84
ADVT	-4.82***	0.63	-1.25	-4.86***	0.149	-2.4
	-2.46	0.24	-0.612	-2.54	0.058	-1.29
SKILL	-0.71***	-0.22	-0.398***	-0.788***	-0.187	-0.44***
	-2.86	-1.05	-2.27	-3.1	-0.913	-2.72
GP	1.09***	0.03	0.16	1.09***	-0.09	0.18
	5.21	0.151	0.9	5.61	-0.438	1.09
VI	-0.67***	-0.27	-0.39***	-0.73***	-0.467*	-0.468***
	-4.88	-0.95	-2.47	-5.48	-1.65	-3.26
CR4	0.07***	0.02	0.03	0.08***	0.05	0.04*
	2.45	0.555	1.29	2.79	1.18	1.72
IMPCAP	-0.66*	0.13	0.02	-0.65*	0.119	-0.02
	-1.70	0.603	0.132	-1.74	0.535	-0.133
IMPSPS	7.80**	1.94	2.38	9.46***	1.83	3.23
	1.85	0.733	0.968	2.15	0.712	1.35
ROY	-9.27	19.27	-0.59	-5.07	25.93	1.05
	-0.99	0.931	-0.05	-0.471	1.37	0.99
Adj.R ²	0.44	0.87	0.27	0.45	0.87	0.311
N	132	132	132	132	132	132
LM	74.06***			70.77***		
HAUSMAN	44.73****			65.14***		
F Test	8.47***			28.51***		

Notes: 1.autocorrelation corrected estimates are presented

2.*indicates significant at 10%** indicates significant at 5%*** indicates significant at 1%.

3.Hausman statistic tests Random Effects Vs. Fixed Effects

4. for notations see Table of Definitions

Table 5: Impact of Japanese FDI, U.S. FDI and aggregate FDI on export intensity of all industries

VARIABLES	OLS 1	FEM 2	REM 3	OLS 4	FEM 5	REM 6
Constant	0.21*** 6.38	-	0.19*** 6.2	0.192*** 5.34		0.198*** 5.64
FEQ	—	-	-	0.02 1.13	0.007 0.315	0.006 0.303
JEQ	-0.01 -0.52	0.016 0.763	0.0055 0.3			
USEQ	0.01 0.90	0.013 0.894	0.012 0.755			
ERP	-0.02 -1.40	-0.0016 -1.51	-0.001** -1.89	-0.0002 -1.23	-0.0001 -1.38	-0.0017* -1.77
SIZE	-0.01*** -2.74	-0.0002 -0.015	-0.0005 -0.373	-0.0005*** -2.86	-0.0002 -0.013	-0.0005 -0.374
KI	0.00 -1.33	-0.002*** -2.48	-0.0019*** -2.11	-0.001 -1.35	-0.002*** -2.43	-0.001*** -2.11
R&D	1.10 0.56	0.106 0.104	0.177 0.177	0.829 0.433	0.374 0.381	0.299 0.308
ADVT	-1.44*** -2.97	0.0177 0.026	-0.408 -0.714	-1.37*** -2.84	0.022 0.033	-0.397 -0.697
SKILL	-0.31*** -3.59	-0.21*** -2.57	-0.225*** -2.92	-0.29***4 -3.48	-0.217*** -2.62	-0.22*** -2.97
GP	0.70*** 7.33	0.242*** 3.54	0.268*** 4.07	0.70***7 7.59	0.233*** 3.43	0.26*** 4.03
VI	0.01 0.56	0.0003 0.618	0.0003 0.654	0.0007 0.544	0.0003 0.685	0.0003 0.678
CR4	-0.01 -0.39	-0.007 -0.782	-0.007 -0.872	-0.007 -0.404	-0.007 -0.834	-0.008 -0.906
IMPCAP	0.11 0.63	0.039 0.464	0.034 0.412	0.125 0.711	0.029 0.35	0.031 0.378
IMPSPS	-0.87 -3.03	-0.004 -0.026	-0.044 -0.298	-0.854 -2.99	-0.005 -0.038	-0.04 -0.374
ROY	-680.00** -1.93	-1.97 -0.813	-2.54 -1.08	-7.31*** -2.05	-2.2 -0.911	-2.67 -1.14
Adj.R ²	0.16	0.88	0.09	0.16	0.88	0.09
NO.OF.OBS	444	444	444	444	444	444
LM	736.59***			734.47***		
HAUSMAN	15.58			14.85		
F Test	7.09***			7.68***		

Notes: 1.autocorrelation corrected estimates are presented

2.*indicates significant at 10%** indicates significant at 5%*** indicates significant at 1%.

3.Hausman statistic tests Random Effects Vs. Fixed Effects

4. for notations see Table of Definitions

Table 6: Correlation matrix - Export intensity and Japanese, U.S. and foreign equity in the industry and firms

	<i>Export-intensity in industries</i>		
	NON-TRADITIONAL EXPORT SECTOR	TRADITIONAL EXPORT SECTOR	ALL INDUSTRIES
US EQUITY	0.029	-0.133	-0.089
JAPANESE EQUITY	-0.02	-0.135	-0.105
FOREIGN EQUITY	0.062	-0.161	-0.155
	<i>Export-intensity in firms</i>		
	NON-TRADITIONAL EXPORT SECTOR	TRADITIONAL EXPORT SECTOR	ALL INDUSTRIES
US EQUITY	0.029	-0.015	0.016
JAPANESE EQUITY	-0.005	-0.012	0.004
FOREIGN EQUITY	0.321	-0.051	-0.001

Table 7: A comparison of average shares of Japanese and U.S. firms: Using t-test for equality of means

	U.S. Firms	Japanese Firms	t-Test for equality of means
	Mean	Mean	
SIZE _F	4.36	3.97	1.34*
ADVT _F	0.006	0.005	0.42
KI _F	28.45	18.32	1.57*
GP _F	0.06	0.09	0.16
IMPCAP _F	0.28	0.003	1.22*
IMPFIN _F	0.004	0.002	0.87*
R&D _F	0.02	0.0002	1.13*
IMPRAW _F	0.03	0.04	-0.48
IMPSPS _F	0.002	0.004	-0.74*
EXTINT _F	0.14	0.15	-0.22
ROY _F	0.0004	0.005	-0.94*
N	60	47	

Notes: for notations see Table of Definitions

Table 8: Correlation coefficients between FDI shares and trade patterns

	FDI	JAPANESE FDI	US FDI
<i>Export Intensity</i>	0.21506	-0.07990	0.06781
<i>Export Growth</i>	-0.04879	-0.03440	0.00040
<i>Import of Capital Goods</i>	-0.01316	-0.10784	0.05131
<i>Import of Spares and Stores</i>	0.18477	0.35464	0.09478
<i>Import of Disembodied Technology</i>	.37	.17	.37
<i>Import of Embodied Technology</i>	-.15	-.08	-.002
<i>Import of Knowledge Capital</i>	0.60388	0.23848	0.41578

Table 9: Component Score matrix

	COMPONENT
IMPCAP	0.514
R&D	0.068
IMPRAW	0.478
IMPSPS	0.519
ROY	0.369

Table 10: Determinants of export-intensity of firms in non-traditional export sector: Tobit Model estimates

VARIABLES	OLS	TOBIT	OLS	TOBIT
Constant	-0.004 -0.04	-0.109 -5.26	-0.0001 -0.011	-0.1 -4.92
D1	-0.02*** -2.80	-0.15*** -10.955	-0.021*** -2.64	-0.14*** -10.59
D2	0.00 0.60	-0.021* -1.68	0.005 0.719	-0.01 -1.38
D3	0.02*** 2.01	0.023** 1.86	0.016*** 2.11	0.02*** 2.08
D4	0.01 0.77	0.007 0.575	0.006 0.835	0.008 0.706
D5	0.00 0.14	0.004 0.4	0.001 0.149	0.005 0.419
FE	0.04*** 2.35	0.116*** 4.799		
JE			-0.17 -1.13	-0.36 -1.21
USE			0.11*** 2.83	0.034*** 2.51
ERP	0.0003*** -2.81	-0.0002*** -2.49	-0.0001*** -2.83	-0.0003*** -2.6
SIZE _F	0.00** 1.86	0.003 1.533	0.002* 1.79	0.003 1.47
KI _F	0.00* -1.69	-0.0009*** -5.87	-0.0001** -1.85	-0.001*** -6.38
R&D _F	-0.01 -0.71	-0.165* -1.67	-0.97 -0.723	-0.17* -1.74
ADVT _F	0.11*** 2.77	0.25*** 3.94	0.11*** 2.85	0.265*** 4.05
SKILL _F	0.1***9 6.48	0.277*** 5.69	0.19*** 6.52	0.27*** 5.54
GP _F	0.00* 1.79	0.16*** 3.46	0.003** 1.88	0.01*** 3.51
IMPFIN _F	-0.01 -0.30	0.11 1.25	-0.009 -0.17	0.144* 1.6
IMPRAW _F	0.2***2 11.36	0.437*** 14.2	0.233*** 11.7	0.454*** 14.85
IMPCAP _F	0.05*** 5.57	0.08*** 5.87	0.04*** 5.6	0.08*** 6.01
IMPSPS _F	0.59*** 10.75	1.08*** 10.95	0.599*** 11.04	1.14*** 11.65
ROY _F	0.35 0.80	1.77*** 2.67	0.5 1.14	2.25*** 3.45
Adjust.R ²	0.06		0.06	
N	6288	6288	6288	6288
LOGLIKLIHOOD FN		-1717.7		-1724.26
SIGMA		0.249***		.249***
F Test	26.06***		24.9***	

Notes: * indicates significant at 10%;** indicates significant at 5%;*** indicates significant at 1%.

**Table 11: Determinants of export-intensity of firms in traditional export sector:
Tobit Model estimates**

VARIABLES	OLS	TOBIT	OLS	TOBIT
Constant	-0.14*** -4.56	-0.44*** -8.41	-0.14*** -4.47	-0.44*** -8.45
D1	0.00 -0.19	-0.18*** -6.47	-0.002 -0.171	-0.18*** -6.51
D2	0.08*** 4.95	0.086*** 3.39	0.079*** 4.95	0.08*** 3.35
D3	0.13*** 8.06	0.2096*** 8.04	0.133*** 8.05	0.2*** 8.01
D4	0.12*** 7.25	0.1878*** 7.39	0.117*** 7.23	0.187*** 7.39
D5	0.08*** 5.43	0.13*** 5.55	0.813*** 5.4	0.13*** 5.56
FE			-0.06** -1.99	0.34 0.67
JE	-0.03 -0.41	-0.13 -0.918		
USE	-0.47 -0.89	-0.05 -0.613		
ERP	0.00*** 12.04	0.006*** 11.07	0.004*** 11.95	0.007*** 11.09
SIZE _F	0.01*** 2.64	0.009*** 2.61	0.006*** 11.95	0.009*** 2.46
KI _F	0.00 -1.02	-0.0001 -0.502	-0.0001 -1.13	-0.0007 -0.475
R&D _F	0.04 1.03	0.05 0.629	0.04 1.01	0.052 0.626
ADVT _F	-0.22 -0.97	0.183 0.479	-0.19 -0.85	0.165 0.431
GP _F	0.00 0.74	0.014*** 2.17	0.001 0.764	0.01*** 2.15
IMPFIN _F	0.07 0.33	0.65*** 2.2	0.09 0.498	0.636*** 2.14
IMPRAW _F	0.74*** 23.24	1.14*** 22.1	0.737*** 23.27	1.14*** 22.09
IMPCAP _F	0.00 1.29	0.007 1.31	0.004 1.31	0.006 1.24
IMPSPS _F	1.00*** 3.50	1.57*** 3.53	0.998*** 3.49	1.59*** 3.58
ROY _F	-3.70*** -2.28	0.04 0.02	-3.16** -1.93	-0.15 -0.06
R2	0.18		0.18	
NO.OF.OBS	4014	4014	4014	4014
LOGLIKLIHOOD FN		-2102.2		-2102.54
SIGMA		.3748***		.375***
F Test	49.77***		52.75****	

Notes: * indicates significant at 10%; ** indicates significant at 5%; *** indicates significant at 1%.

Table 12: Determinants of export-intensity of firms in all industries: Tobit Model estimates

Variables	OLS	TOBIT	OLS	TOBIT
Constant	0.104*** 11.24	0.011 0.749	0.104*** 11.2	0.005 0.335
D1	-0.07*** -8.82	-0.26*** -18.38	-0.07*** -8.77	-0.271*** -18.62
D2	-0.01 -1.50	-0.05*** -3.92	-0.011 -1.46	-0.05*** -4.12
D3	0.02*** 2.43	0.033*** 2.54	0.02*** 2.46	0.031*** 2.38
D4	0.01 1.53	0.022* 1.74	0.012 1.54	0.02* 1.66
D5	0.01 1.50	0.024** 1.92	0.011 1.5	0.02** 1.91
FE			0.0017 0.915	0.125*** 4.77
JE	0.02 0.40	-0.01 -0.124		
USE	0.06** 1.96	0.03 0.526		
ERP	0.00 0.82	0.0003 0.273	0.0006 0.806	0.0005 0.434
SIZE _F	0.00 1.11	0.001 0.933	0.001 1.24	0.001 0.911
KI _F	0.00*** 3.18	0.01*** 3.52	0.0002*** 3.16	0.0002 0.26
R&D _F	0.00 -0.08	-0.03 -0.804	-0.0013 -0.08	-0.02 -0.767
ADVT _F	-0.01 -0.13	0.12 1.51	-0.008 -0.159	0.11 1.35
GP _F	0.00 1.59	0.01*** 3.82	0.0019 1.58	0.017*** 3.73
IMPCAP _F	0.01*** 4.59	0.01*** 3.52	0.013*** 4.61	0.019*** 3.46
IMPSPS _F	0.58*** 8.43	1.24*** 9.94	0.579*** 8.39	1.18*** 9.43
ROY _F	-0.65 -1.22	1.97*** 2.44	-0.673 -1.23	1.34* 1.64
ADJ R2	0.02		0.02	
NO.OF.OBS	10302	10302	10302	10302
LOGLIKLIHOOD FN		-4786.29		-4775.04
SIGMA		.336***		.336***
F Test		20.11***		21.18***

Notes: for notations see Table of Definitions
Period of the analysis is 1994-95 to 1999-2000

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