

Technological Spillovers from Foreign Direct Investment: the case of Vietnam

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Abstract

Foreign Direct Investment has been considered a very important factor in the growth of recent Vietnam's economy and so far it has drawn a lot of concerns of economic researches in Vietnam. However, studies on the impacts of Foreign Direct Investment on Vietnam's economy, especially the Technological Spillovers are still very scarce compared with other developing countries. This study makes an attempt to figure out the main channels and estimate the degree of Spillover effects in Vietnam using industry level data for 1995-1999 and 2000-2002 periods. The linkage between foreign investors and domestic private sectors is found to play an important role for Technological Spillovers from Foreign Direct Investment in Vietnam.

Key words: FDI, Vietnam, Spillovers

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1. Introduction

Since its Doimoi policy in 1986, Vietnam has experienced high rates of economy growth, changing the nation from a backward and underdeveloped country in the 1980s to a developing economy increasingly converging to the regional fast-growing economies. The adoption of market-oriented institutions and open door policy have opened the countries to international economy which have brought in a lot of structural transformations. Together with exports, Foreign Direct Investment (FDI) has been considered to contribute substantially to the recent speedy growth of Vietnam. With its issue in 1987 and a great many of reforms up to now, the Law on Foreign Investment of Vietnam (LFI) has taken an important role in attracting substantial amounts of FDI inflows to Vietnam. Economic studies on FDI have been concentrating on determinants of FDI, the question of how to invite more FDI to Vietnam is a center matter of concerns in researches. However, it is also not less important to analyze the impacts of existing FDI to make FDI more effective to the country's growth and it is unfortunate that studies on this approach in Vietnam's case are still very few. This study focuses on the Technological Spillover Effects of FDI on Vietnam's industry.

There have been a great number of researches examining the Technological Spillover Effect of FDI in various countries in the world since the 1970s. Economists have done a lot of researches to discuss in what channels Multinational Corporations (MNCs) spillover technologies to host country enterprises and whether there are positive spillovers as well as to what extent these effects occur. The empirical evidence shows mixed results and the degree of spillover effects are argued to depend on characteristics of the host country and investing firms such as technology gap between FDI and host country enterprises, 'absorptive capability' of the host country, ownership structure of foreign firms, etc.

Similar to other late comers, the technology level of Vietnam's economy in general and manufacturing industry in particular might be too low to be capable of adopting advanced technologies brought in by foreign investors. Therefore, despite the increasing FDI flows into Vietnam, its spillover impacts on domestic production may be small or even negative. Nevertheless, there is a special characteristic for Vietnam's case - FDI flows into Vietnam during periods when the country is experiencing important structural reforms- hence its impacts of introducing new ideas, skills and know-how, of opening export markets may be higher and more crucial compared to the cases of other developing countries; and this effect might be more substantial to offset the negative impacts stated above. This paper makes attempts to answer the question of whether there is a positive spillover of FDI on Vietnam's domestic market in two ways: analyzing recent trends and characteristics of FDI and Vietnam's economy and industry and doing empirical work on 29 industrial sectors during 1995-1999 and 2000-2002 periods. In addition, this paper also tries to make policy implications on how to enhance spillover effects. The findings support positive spillover hypothesis and promoting domestic private sector is suggested to strengthen the impacts.

The paper is constructed as follows. Section 2 presents previous literature on technological spillover effects, section 3 analyzes the trend of FDI in Vietnam, characteristics of Vietnam's industry and presents empirical work on spillover effects in Vietnam during 1995-1999 and 2000-2002. The last section summarizes concluding remarks and results of the paper.

2. Previous studies on Technological Spillover Effects

With the characteristic of a public goods, FDI technologies have been considered an important externality with long-run effects in endogenous growth models (Grossman and Helpman (1991), Lucas (1988), Romer (1990)). Technology transfer through trade has become a popular area of research (Krugman (1979)). Nevertheless, models and researches on the interaction of FDI and growth are still scarce.

Despite of this, there have been a great many of empirical studies on the Spillover Effects of Foreign Direct Investment. FDI spillovers are discussed to have positive effects on the productivity of the host country through three main channels: demonstration, competition and labor turnover. *Demonstration* effects represent the 'imitation' channel of spillover or 'learning-by-watching effect' (Jutta Gunther, 2002). Foreign Capitals are supposed to have advantages due to the possession of proprietary technology (Hufbaeuer and Nunns, 1975), marketing and managing skills and if these factors are transferred to the subsidiaries (brought in to the host country market), technical progress in industry in the host country are expected (Blomstrom, 1986). As new technologies are introduced to the host country, domestic firms can observe foreign firm's actions, skills or techniques and 'imitate' them or make efforts to acquire these techniques and apply them, which results in production improvements. Multinational Corporations (MNCs) are also discussed to have positive spillover effects on domestic firms through *Competition*. Under increased competition, domestic firms are forced to operate more efficiently and introduce new technologies earlier than what would otherwise have been the case (Kokko, 1994). Moreover, MNCs can furthermore create spillover effects on domestic production through the channel of *labor turnover*. This effect occurs when workers employed in foreign affiliates who have been trained with advanced technical and managerial skills move to other domestic firms or open their own enterprises (Fosfuri, 1996).

Besides these three so-called 'horizontal effects' of spillovers, several researchers also discuss linkages effects or 'vertical effects' brought about by FDI. (Lall (1978), Clare (1996)). This is the case when MNCs are suppliers (forward linkages) or buyers (backward linkages) of domestic firms. MNCs can help local firms break the market-constraints to acquire increase returns by boosting demands, which leads to efficient production (enhancing production under lower costs). FDI can also contribute to technology improvement of their domestic suppliers by offering technical assistance and supports to these firms. This kind of vertical spillovers occurs in the interaction between foreign and domestic firms not in the same industry, therefore it is also called inter-industry

spillover (the above horizontal effect is called intra-industry spillover).

On the contrary to positive effects of spillovers, it is also argued that FDI may create negative spillovers to domestic firms' productivity and this effect may be large enough to offset the above positive ones. As MNCs enter the market, their advantages on technology and know-how may take in the market of the domestic firms and make them produce in less efficient scales, which leads to less productiveness of domestic firms (so-called 'market stealing effects').

Using data at both industry and plant level, researchers have done a lot of empirical work on a variety of countries of both developed and developing countries in different periods of time. The framework of most of the researches are comparatively similar. Spillover effects are measured by the impact of foreign presence on output level or labor productivity of domestic firms. Together with other factors that are supposed to have influence on productivity of domestic firms or industries such as capital intensity, labor quality, production scales, competitiveness of the market, the foreign presence proxy is put as an independent variable in a linear or log-linear regression with labor productivity of domestic sector being the dependent variable. In the estimation, if the significant positive sign of the foreign presence coefficient is found, a positive spillover is concluded.

Caves (1974) employs data of 23 Australian manufacturing industries in 1962 and 1966 and finds that higher productivity level (value-added per employee) of local firms is related to higher foreign subsidiary shares of employment in the same industry; however, the changes of foreign share in the industries have negative insignificant impacts on productivity levels. Globerman (1979) also finds the positive effects of foreign shares in output of the industry on the labor productivity in Canadian manufacturing industries in 1972. Blomstrom and Persson (1983), Blomstrom (1986), Blomstrom and Edward Wolff (1994), Blomstrom and Sjöholm (1999) find positive spillovers for Mexican and Indonesian manufacturing sectors. Others researches which also find positive spillovers are, for instance, Hirschberg and Lloyd (2000) for China, K. Kozlov (2001) for Russia from 1992 to 1997, Evis Sinani and Klaus Meyer (2002) for Estonia during 1995-1999, etc. On the other hand, a number of researches can not find evidence supporting positive effects and significant negative spillover results are not scarce in literature. Haddad and Harrison (1993), who study on data of Moroccan manufacturing industries during 1985-1989 find no significant positive relationship between higher productivity growth in domestic firms and the foreign presence in the sector. Aitken and Harrison (1999) report similar findings for Indonesia during 1980-1991 and Venezuelan from 1976 to 1989, except that negative effects are smaller in Indonesia than that found in Venezuela. Studies on several Eastern European such as those done by Djankov and Hoekman (1998) for the Czech Republic during 1992-96, Konings (2001) for Bulgaria, Romania and Poland between 1993 and 1997 also find negative or insignificant spillover impacts.

In making efforts of finding the causes of mixed results and searching for factors affecting the magnitude of spillovers, researchers look into the characteristics of the host country and FDI. The

first factor influencing spillover effects to mention is the technology gap of host country and FDI. As argued by Lapan and Bardhan (1973), “Technical advances applicable to the factor-proportions of capital-rich developed countries are hardly of any use in improving techniques of low capital-intensity in less developed countries”. Borensztein (1998) refers to this as ‘*absorptive capability*’ of host countries” FDI is more productive than domestic investment only when the host country has a minimum threshold stock of human capital”. K. Kozlov.(2001) also shows in Russia that “The level of education of adult population in Russia is quite high, so spillovers are positive in almost all the regions. Furthermore, regions with higher educational level benefit from FDI to a greater extent”. The technology gap between MNCs and domestic firms is also analyzed at industry level. Using Mexico data in 1970, Kokko (1994), Kokko, Tasini and Zejan (1996), Barrios (1999), Konings (2001) find that spillovers are smaller in industries with larger labor productivity gap between local and foreign firms. However, the study of Sjöholm (1999) on Indonesia shows a completely contrast result. There is a hypothesis that the relation between technology gap and spillovers is not linear: “ a certain gap is required for spillovers and but if the gap is too large, it may be impossible for domestic firms to absorb foreign technology “.

The second factor of host country affecting spillovers of FDI to mention is the competition of domestic market. As discussed by Wang and Blomstrom (1992) in a model of strategic interaction between MNCs and domestic firms, high competition forces MNCs to bring in relatively new and sophisticated technologies from their parent company in order to retain their market shares. The technology that is transferred to the subsidiaries might leak out to the domestic firms and thereby increase the competition facing subsidiaries even more. The stronger the competition, the more advanced technology brought into the domestic market. Sjöholm (1999) finds in Indonesia in 1980 and 1991 evidence supporting the argument: higher spillovers of FDI are found in industries with higher domestic competition. The result is consistent to Blomstrom et al. (1994) who find that competition spurs technology transfers to subsidiaries, and to Kokko (1996) who finds some support of a positive effect from competition on spillovers.

There are arguments about whether spillover effects towards domestic firms differ between *export-oriented* domestic firms and *non-exporting* domestic firms. Export-oriented domestic firms are argued to be more capable of learning or copying technology so the impact on their productivity may be larger than non-exporting ones. However, Evis Sinani and Klaus Meyer(2002) ‘s study on Estonia and Barrios (1999) ‘s study on Spain indicate a contrast result. Their explanation for this is that export-oriented firms supply to the international market and so the MNEs’ activities in domestic market do not influence their productivity or there may be a international competition by MNEs towards exporting domestic firms.

Concerning the characteristics of the FDI that have impacts on the spillovers, researchers examine mainly the ownership structure and scale of FDI. Blomstrom and Sjöholm (1999) argue that

“majority ownership results in greater control over profits, which in turn provides a greater incentive to transfer technology and management skills to subsidiaries. Hence, the greater the foreign control over an affiliate, the more sophisticated technologies would be transferred from the parent firm”. On the contrary, Dimelis and Louri (2002) discuss that foreign firms of minority ownership have more interaction with domestic firms thereby create more spillovers. Blomstrom and Sjöholm find no significant evidence supporting majority ownership impact while Dimelis and Louri find spillovers of minority ownership are significantly positive. Based on similar explanations, Dimelis and Louri argue that small foreign firms exert higher spillover effects: Large foreign firms may be better prepared to face their needs on their own, thus operating in isolation from the local environment. On the other hand, small foreign firms may be more willing to buy from or subcontract to local firms engaging in more intensive interaction, resulting in higher spillovers. Their findings support the hypothesis.

Kokko, Tasini and Zejan (2001) consider whether MNEs enter in different *trade regimes* have different spillover effects. It is discussed that “Import-substituting MNCs enter with technologies that are missing or weakly developed in the local industry, which creates a large potential for demonstration effects. Exported-oriented MNCs, often base their strength on their international distribution and marketing networks, thus they do not have much impact on local productivity, but rather on the international sale performance of local firms”.

Recently, there are also a few researches analyzing different results of spillovers based upon methodology. Holger Gorg and Eric Strobl (2001) find in their meta-analysis of the published results “on average, cross-sectional studies report higher coefficients of the effect of foreign presence than panel data studies”. They comment that the results do not seem to be affected whether the data employed in the studies are industry level or firm level data, and that “the definition of the foreign presence variable included in some studies seems to affect the results obtained”. In a recent study, Lipsey and Sjöholm (2004) suggest that results of degree of spillovers are different across different definitions of industry level and choices of measuring spillovers on national or regional level.

In summary, although FDI are theoretically believed to have positive spillover effects on host country productivity by researchers, empirical evidence shows mixed results and the magnitude of spillovers varies across the technology level of host countries, characteristics of industries and firms, and characteristics of FDI. Technological gap between MNCs and host country and the local market competition are the two factors most emphasized and concentrated in searching for the causes of mixed results.

The overview of researches presented above indicates that in Vietnam, technology gap between foreign and domestic sectors may be too large to restrict the spillover effects from FDI. Anyway, this effect may differ across industries (for example, in export-oriented industries, the gap may be small and hence strengthens spillovers); and as FDI flows in Vietnam’s process of reforms, the

demonstration effect might be especially large. Positive spillovers from FDI are expected for the case of Vietnam. Furthermore, the country's process of reforms goes along with the development of domestic private sector, there is a possibility that the growth of this sector influence spillovers. We discuss this in the next section.

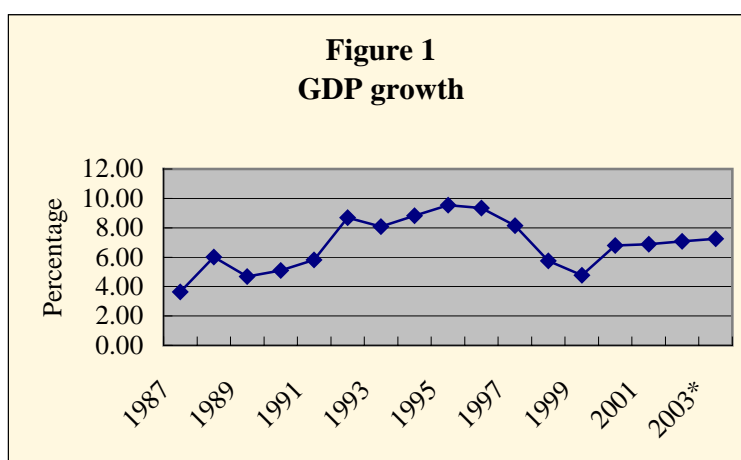
3. Case study: Vietnam

This section makes attempts to find spillover effects in Vietnam's industry in two approaches. We first analyze the recent trend and characteristics of FDI and Vietnam's industry and then do empirical study on Vietnam's industry in two periods of 1995-1999 and 2000-2002 periods.

3.1 Current trend of Foreign Direct Investment in Vietnam and Vietnam's Industry

Overview of Vietnamese Economy

The development of Vietnamese Economy can be divided into two major stages: before 1986 (pre-reform) period and after 1986 (post-reform) period. Before 1986, Vietnam is a centralized economy, in which the Government determines all economic targets and prices. Since the issue of the market reform policy, Vietnam has undergone market-oriented economy, where all the prices and quantities are determined by market rules. This substantial institutional reform, which is also called the 'Big bang' (Carolyn, 2000), has brought out dramatical changes to the economy in all aspects. Economic growth has averaged 7.5 percent since 1990, investment rate (including Foreign Direct Investment) reaches 27% of total GDP, export grows at increasing rate of over 30 per cent annually, living standard improves, poverty reduced from 70 percent in the end of the 1980s to 37 percent in 1998, a lot of achievements have been made in education and Vietnam ranks high as of UNDP Human Development Index (HDI). There is a recession during 1997-1999 after Asian currency crisis; however, the economy has recovered since 2000 (Figure 1). Among of the factors leading to this success, Foreign Direct Investment has been believed to play a crucial role.



Source: GSO, 2004

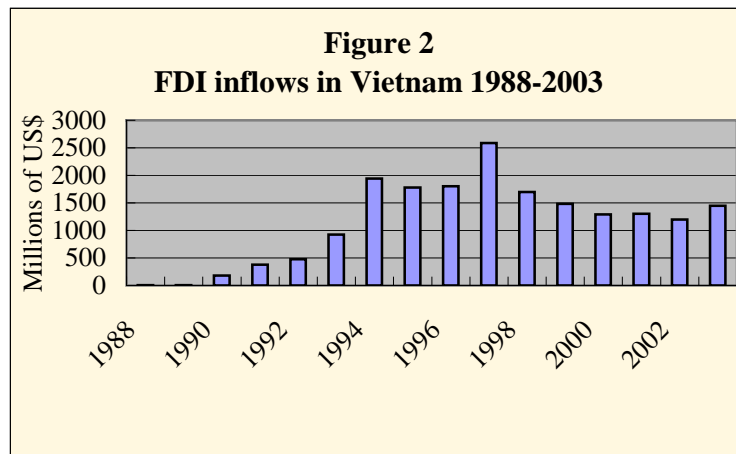
Institutional regimes of Foreign Direct Investment in Vietnam

The Law on Foreign Investment (LFI) in Vietnam, which was first passed by the National Assembly of Vietnam in December 1987, has opened the economy to foreign capital. The regulations in LFI have been amended several times, notably in 1990, 1992, 1996, 2000, 2003 and thus have had a great many of positive impacts. They are, for instance, reducing risks for foreign-invested enterprises in land clearance by shifting responsibility for employee compensation and land clearance from the foreign to the Vietnamese partner in joint ventures (2000); offering special conditions for foreign investors in Export Processing Zones (EPZs)(1991), Industrial Zones (IZs)(1994) and Hi-tech Zones; increasing the scope for import tariff exemptions and reductions, and reducing the tax on profit remittances (1996), etc. Yet, there are still numerous restrictions in the LFI such as those relating to regulations on the stake and legal capital held by the foreign investors of joint ventures (JVs), local content requirements in the motorcycle, electronic and engineering, restrictions of establishment of equity-based cross border production and relevant M&A activity: These restrictions essentially aim to protect the State-Owned Enterprise (SOE) sector as emphasized at the 9th Communist Party Congress (Bui, 2004).

Recent Trends in FDI

Since the approval of the LFI, FDI inflows to Vietnam have increased substantially. Vietnam advanced from virtually no foreign investment in 1988 to total 4,324 licensed projects with a value of about US \$40.8 billion, of which the total realized capital was US\$ 24.6 billion. Total foreign capital now has doubled that of 1995 (Ministry of Planning and Investment). In UNTAD's ranking, from a host country of low inward FDI potential index during 1988-2001, Vietnam has now ranked as a "front runner" with high inward FDI potential and performance indices (Appendix 1). However, compared to other countries in the region, especially the People Republic of China (PRC), the total amount of FDI inflows is still small. Vietnam has attracted only about 0.2 percent of total FDI inflows to developing countries (UNCTAD, 2004).

The history of FDI flows to Vietnam can be divided into two main periods: pre and post 1997-98 Asian crisis. In the former, together with the world's trend of capital flowing to emerging and transitional economies, FDI inflows into Vietnam increased consistently with an annual growth rate of 28 percent and reached its peak of US\$ 2.6 billion in 1997. After the crisis in 1997-1998, FDI flows to Vietnam declined sharply, though it began to recover in 2000 with realized capital growing weakly by about three percent annually (Figure 2).



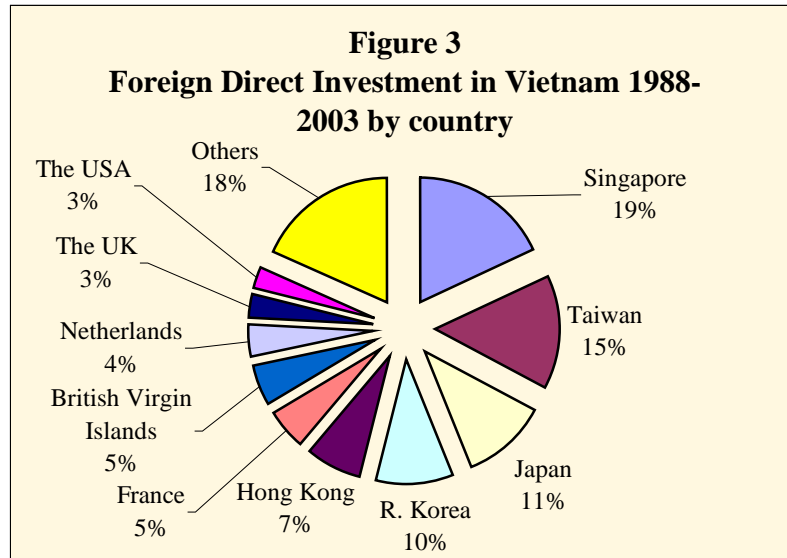
Source: UNCTAD, 2004

Before 1994 FDI in Viet Nam was concentrated on the oil and gas sector, which contributed a great deal to crude oil export promotion, making it the biggest share of total exports until 1996. From 1994 to 1997, foreign investment expanded to a range of new sectors, such as real estate and other different industrial activities. During this time, FDI in industry were mainly performed by East Asian countries, who sought new locations for their export production to face the increasing cost of their local workforce. This rising boom in capital flows was continuing until the regional currency crisis occurred. FDI flows into Viet Nam during these years played a very important role, not only in providing finance but also in opening access to export markets for existing domestic producers, introducing new ideas, skills and know-how, and proposing models that were imitated by domestic investors.

The reasons for the decline of FDI after 1997-98 are mainly the crisis and its problems that most of Vietnam's investors suffered from that time; however, there is also an argument that the reduction is due to the slow reform process of regulations. "The decline in implementation of investment commitments started before 1997, so the regional crisis made evident problems existing prior to the crisis; and that after 1999, investments returned to Korea, Malaysia, and Thailand but not to Viet Nam" (Leproux and Brooks, 2004). Moreover, as pointed out by Freeman (2002), forecasts by foreign investors before 1997 for Vietnam's domestic market demand - "often based on rather euphoric straight-line growth projections - were proved to be exaggerated"; therefore the rising wave of foreign capital inflows calmed down.

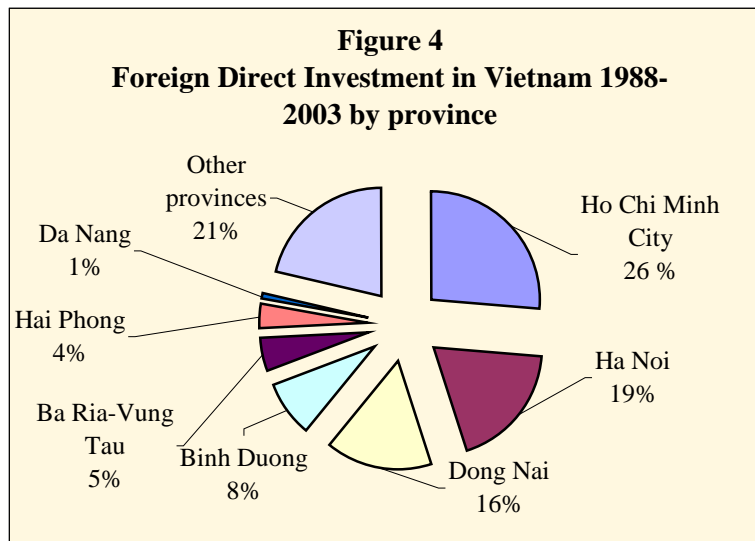
Up to the end of 2003, Vietnam has attracted investors from 64 countries, among them Asian countries account for the largest proportion (68 percent), the followings are European countries (25.7 percent), the Americas (3.2 percent), and finally Australia (1.3 percent). Singapore is the largest foreign investor with 288 projects and \$7370 million of registered capital; followed by Taipei, China (1,086 projects and \$5998 million); Japan (418 projects and \$4480 million); Republic of Korea (henceforth Korea) (662 projects and \$4161 million); and Hong Kong, China (288 projects and

\$2975 million). The total amount of capital of these top five investors accounts for 61 percent of total FDI commitments during the period 1988-2003. Since the signing of the US-Viet Nam Bilateral Trade Agreement in July 2000, FDI from western countries such as France, Netherlands, and United States has been increasing. Meanwhile, FDI from the United Kingdom is mainly connected to investments of the 1990s in the oil and gas sector (Figure 3).

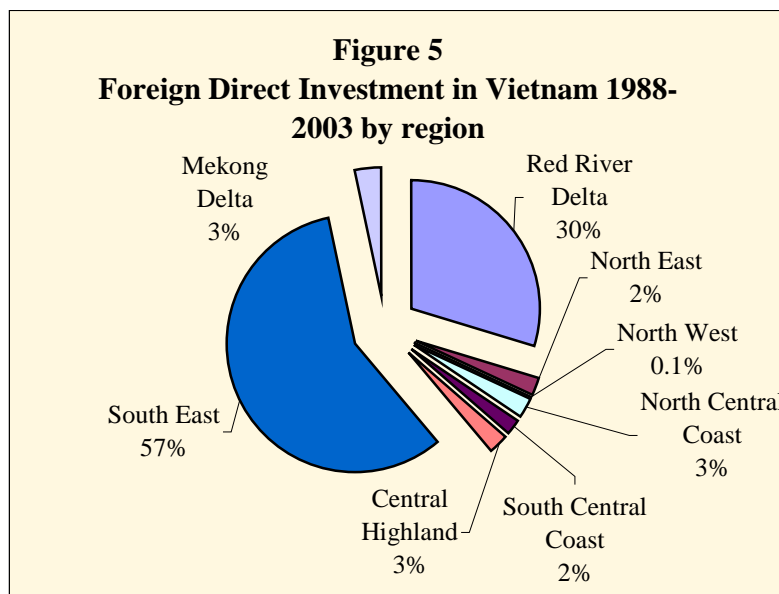


Source: Ministry of Planning and Investment, 2004

FDI has flown into all sectors of Vietnam, of which industry and services occupy large proportion. In industry, manufacturing sector attracts the largest FDI (46.4 percent in 2002), followed by mining (14.8 percent). The share of agriculture, forestry, and fisheries takes only a small component of total FDI, though it is increasing slowly (Bui, 2004). All of 61 provinces receive FDI but the capital is concentrated on urban areas, especially Hanoi and Ho Chi Minh City (HCMC), about 19 and 26 percent of total flows during 1988-2003, respectively. Other provinces with high amounts of foreign capital are southeast ones like Dong Nai, Binh Duong, Vung Tau; on the other hand, big cities in north and central areas like Hai Phong and Da Nang receive less FDI. Southeast area takes more than half of FDI inflows into Vietnam because of rich natural resources and quick institutional reforms of the local government (Figure 4, 5). In addition, a great number of industrial zones with preferential conditions for foreign investors built by the government to lure FDI have attracted a high proportion of the total FDI in the country: 1,202 approved projects with an amount of US \$ 9.4 billion, occupying about 23 percent of the FDI flows to Vietnam and 40 percent of FDI in the industry and construction sector up to 2002 (Bui, 2004). However, it should be also noted that a number of industrial zones are still empty with no foreign investment. This is due to low quality of infrastructure services and inefficient management capability of the zones (Onno, 2003).



Source: Ministry of Planning and Investment, 2004



Source: Ministry of Planning and Investment, 2004

According to the LFI, three forms of investment are allowed: business corporate contract (BCC), joint-venture (JV), and 100 percent foreign-invested company. It is regularized that for investments in the sectors of oil exploration and telecommunications, the BCC form must be applied. The form of JV is required for a wide range of sectors such as transportation, tourism, culture, port construction, airport terminals. A special form of build-operate-transfer (BOT), build-transfer-operate (BTO) and build-transfer (BT) contracts is required for projects regarding investment in the construction of infrastructure, such as water and electricity supply; and the

contracts are required to be signed with the authorized state agency. Up to the end of 2001, BCC projects accounted for about 11 percent of total inflows. The projects under 100 percent foreign-owned enterprises accounted for 61 percent of licensed projects (1858 projects) and 33 percent of committed capital (US\$ 12.4 billion), while JVs accounted for 34 percent and 53 percent of licensed projects and committed capital, respectively. Just six projects for a total amount of \$1.2 billion had been contracted as BOT (Table 1). The tendency of FDI forms is an increasing proportion of 100 percent foreign-owned projects. Two reasons can explain this trend: the first is that regulations for 100 percent foreign-owned enterprises are liberalized (Freeman, 2002); and the second is that foreign investors increasingly prefer the wholly owned form (Leproux and Brooks, 2004). This is due to the fact that the reliance of foreign investors on domestic counterparts is becoming comparatively less important after a period of experiencing Vietnamese market; and that foreign investors find it difficult to cooperate with domestic counterparts (Bui, 2004).

Another characteristic of the foreign capital in Vietnam is that most of the foreign firms are of small and medium sizes. Except for BOT contracts, almost all FDI project values are less than US\$ 100 million, average value of FDI projects in 2001 is merely US\$ 12.4 million (Table 1). This comes from the fact that a great proportion of investors are from Asian region. In a survey of foreign enterprises established during 1991-2000, Klaus et al. (2002) also shows that except for Japan, most of the Asian foreign investors are small firms with little international business experience outside the region.

Table 1
FDI in Vietnam by type, 2001

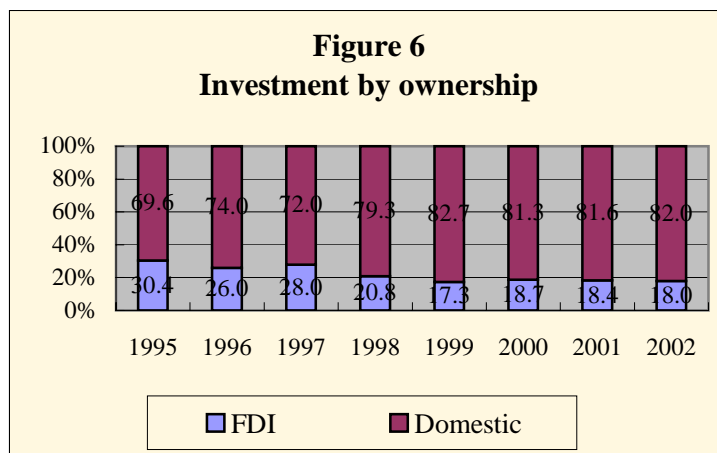
Form of FDI	Number of Projects	Approved Capital (US\$ million)	Realized Capital (US\$ million)	Project size (US\$ million)
BOT	6	1,228	40	204.7
BCC	139	4,052	3,274	29.2
100% foreign-owned	1,858	12,414	5,663	6.7
JV	1,043	20,167	9,716	19.3
Total	3,046	37,861	18,694	12.4

Source: Bui, 2004

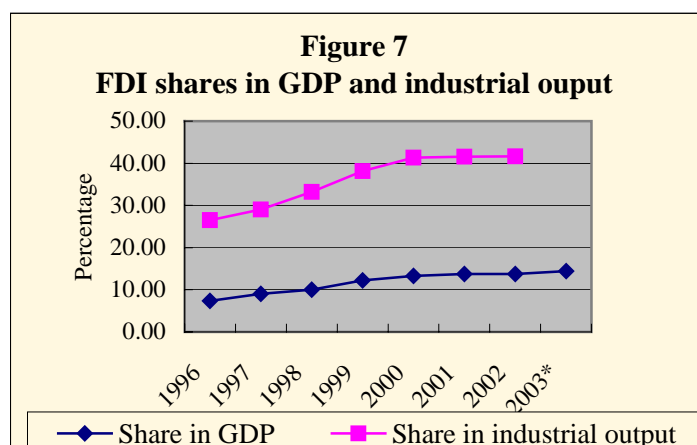
The above trend in FDI indicates that there is a strong relation between FDI and Vietnam's economic growth (the same tendency); foreign investors are mainly from Asia implies that technology gaps from Vietnam's level are not so big and customs are comparatively similar, hence it may be favorable for FDI to spillover on domestic production. Furthermore, as discussed by earlier studies, small and medium sized foreign projects may exert more spillover effects on the host country.

Impacts of FDI on Vietnam's Economy

Similar to the case of other late comers, FDI has been taken a lot of importance as the engine of growth of Vietnam. The first role of FDI to mention is its supplementary contribution to the investment of the country. It accounted for 25 percent of total investment on average in 1991-1995 with a peak of 30.4 percent as of 1995, and 21 percent in 1996-2000 period (Figure 6). This has been very meaningful for Vietnam as the country experienced insufficient investment and saving rate for development up to 1990, approximately 8 percent and 5 percent of GDP during 1981-1990, respectively (Carolyn, 2002). Foreign capital has also contributed significantly to state revenue. Between 1997 and 2000 foreign invested enterprises accounted on average for 5.7 percent of the state budget. If oil and gas revenues were included, FDI's contribution would account for over 20 percent (IMF 2002). FDI's contribution to state revenue is estimated to reach 6.95 percent. The contribution of FDI to total GDP has risen sharply since late 1990s. In the early 1990s the share was modest at 2-4 percent of GDP, it reached 10 percent in 1998 and has recently climbed over 13 percent (13.3 percent as of 2000, 14.75 % as estimated for 2003) (Figure 6). The role is much more crucial concerning only industry. During early 1990s, foreign sector accounted for 10 percent of total industrial output, and from 1996 it contributed more than 25 percent to total output in 1996 and the share now has reached 41.54 percent as for 2002 (Figure 7).



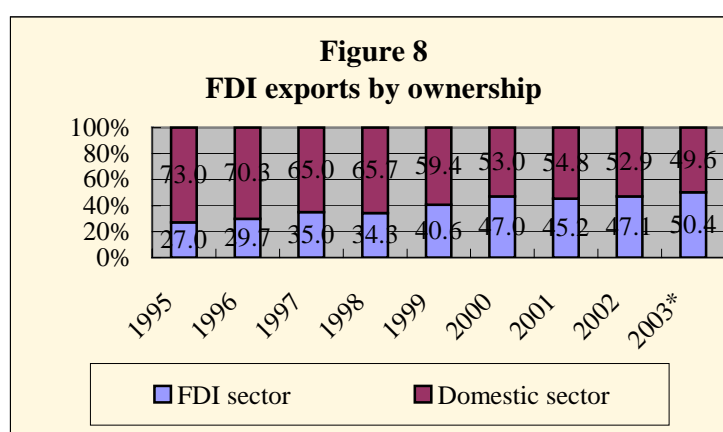
Source: GSO, 2004



Source: GSO, 2004

*estimated data

With foreign investors increasingly attracted to export-oriented industries, FDI has also played an important role for export growth, especially after the crisis. During 1992-1992, the share of FDI in total export was only 4 percent, from 1996 its share presented more than 20 percent of total exports. Since 1999, the share has climbed over 40 percent and estimated to be almost half of the total exports in 2003 (Figure 7). During 2002 the contribution of FDI to total exports was particularly relevant in some key industries such as footwear (42 percent of total footwear exports); textile and garments (25 percent); and electronics, computers, and supplies (84 percent) (Bui 2004). It is clearly that the growth of exports by FDI sector have been very high: 35.27 percent in 1995-1999 and 22.5 percent during 2000-2003. At the same time, exports of domestic firms has also increased: average growth rates are 14.9 percent and 10 percent for 1995-1999 and 2000-2003, respectively (the decline in growth of exports in the latter period is due to a fall in prices of export goods). It may be inferred that FDI has some impacts on domestic exports.



Source: GSO, 2003

*: estimated data

Nevertheless, comparing to the crucial amount of capital contributed to Vietnamese Economy,

employment created by FDI has not been as much as expected. Up to now, FDI has provided 739,000 jobs, accounting for less than two percent of the total number of people of working labor force (Ministry of Planning and Investment, 2004). In McCarty and Diep (2003)'s report, the share of FDI in total employment up to 2000 was estimated to be 0.6 percent. Referring to contribution to different sectors, foreign-invested enterprises accounted for 6.4 percent of total labor in industry and construction; 0.2 percent in agriculture, forestry, and aquaculture; and 0.4 percent in service sectors. The main reason why foreign investment has not created much employment is reflected in the low labor requirements per unit of output characterizing foreign-invested enterprises. This is fundamentally because labor productivity is higher in foreign-owned enterprises (Quynh, Nguyen, and Bui 2002). The second cause is the large share of FDI projects that have been carried out in capital-intensive industries such as cars and motorbikes, cement, and steel instead of sectors characterized by more labor-intensive production, especially agriculture.

Regarding to FDI's job distribution in different sectors, industry and construction played have the major role in creating new jobs, accounting for 78.5 percent of total labor in the FDI sector up to the end of 2002. Agriculture, forestry, and aquaculture reached only 10 percent and the rest is attributed to services and transportation. During 2003, the shares were 82 percent, 10.6 percent and 7.5 percent for industry, agriculture and services, respectively. In addition, FDI has contributed a great deal to raising living standards of employees. It is found in the study of the Institute of World Economy that the average wage of workers in foreign firms is much higher than that in private and state firms (annual income of nearly 14 million VND per worker in foreign-owned enterprises and about 8 million VND per worker in private and state enterprises in textile and garments industry in 2000) (Le, Bui and Dao, 2002).

With the modern technologies and management skills lying in capital, FDI has played a crucial role in long-term development of late comer Vietnam in technological and skill transfer (or spillovers). The technologies used by FDI projects are generally of a higher level than the technologies currently in use in Viet Nam, especially in the oil and gas, telecommunication, chemical, electronics, and automobiles sectors. These new technologies are supposed to generate relevant spillover effects. The above study of the Institute of World Economy in 2002 finds that among the three ownership, foreign invested enterprises take the most importance on the OJT (On-Job-Training). FDI has helped to modernize management and corporate governance, and to train a new group of young managers. According to Le (2002) about 300,000 workers have been trained or retrained, and 25,000 technicians and 6,000 managers have been trained, partially abroad. By comparing the assessment of local industry at the time of entry and at the time of the survey, the study also finds that there is an 'observed improvement' by foreign enterprises in local industry production, which implies a technological spillover from foreign firms to local ones, ranked by trade and tourism, machinery and equipment and construction. Tran (2002) analyzed a set of ten sample

case studies on foreign firms operating in different industries: oil and gas, telecommunications, automobiles, and information technologies for technological spillover effects through three channels: between joint ventures from foreign to Vietnamese partners; from JVs to Vietnamese organizations (institutions and firms); and direct spillovers from multinationals to Vietnamese organizations. The result shows that in all cases, foreign investors transfer the technologies through the first two channels, only in one case, there is the transfer in the third channel. However, the study also indicates that host country firms are often not ready and not organized well enough for learning and upgrading their industrial capabilities. In part this reflects the SOEs' persistently predominant role in Viet Nam's economy. In his earlier study in 1999, Tran already indicates that joint ventures and other connections between Vietnamese and foreign firms have not produced wide knowledge dissemination in either marketing or management of technical change. This could be related to the low familiarity—characterizing most Vietnamese firms—on utilizing partnership arrangements with foreign firms in order to increase technological capabilities. Moreover, the same study noted that a relevant part of the foreign firms showed insufficient determination to structure and facilitate the learning.

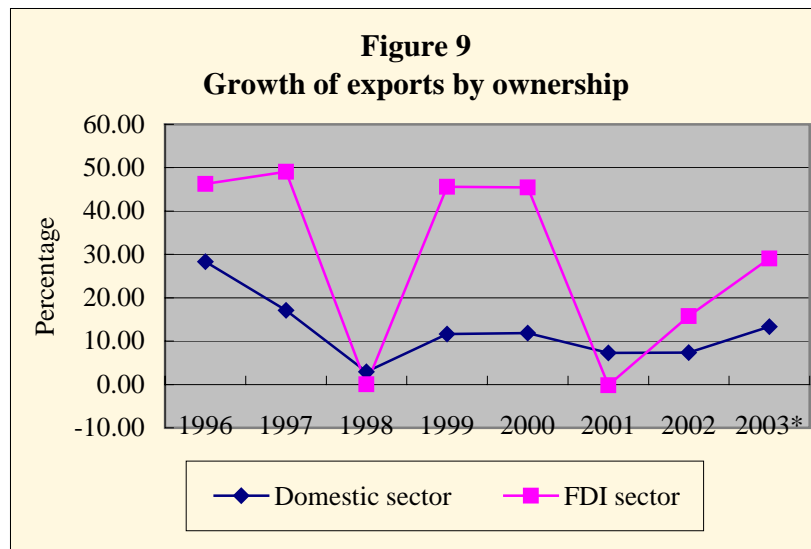
Linkages between research and development institutions and the productive sector in Viet Nam are claimed to remain weak. Moreover, “at present, cooperation between the domestic sector which is protected from foreign competition on the one hand and the export-oriented FDI sector which already participates in the international division of labor on the other is extremely weak...the private sector in Vietnam is dominated by small businesses such as street shops, family factories” (Onno, 2003). The FDI in textile and garments industry in Vietnam in 1999-2000 did not use very much domestic materials and inputs, just above 20 percent of their total input value, compared to 62 percent for the domestic private sector and more than 50 percent for the SOEs. The share of sub-contract revenue by foreign investors in total was only 6.4 percent compared to 10.8 percent for domestic private sector. This implies that the FDI generates a linkage of production which is not as strong as the private firms (Le, Bui and Dao, 2002). So while FDI has had important effects of upgrading the Vietnamese economy's technology and providing technology and knowledge to its local partners, its impact on other domestic firms of the same industry is limited by the weak linkages between foreign-invested enterprises and domestic enterprises, and by the steady weakness of the domestic private sector.

In summary, with its growing share in the economy, FDI has had important impacts on the Vietnamese economy in all aspects in short-term as well as long-term aspects, concerning both quantities and quality for the past 15 years. FDI has shown to be a crucial and steadily growing economic sector of Vietnam. At the same time, FDI has contributed to the development of domestic sector indirectly through increasing incomes, expenditure, hence boosting demand for domestic goods, and directly through increasing competition, forcing domestic firms to invest more and

produce more efficiently and introducing new technologies and skills. FDI is therefore supposed to exert positive spillovers on Vietnam's domestic production.

Vietnam's Industry: the history and characteristics

The Vietnam's Industry after reform in 1986 can be divided into three periods: 1986-1994, 1995-1999 periods and from 2000 up to now (Ministry of Industry, 2004). After the reform until 1990, with the development of market, industrial output grew at a stable rate of 6.07 percent; in 1991-1994 the whole industry grew fast and got the recording annual rate of 13.5 percent. Industrial exports increased sharply from 1990 to 1994 in both volume and types of export goods; foreign sector's share in exports also started to rise from 1994. In the later two periods, industrial gross output increased steadily with annual average growth rate of 13.03 percent and 15.67 percent in 1995-1999 and 2000-2002, respectively; gross output of 1999 was VND 168,749 billion (at 1994 price), as much as 1.7 times of that of 1994 and in 2002 output reached 301 billion VND (at 1994 price), nearly double that of 1999. The proportion of exports in gross output, as well as the contribution of FDI sector have risen dramatically in both periods (Figure 9). Since there is a change in sector division of industry in 1995 (before 1995, data of industry was divided into 20 sectors, from 1995 there is 29 industrial sectors), this study is concentrated on the development of industry in 1995-1999 and 2000-2002 periods.



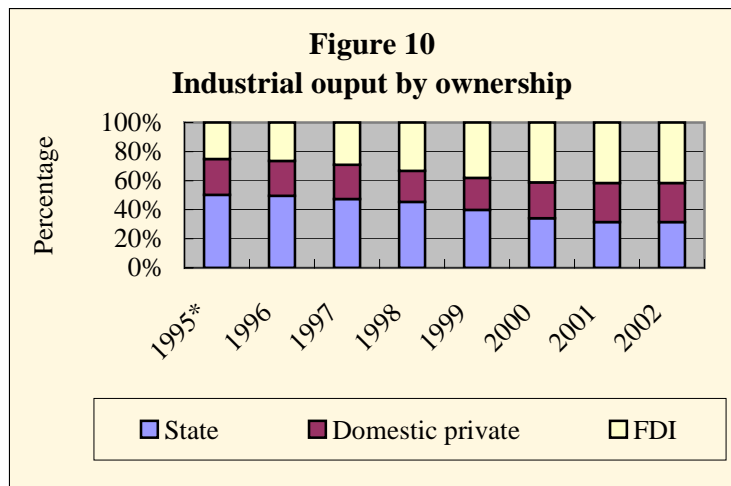
Source: GSO, 2004

Recent characteristics of Vietnam's Industry

There is a tendency of structural change in industrial output during 1995-1999 and 2000-2002 periods. Mining and quarrying tends to reduce in total share: in 1995 its share in total output was 13.47 percent, and reduces to 11.6 percent in 2002; manufacturing and electricity, gas & water supply keep stable shares of 79.5-81 percent and 5.9-6.1 percent, respectively. In manufacturing

industries, the share of machinery, chemical and other heavy industries decline while the share of electric and electronic industries climb sharply despite a fall in growth rate of electronic industry from 30.2 percent in 1995-1999 to 8.1 percent during 2000-2002. During nearly ten years, textile and garments industry keeps stable share from 12.0 to 12.5 percent in the total output; construction, water and gas and remaining other industries experience increasing shares. The same trend is observed output growth. During 2000-2002, the growth rate mining & quarrying drops sharply to 7.3 percent while the rates of manufacturing and electricity, gas & water supply rise to 16.9 and 17.8 percent, respectively. Electronic industry annual growth rate in reduces from around 30.2 percent in 1995-1999 to 8.1 percent in 2000-2002; however, it is estimated to increase again to 19.6 percent in 2003.

This change in industrial output is related to a change in ownership structure: a rise in the shares of domestic private and FDI sectors in Vietnam’s industry is observed. The share in total output of the State sector (central and local states) tends to decline, from 50.29 percent in 2000 to 31.42 percent in 2002, the share of domestic private sector fluctuates between 24-27 percent; and FDI’s output share rises a great deal from 25.1 percent in 1995 to 41.6 percent in 2002 (Figure 10). The share changes different among industries. However, private domestic sector is still weak, due to the restrictions in legal regulations in terms of access to capital, limited supports by the government compared to the State sector. It is argued that FDI has contributed substantially to changes in industrial output. Several new industrial has been created by FDI, hence created demands for domestic inputs.



Source: GSO, 2004

*data calculated by 1994 price values, others by current price values

During 1995-1999, investment in the industry kept increasing, accounting for approximately 32-35 percent in total social investment. Average annual growth rate of investment in this period was 18.07 percent. During 2000-2002, industry investment takes a proportion of 34.6 percent of total

social investment. Total industry investment in three year period of 2000-2002 is nearly that of four-year period of 1995 to 1999 (Table 2). The ownership share in investment is as follows: The State sector frequently accounts for 38-52 percent, FDI takes a share of 24-32.5 percent and private domestic investment occupies around 21-29.5 percent. Referring to the sectorial structure, electricity, gas & water supply accounts for the largest proportion, followed by manufacturing. This tendency appears much clearer in the State sector. As for the FDI sector, the trend turns the other way around: investment is concentrated most on manufacturing, mining & quarrying. The private domestic sector invests the most in textile and garments.

Table 2
Industrial investment

Year	1995	2000	2001	2002	1995-1999	2000-2002
Investment at current price	23489	49893	56250	67853	169242	223889
Investment at 1994 price	20973	37981	42710	50460	136242	169078

Source: Ministry of Industry, 2004

Technology transfer has played an important role in the industrial production. Since the reform, technology transfer has developed sharply in terms of both scale and speed. Together with the development of EZs and Industrial Zones (IZs), a great number of modern technologies have been transferred and applied in various sectors of industry. However, a particular characteristic of industry technology is the disparity of levels of technologies: there is a mixture of backward, middle and advanced levels observed among sectors, enterprises and even inside enterprises. The proportion of backward and middle-level technologies in the whole industry is approximately 60-70 percent, modern and advanced technologies account for only around 30-40 percent. The disparity of technology levels is also observed across ownership. Central state sector technology level is higher than that of the local state, the level of state sector is higher than private domestic and foreign sector level is higher than domestic sector. Modern and advanced technologies are mainly concentrated on JVs and 100 percent foreign enterprises. The mixture of technologies is clearly observed in most of state enterprises. Technologies applied by these enterprises are mainly from Eastern Europe, Malaysia, Taiwan, Korea, China, India, which are not really of high levels. In several cases, enterprises import second-hand equipment due to the shortage of capital. In terms of industrial sectors, modern technologies are concentrated in a few major fields such as oil and gas, electricity, textile and garments, food and beverage, automobiles and electronic goods. The speed of technology growth remains slow and unequal among enterprises. Furthermore, since the quality of technicians and engineers is still insufficient, the degree of technology application is restricted; the usage ratio of technologies is still slow, accounting for only 70-80 percent of capacity, even 50-60 percent for some sectors.

The above analysis of recent trend and characteristics of Industry in Vietnam indicates that FDI inflows in Vietnam has risen substantially with the increasing growth of the country in general, and the development of industry in particular. As an economic sector of Vietnam, the contribution of FDI to the economy has become more and more important in various aspects. Furthermore, with the advanced technologies, skills and know-how embodied in the capital, FDI sector might have further spillover impacts on other economic sectors, which takes a special meaning for the long-term growth of the country. In the following section, the paper presents an empirical work to answer the question of to what extent FDI sector has contributed to the technologies and production of domestic sectors Vietnam's industry and what factors influences these impacts. Based upon the above analysis, it seems that in the case of Vietnam, demonstration is the main channel for intra-industry spillover effects and backward-linkage, if it has, is the channel for inter-industry spillovers for most of industrial sectors; the technology level of the domestic sector ('absorptive capability') is an important factor determining technological spillovers by FDI. In addition, the weak linkage between domestic sectors, especially domestic private sector and foreign sector in Vietnam has probably been an obstacle to these effects, therefore it is necessary to promote this domestic sector.

3.2 Technological Spillovers from Foreign Direct Investment in Vietnam's Industry

3.2.1 Framework: data and model

This section explores the spillover effects FDI on the productivity of domestic firms in Vietnam industries during 1995-1999 and 2000-2002 periods. Analyzing different characteristics of industrial sectors such as manufacturing or mining, labor-intensive or capital-intensive, sectors with high technology gap between domestic and foreign sectors, we try to make policy implications to enhance the spillover effects of FDI.

Data description

This study employs industry-level panel data published and unpublished on Vietnam's industrial sectors from 1995 to 2002 provided by the General Statistical Office of Vietnam (GSO). The data include 29 sectors from three industrial groups of mining & quarrying, manufacturing and electricity, gas & water supply. There are four industries in mining and quarrying, 23 sectors in manufacturing and two in electricity, gas & water supply (Appendix 1). The data are divided by two sub-samples of 1995-1999 and 2000-2002 periods. The former data are mainly based on *Statistical Yearbook 1999, 2002*, which includes household sector while the latter sample is comprised of data from *Statistical Yearbook 2003* and *The Real Situation of Enterprises through the results of surveys conducted in 2001, 2002, 2003*, hence excludes household sector.

Domestic sector is defined to include State-Owned-Enterprises (SOEs), non-state collective

establishments, domestic private firms and households; foreign sector includes all establishments with foreign investors (JVs and 100 percent foreign-invested firms). Therefore, in 2000-2002 sample, domestic sector is considered to include only SOEs, non-state collective and domestic private firms. The data sets include information on gross output, fixed assets and employment. Data on gross output and employment are available separately for all of given economic sectors while data on fixed assets are available only for foreign sector and total domestic sector, without further division inside domestic one. Gross outputs are fixed values at 1994 price; fixed assets are calculated at 1994 asset deflator according to a prior research.

Model

The data employed are panel at industry level; the model applied in this paper is similar to those of earlier empirical studies of aggregate industry (Caves (1974), Globerman (1979), Blomstrom and Persson (1983), Kokko (1994), Sjöholm (1999), etc). Production function of domestic sector in industry i is assumed to have Cobb-Douglas form and homogenous with degree one as follows.

$$Y_i^d = (K_i^d)^\alpha (L_i^d)^{1-\alpha} e^{Z_i} \quad (1)$$

where d denotes domestic, i denotes industrial sector i , Y_i^d is output, K_i^d, L_i^d are capital and labor of domestic sector in industry i and Z_i presents sectorial externalities which will be explained specifically later, α is a parameter. Foreign presence is assumed to be an externality affecting output among other factors such as sectorial capital-labor ratio, labor quality, scale economies, concentration (Z_i in general). Due to the limitation of data, this paper employs only the proxy for concentration, the output function of domestic sector is expressed as follows.

$$Y_i^d = (K_i^d)^\alpha (L_i^d)^{1-\alpha} e^{\beta*GOV} e^{\gamma*FOR} \quad (2)$$

Dividing both sides by L_i^d , we have the following function for labor productivity of domestic sector.

$$\frac{Y_i^d}{L_i^d} = \left(\frac{K_i^d}{L_i^d} \right)^\alpha e^{\beta*GOV} e^{\gamma*FOR} \quad (3)$$

α, β, γ are parameters, the proxies are defined as follows: average labor productivity in domestic sector $\frac{Y_i^d}{L_i^d}$ is measured as the ratio of gross output to total employees in domestic sector, domestic

sector's capital-labor ratio $\frac{K_i^d}{L_i^d}$ is measured as the ratio of total fixed assets to total employees

in domestic sector. In earlier studies, the Herfindahl index is used as a proxy for concentration of industry; however since the data for this index is not available in Vietnam, the share of SOEs in total output of each industry denoted by GOV is alternatively used. This comes from the particular characteristic of Vietnam that industries with higher presence of SOEs tend to be more concentrated. FOR , finally, is the degree of foreign presence in each industry measured by foreign the percentage of foreign sector's employees of total industry's employees. This proxy is argued by Caves (1974) to be better than share of foreign sector output (as an proxy of input should be used to explain productivity). The omission of other externalities in the equation such as labor quality and scale economies might cause a bias, however this bias is expected to be small. In earlier studies, scale economies do not show a significant impact on output (Kokko (1994), etc). Furthermore, applying to the case of small production of Vietnam, it is supposed that only a few firms have acquired scale economies, thus on average it is likely that there is yet virtually no impact of scale on productivity. Applying log-linear regression, the labor productivity of domestic sector is estimated as follows.

$$\ln\left(\frac{Y_{it}^d}{L_{it}^d}\right) = \mu + \alpha \ln\left(\frac{K_{it}^d}{L_{it}^d}\right) + \beta GOV_{it} + \gamma FOR_{it} + \varepsilon_{it} \quad (4)$$

where μ is constant, t denotes time; ε is error term absorbing all other technology factors influencing labor productivity and measurement error. Small characters present variables in log-values. The coefficient α is undoubtedly expected to be positive. The coefficient β is also expected to be positive under the hypothesis that "more concentrated industries are supposedly better able to engage in monopoly pricing and should therefore display higher labor productivity" (Kokko, 1994). γ estimates spillovers. If it has significant positive value, spillovers from foreign presence on domestic productivity are concluded.

As argued in earlier studies, there is a possibility that foreign investors are attracted to industries with higher labor productivity, therefore the observed correlation between foreign presence and domestic productivity may overestimate the positive impact of foreign sector. OLS estimator can have an upward bias. Assuming that the unobserved characteristics of industries are time-invariant, we use fixed effect estimation method to control for the bias. Since there might be a possibility that unobserved factors do not affect domestic output, we also run random effect estimation and do Hausman test for the difference between fixed and random effect estimators.

The second purpose of the empirical study is to search for factors affecting the magnitude of spillovers of foreign presence on domestic productivity. As presented before, this paper examines the effects of the size of technology gap between foreign and domestic firms, industry characteristics

such as capital-intensive or labor-intensive and the domestic private firms' linkage role. The proxy chosen for technology gap is productivity gap *PRG* defined as the ratio of gross output per employee in foreign sector to that of the whole industrial sector (an observed technology gap). Capital intensity proxy *CAI* is defined as capital-labor ratio of foreign sector in each industry. It shows whether the industrial sector is labor-intensive or capital-intensive. The proxy for domestic private activities *PRI* is defined as the percentage of domestic private sector's output in the whole industrial sector's output. By including interaction terms of the above proxies and foreign presence *FOR* into (1) regression, we can see whether these factors have impacts on spillovers which is expressed as follows.

$$\ln\left(\frac{Y_{it}^d}{L_{it}^d}\right) = \mu + \alpha \ln\left(\frac{K_{it}^d}{L_{it}^d}\right) + \beta GOV_{it} + \gamma FOR_{it} + \lambda FOR_{it} * proxy_{it} + \varepsilon_{it} \quad (5)$$

where $proxy=(PRG, CAI, PRI)$. If the coefficient λ of the interaction term is significantly positive, it is concluded that the factor enhances spillovers, and it restricts spillover if λ is significantly negative. We use here the assumption that these proxies have virtually no impacts on other variables; however, we also do estimation with interaction terms of *proxy* and other variables. As expressed above, technology gap is a condition for spillover effects but if it is too large, foreign firms may crowd out domestic enterprises; hence the impact of technology gap is ambiguous. A trend in Vietnam's industry labor-intensive industrial sectors are often export-oriented ones, hence these sectors are comparatively efficient and of high technologies compared to other sectors. This implies that spillover effects of foreign presence are bigger in favor of labor-intensive industries compared to capital-intensive ones; thus the coefficient of interaction term for *CAI* is expected to be negative. Finally, as discussed by Tran (2002) and other researchers, domestic private firms have played a very important role of linkages between foreign and local technologies, private firms determine the degree of technology transfer; the coefficient of interaction term of *PRI* is expected to be positive.

3.2.2 Empirical results

Table 3 presents the results of regressions in equation (4) for 1995-1999 and 2000-2002. All regressions are run in both fixed effects (FE) and random effects (RE). RE estimations show a smaller coefficient of *FOR*, the difference between the two are not systematic. During 1995-1999, the coefficients of capital-labor ratio and *GOV* are significantly positive as expected. The coefficient of *FOR* is significantly positive at around 0.02 to 0.03, as much as the coefficient of *GOV*. Foreign presence does have big spillover effects on average domestic productivity of industry in Vietnam in 1995-1999. In 2000-2002, the coefficient of *GOV* is negative, which indicates that during this period there is less monopoly in pricing by the government and the state-owned sector becomes inefficient. Insignificant results of all variables except constant term suggest that during

2000-2002, fixed effects rather than given factors do influence average labor productivity. The sign of spillover is still positive though it is not significant. As this sub-sample of 2000-2002 excludes household sector, there are two possible explanations: FDI sector has virtually no impacts on domestic sector except for households or the ‘market-stealing effect’ of FDI is big in 2000-2002 period.

Table 3

Dependent variable: labor productivity of domestic sector				
Period	1995-1999		2000-2002	
	Fixed effects	Random Effects+	Fixed effects	Random Effects+
No of observations	143		84	
R2	0.3173	0.3940	0.0644	0.2287
Constant	-5.023734 (0.4187228) **	-4.543374 (0.29246) **	-6.829876 (5.157828)	-5.487061 (1.532057) **
Capital-labor ratio	0.0657692 (0.0304668) **	0.0812018 (0.03095) **	-0.9643787 (0.7387776)	0.0649326 (0.3569135)
<i>GOV</i>	0.0304646 (0.0065966) **	0.0211598 (0.00413) **	0.1063964 (0.0864823)	-0.0041546 (0.0195909)
<i>FOR</i>	0.0307388 (0.0069492) **	0.0256331 (0.00478) **	0.066886 (0.0614172)	0.0406693 (0.0234803)

figures in parentheses are standard errors

** significant at 1 percent level

random effects+: difference of F.E and R.E estimators not systematic

Followings are the results of the regressions with interaction terms of *FOR* and *proxy* (Tables 4, 5, 6) (equation (5)). The results presented in all three tables are reported with the more consistent and efficient estimators between FE and RE based upon Hausman tests. Column (i) gives result on regression with only interaction term *FOR*proxy* while column (ii) shows regressions with interaction terms of all variables.

Table 4 presents the results of regression with interaction term of *FOR* and *CAI*. The results in both equations (i) and (ii) shows a significantly negative sign of the interaction term *FOR*CAI* during 1995-1999. It shows that the spillovers of FDI on domestic sector are bigger in labor-intensive industries and smaller in capital-intensive ones. This support the hypothesis that spillovers are bigger in industrial sectors with smaller gap between FDI and domestic firms. However, an insignificant negative sign of the interaction term is found as for 2000-2002. It can be inferred that in Vietnam, across the time, domestic firms in capital-intensive sectors can achieve high technologies so that the gap between them and their foreign competitors becomes not too big compared to that in labor-intensive ones, there is no significant difference of spillovers between these two types of

industrial sectors.

Table 4

Spillovers with capital-intensity				
Dependent variable: labor productivity of domestic sector				
Period	1995-1999		2000-2002	
	(i)	(ii)	(i)	(ii)
No of observations	130		81	
R2	0.5828	0.5504	0.2138	0.2415
	-4.640354	-4.374162	-6.462007	-7.856337
Constant	(0.2516576) **	(0.3158745) **	(1.77885) **	(2.149191) **
	-0.020698	-0.0012018	-0.1423918	0.399172
Capital-labor ratio	(0.0308401)	(0.0507104) **	(0.4047716)	(0.6173123)
	0.0237471	0.0199481	0.0193008	0.016792
GOV	(0.0035267) **	(0.0048796) **	(0.0209441)	(0.0228564)
	0.0422035	0.0338813	0.0556351	0.0485887
FOR	(0.0041483) **	(0.0052995) **	(0.0267108) **	(0.0277477)
	-	-0.0000517	-	-0.0006875
K/L*CAI	-	(0.0000248) **	-	(0.0006722)
	-	3.19e-06	-	0.0000333
GOV*CAI	-	(1.45e-06) **	-	(0.0000365)
	-5.56e-06	-2.60e-06	0.0000177	0.0000654
FOR*CAI	(1.05e-06) **	(2.62e-06)	(0000171)	(0.0000514)

figures in parentheses are standard errors

** significant at 1 percent level

*significant at 5 percent level

Table 5 reports the results of regressions with interaction term of *FOR* and *PRG*. The interaction terms of *FOR* and *PRG* have negative sign and are statistically significant in 1995-1999 and insignificant during 2000-2002 period. This indicates that technology gap restricts the effect of spillovers. Industries with low technology gap benefit from foreign presence more than those with a high gap. This is consistent to the above result reporting higher spillovers in favor of more efficient labor-intensive sectors. It supports the hypothesis of ‘absorptive capability’ of host country (Brozentine, 1998). Since Vietnam is a developing country with backward technologies, only industries or firms with relatively high technologies are capable of absorbing modern and advanced technologies brought in by foreign investors. This effect disappears with time when technology gaps become indifferent across industrial sectors.

Table 5

Spillovers with technology gap in productivity				
Dependent variable: labor productivity of domestic sector				
Period	1995-1999		2000-2002	
No of observations	130		81	
R2	0.6337	0.6514	0.2411	0.2902
	(i)	(ii)	(i)	(ii)
Constant	-4.52406 (0.3110415) **	-4.33126 (0.29024) **	-7.80861 (1.689459) **	-8.493247 (1.735583)
Capital-labor ratio	0.0793739 (0.0260011)	.0424081 (.0351445)	0.0021506 (0.3542715)	0.0711269 (0.4780006)
GOV	0.0182278 (0.0042202) **	0.0202045 (0.0044101) **	0.0266886 (0.0233423)	-0.00227 (0.00079)
FOR	0.0374947 (0.0043897) **	0.0397611 (0.0048838) **	0.0508508 (0.0299888)	0.0488399 (0.0339884)
K/L*PRG	-	-0.0316914 (0.0214526)	-	0.0430951 (0.1672104)
GOV*PRG	-	0.0015984 (0.0008714) *	-	-0.0061414 (0.0090828)
FOR*PRG	-0.005523 (0.002765) **	-0.0077515 (0.0031121) **	0.0242934 (0.0281733)	0.0264732 (0.0302229)

figures in parentheses are standard errors

** significant at 1 percent level

*significant at 5 percent level

Finally, results in table 6 show the impacts linkage role of domestic private sector towards spillovers. The interaction terms *FOR* PRI* are insignificant for 1995-1999 and significantly positive for 2000-2002 though the magnitude is small. It is inferred that in the latter case, when there is less monopoly of government (coefficient of *GOV* no longer significant), domestic private sector plays an important role for spillovers. The more there is operation of domestic private firms, the stronger are the spillover effects of foreign presence. Vietnamese government has been supporting SOEs so far; however, domestic private sector is the very factor enhancing technology transfer and productivity growth. It is therefore necessary that the Vietnamese government should pay much attention to encourage the development of small and medium domestic private firms.

Table 6

Spillovers with domestic private sector				
Dependent variable: labor productivity of domestic sector				
Period	1995-1999		2000-2002	
	(i)	(ii)	(i)	(ii)
No of observations	143		84	
R2	0.3942	0.1837	0.3317	0.5085
	-4.55981	-5.519851	-6.526497	-7.536424
Constant	(0. 2862229) **	(0. 4478135) **	(1.400172) **	(1.178079) **
	0. 0867979	0. 089416	0.120274	0. 4389662
Capital-labor ratio	(0. 0315845) **	(0. 0304615) **	(0. 3227039)	(0. 2767178)
	0. 0209144	0.0274805	0. 0082067	0.0091779
GOV	(0. 0040439) **	(0. 0069205) **	(0. 017929)	(0. 0151819)
	0. 027418	0. 0377995	0. 042229	0. 0403942
FOR	(0. 0051134) **	(0. 0081243) **	(0. 0211667) **	(0. 0178085) **
	-	-0. 0007609	-	0. 0023093
K/L*PRI	-	(0. 0010288)	-	(0. 001227)
	-	0. 0006129	-	0. 0000416
GOV*PRI	-	(0. 0001539)	-	(0.00000) *
	-0.0000502	0. 0000121	0. 0002324	0. 0000368
FOR*PRI	(0000533)	(0. 0000928)	(0. 0000587) **	(0. 0001005) **

figures in parentheses are standard errors

** significant at 1 percent level

*significant at 5 percent level

The above results show evidence of significant positive spillover effects in Vietnam's industry during 1995-1999 and insignificant spillovers in 2000-2002. It may suggest that in the former case, when Vietnam is experiencing important structural reforms, positive demonstration and competition effects of FDI are big, in the latter case when markets get more stable, 'market stealing effect' becomes larger. The results also show some evidence support the hypothesis of high technology gap may not create spillovers. This is in accordance with the empirical findings of Sjöholm (1999) "The gap may be so large that it will impossible for domestic firms to absorb foreign technologies with their existing experience, educational level and technological knowledge". However, it is restricted to period 1995-1999. It may suggest that in later period of 2000-2002, the before low-level industrial sectors become more efficient, and the difference in technology gaps between industrial sectors no is longer significant to influence spillover effects.

By applying fixed effect estimation, the study can control for the problem that unobserved time-invariant factors of industrial sectors may influence the incentive of FDI operation, therefore it may cause biased estimation. However, further estimation should be made if the assumption is relaxed, i.e. unobserved sectorial factors such as production efficiency are time-variant. A 2SLS estimation with investment of domestic firms used as an instrumental variable can probably control for this bias (We could not do this in the study as we were not able to acquire this kind of data). The omission of labor quality in the regressions may cause a bias since there is a possibility that it is correlated with *FOR*. In addition, as the data employed are at aggregate industry level, even a positive spillover of FDI on domestic sector's productivity, it can not be concluded that MNCs' operation does make a positive impact on the productivity of domestic firms. There is a possibility that with the entry of foreign firms, inefficient domestic firms go bankrupt or get out of the market, leaving only efficient firms in the market, making the average productivity higher even there is no spillovers of the FDI. Finally, this paper does study on factors influencing spillover effects on the demand side (characteristics of industries in Vietnam); however, factors on the supply side such as origin country of FDI, incentives of projects, ownership structure of FDI can also have impacts on the spillovers. This aspect and the above restrictions are left for future researches.

3.2.3 Policy implications

The empirical study suggests that spillover effects from FDI in Vietnam are bigger in the period just after the country's reform policy, and in later period, it may be that market-stealing effect becomes larger. There may be more competition created by FDI in later periods. However, this effect may be only contemporary, spillovers may turn positive again if domestic sectors develop well enough to be able to compete with foreign sector and take advantage of the advanced technologies, know-how and skills introduced to the country by FDI. The presence of foreign investors is good for the country, the question is to support and develop domestic sectors.

The empirical evidence also supports the argument that domestic private sector has been played a crucial role in technological transfer from FDI to domestic production. The analysis is restricted to spillover effects on total domestic sector, a stronger effect is expected if we exclude SOEs from domestic sector. As discussed by Tran (2002) and Ohno (2003), the interaction of domestic private and foreign-owned firms has been the technological linkage for spillovers. It is the small and medium enterprises that have more contacts with foreign-owned firms and react more to the markets, and hence bring about more changes. The argument may be strengthened if we study on inter-industry spillovers. Therefore, it is suggested that the government should develop more policies encouraging the domestic private sector. At present, , domestic private sector is still unbeneficial in tax regimes and access to loans from state banks, these institutions should be abolished, an equal investment environment for state and private producers should be created and protected. In addition,

policies strengthening linkages between domestic and foreign sectors like local content requirement in automobile industry should be spread widely.

3. Concluding remarks

FDI has been considered the engine growth for developing countries. FDI flows to Vietnam have been increasing dramatically since the issue of the Law of Foreign Direct Investment (LFI) in 1988. FDI has been a major concern in the researches of Vietnamese economists and politicians. However, most of the existing studies concentrate on the objective and subjective factors and institutions attracting FDI to Vietnam. This paper studies the impacts of FDI on Vietnam's economy, particularly the Technological Spillover Effects brought in by MNCs. Focusing on the spillover effects of FDI, two approaches are employed: the first one is an indirect approach analyzing recent trends and characteristics of FDI and Vietnam's economy and industry and the second one is doing empirical work on using industry-level panel data of 29 industrial sectors during 1995-1999 and 2000-2002 periods. Besides the attempts to estimate whether and to what extent there has been a spillover effect of current FDI on the industries, the empirical study also tries to find out what characteristics of industries influence the degree of spillovers, and therefore suggests several policy implications to enhance spillover effects of FDI.

Although the value of FDI inflows to the country decreased in 1997-1998 owing to the regional currency crisis, FDI has recovered soon since 1999 and contributed a great deal to the growth of the country. FDI has complemented the insufficient domestic investments for enlarging production, helped to reduce government budget deficits, contributed to rising exports to international markets, increased employment and with advanced technologies and know-how embodied in the capital, FDI has been discussed to have a long-term effect of contributing a lot to the growth of productivity in Vietnam's industries. There is a tendency that the enlargement of FDI also goes along with the development of domestic sectors, suggesting a positive spillover from FDI. The empirical study shows that spillovers are significantly positive during 1995-1999, and insignificantly positive in 2000-2002. The results also indicate that technology restricts spillover effects in earlier period but has no effects in the later years. The findings support the argument that domestic private sector plays a crucial role in spreading out spillovers from FDI. This suggests that policies strengthening the growth of private sectors should be promoted to enhance the spillover effects of FDI. However, it should be pointed out that despite of the findings, the results and implications of the study is still restricted due to the unavailability of data. These questions are left for further studies.

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.Appendix 1.

The Inward FDI Performance Index ranks countries by the FDI they receive relative to their economic size. It is the ratio of a country's share in global FDI inflows to its share in global GDP.

The Inward FDI Potential Index captures several factors (apart from market size) expected to affect an economy's attractiveness to foreign investors. It is an average of the values (normalized to yield a score between zero, for the lowest scoring country, to one, for the highest) of 12 variables such as GDP per capita, the growth of GDP, the share of exports in GDP, etc (no weights are attached in the absence of *a priori* reasons to select particular weights)

Front-runners: countries with high FDI potential and performance.

Above potential: countries with low FDI potential but strong FDI performance.

Below potential: countries with high FDI potential but low FDI performance.

Under-performers: countries with both low FDI potential and performance.

Source: UNCTAD, 2004

Appendix 2 Industrial sectors	
C	Mining and quarrying
C10	Mining of coal and lignite; extraction of peat
C11	Extraction of crude petroleum and natural gas
C12	Mining of metal ores
C13	Other mining and quarrying
D	Manufacturing
D15	Food and beverage
D16	Cigarettes and tobacco
D17	Textile products
D18	Wearing Apparel, dressing and Dying of Fur
D19	Leather Tanning and Dressing
D20	Wood and wood products
D21	Paper and paper products
D22	Printing, publishing and reproduction of recorded Media
D23	Coke and Refined petroleum products and Nuclear fuel
D24	Chemicals and chemical products
D25	Rubber and plastic products
D26	Other Nonmetallic Mineral products
D27	Basic Metals
D28	Fabricated Metal products
D29	Machinery and equipment N.e.c
D30	Office, accounting and computing machinery
D31	Electrical machinery and apparatus N.e.c
D32	Radio, TV, communication equipment
D33	Medical and precision and optical instruments
D34	Motor vehicles trailers and semi-trailers
D35	Other transport equipment
D36	Furniture, N.e.c
D37	Recycling
E	Electricity, gas and water supply
E40	Electricity, gas, steam and hot water supply
E41	Collection, purification and distribution of water

