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Abstract

Recent trade literature highlights the importance of export diversification and upgrading in fostering faster and sustainable economic growth. This study investigates the impact of FDI inflow and stock on the level of export diversification and sophistication in host country's export baskets. By utilizing the dynamic panel data model, we find that the five-year lagged FDI inflow correlates positively with both export diversification and sophistication, and FDI stock makes the positive contribution to export sophistication. These findings provide support for the possibility of successful capabilities transfer to and building by local firms. We also find that these positive impacts of FDI exist only in developing countries.

Keywords: FDI, export diversification, export sophistication, capabilities transfer
JEL classification: F21, F10, O14

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Can FDI Promote Export Diversification and Sophistication of Host Countries? Dynamic Panel System GMM Analysis

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Abstract

Recent trade literature highlights the importance of export diversification and upgrading in fostering faster and sustainable economic growth. This study investigates the impact of FDI inflow and stock on the level of export diversification and sophistication in host country's export baskets. Theoretically, FDI should promote export diversification and sophistication of host countries through export activities of MNCs and productive capabilities transfer to local firms. By utilizing the dynamic panel data model based on system GMM for 175 countries from 1980 to 2007, we find that the five-year lagged FDI inflow correlates positively with both export diversification and sophistication, and FDI stock makes the positive contribution to export sophistication. These findings provide support for the possibility of successful capabilities transfer to and building by local firms. We also find that these positive impacts of FDI exist only in developing countries.

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1. Introduction

There is a long tradition in economics, from the age of Adam Smith and David Ricardo, which identifies the external performance of a country as a key driving force for economic development. In fact, it was the export-led strategy that produced many growth miracles and lifted millions of people out of poverty in East Asia as well as in other regions (World Bank 1993). However, the expansion of exports alone, without structural transfer of export baskets, may not lead to sustainable economic growth. This is particularly true if exports are dominated by primary and/or low-productive commodities. Recent trade literature highlights the important role that structural transformation of export sectors, or export diversification and sophistication, plays in promoting faster and sustainable economic growth (see, for example, Herzer and Nowak-Lehnmann 2006 and Hausmann et al. 2007). In other words, economies that produce and export more diversified and high-productivity products tend to enjoy faster growth than countries with less diversified and low-productivity products.

The purpose of this study is to empirically investigate whether foreign direct investment (FDI) [1]can promote diversification and upgrading of host country's export baskets. Theoretically, FDI has positive impacts on the level of export diversification and sophistication through direct and indirect channels. Foreign firms or joint ventures, engaging in production and export of new and/or more advanced products, directly affect the composition of host country's export bundle and make it more diversified[2] and sophisticated. Moreover, the entrance and activity of multinational corporations (MNCs) can potentially lead to transfer of new and/or more sophisticated productive capabilities to local firms[3], thereby indirectly affecting the export composition-- As firms in host countries acquire and accumulate those productive capabilities, they will be able to produce and export a wider variety of and more sophisticated products than before. Here, capabilities refer to capital equipment, know-how, specific labor skills, working practices, and so on[4] (Hidalgo et al. 2007). The indirect effect of FDI is more commonly known as spillover-effects, and has been the main research target in FDI literature.

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[1] According to the World Bank, FDI are "the new inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of capital, reinvestment of earning, and other long-term capital, and short term capital as shown in the balance of payments".

[2] Harding and Javorcik (2009) argue that if foreign-owned plants export only products that the host country already exports intensively, FDI might lead to more specialized rather than more diversified exports.

[3] Sutton (2003) claims that the process of transferring productive capabilities consists of two phases. At the first phase, capabilities are transferred to firms that are in direct contact with MNCs through vertical or horizontal linkages. The second phase consists of "the knock-on effects" within and outside the host industry that results from the first phase.

[4] According to Hidalgo et al.'s (2007) definition, capabilities also include various factors such as norms, institutions, property rights, regulations, and laws. However, in this paper, capabilities refer only those elements that are transferable from MNCs to local firms.

This study differs from the previous studies on FDI which mostly focused on investigating the existence of productivity enhancement effects of FDI on local firms through spillovers. The aim of this study is to explore the role of FDI further beyond productivity improvement effects, that is to say, the effects on their export diversification and upgrading: firms in host countries not only become more efficient and productive, but also begin to produce and export more diversified and more sophisticated products than before as a result of acquiring and accumulating capabilities through MNCs. In order to empirically test this relationship, we construct a rich panel database for 175 countries between 1980 and 2007 and employ a dynamic panel model based on generalized methods of moments (GMM) (Arellano and Bond 1991) that permits us to control for endogeneity and time-invariant country effects.

The structure of this paper is as follows; Section 2 reviews related literature. Section 3 introduces and describes key variables. Section 4 discusses the baseline empirical model. Section 5 presents the empirical results from the baseline model. In Section 6, we extend the analysis by considering difference in the development levels of the sample countries. Lastly, Section 7 concludes.

2. Literature Review

This section presents literature review on FDI and explains how FDI may contribute to export diversification and sophistication. We also provide literature review on the relationship between export performance and economic growth. Although the benefit of export diversification and sophistication is not the main focus of this paper, we provide a brief overview on this issue as it is the prime motivation for this study.

2.1. FDI and Spillover Effect

Countries around the world, especially developing countries, have been competing fiercely with their neighbors in attracting long term capital flows, or FDI, by offering significant incentives for foreign firms such as tax holidays and preferential tariffs. As a result, there is a significant increase in the total volume of FDI flowing around the world over the last three decades (see Figure 1). In the eyes of policy makers, FDI is an attractive source of economic growth as it can bring additional capital and create new employment, and it is relatively stable compared to other capital flows. In addition, and perhaps more importantly, MNCs bring with them the fruit of their R&D, advanced physical equipment, efficient marketing and management know-how, as well as other assets across national borders. Those advanced technologies and knowledge, in turn, are expected to spillover to

domestic industries, resulting in the aggregate productivity enhancement and thereby higher economic growth. Most of previous works on FDI has dedicated to searching for this spillover effect.

The previous studies on FDI identify two different types of spillovers; horizontal and vertical spillovers. According to Du et al. (2011), 1) horizontal-spillovers occur when domestic firms become more productive due to the presence of foreign investors in the same sector by means of reverse engineering, increased competition, demonstration effect on local R&D activity[5], and enhanced labor mobility[6], and 2) vertical-spillovers (or inter-industry spillovers) arise when foreign firms enhance the productivity of domestic firms through either forward or backward linkages. In forward linkages, domestic firms can improve productivity as MNCs located in the domestic market supply intermediate inputs that embody new technologies or processes. In backward linkages, MNCs make contracts with domestic suppliers of intermediate inputs and directly transfer knowledge and technologies in order to enhance productivity of their local suppliers. Horizontal spillovers are expected to have smaller impacts than vertical spillovers since MNCs have an incentive to prevent information linkage to the local competitors. As being consistent with the theory, FDI researchers have found mixed evidence for horizontal spillovers (see Gorg and Greenaway 2004 for summary) and positive effects for vertical spillovers (Javorcik 2004; Blalock and Gertler 2008; Lin et al. 2009; Javorcik and Spatareanu 2011; Du et al. 2011). Hence, the overall FDI literature support the existence of spillover-effects of FDI to local firms through MNCs operating in a host country-- Technologies and knowledge brought by MNCs spillover to domestic industries, particularly though vertical linkages, and increase their productivities.

In recent years, a handful of studies that address the link between FDI and structural transfer of export sectors have started to emerge. For instance, with regard to the relationship between FDI and export diversification, Banga (2006) empirically examines the export-diversifying impact of FDI in the Indian manufacturing sector, and concludes that FDI from the United States has led to diversification on Indian's exports. Tadesse and Shukralla (2011) investigated this relationship for 131 countries spanning the years 1984 to 2004 by utilizing parametric and semi-parametric methods. Their findings suggest an increase in FDI stock enhances the diversification of exports, although the magnitude of the effect varies greatly across countries depending on the stage of diversification. Moreover, Harding and Javorcik (2009) for Central and Eastern European countries, Ancharaz (2006) for Mauritius, Nicet-Chenaf and Rouiger (2008) for the Mediterranean countries also find positive contributions of FDI to the diversification of exports.

[5] See Cheung and Lin (2002) for the detailed empirical analysis of a "demonstration effect" of FDI.

[6] According to a recent World Bank survey, 24 percent of local enterprises in Czech Republic and 15 percent in Latvia reported that they have learned about availability of new technologies by observing MNCs operations in their country and their sector (Harding and Javorcik 2011).

There are also several studies that have investigated the link between FDI and the degree of export sophistication of host countries. For example, Harding and Javorcik (2011) empirically test this relationship for 105 countries between 1984 and 2000, and find that sectors receiving grater FDI inflows have higher unit values of exported products than other sectors, thereby concluding that FDI leads to export upgrading[7]. Xu and Lu (2007) also find that China's rising export sophistication is significantly explained by increasing presence of wholly foreign owned MNCs. In addition, several qualitative studies explain the positive impact of FDI on export sophistication (Rodrik (2006) on China[8]; Lall (2000) on Singapore; Freitas and Mamede (2008) on Portugal).

As these previous studies suggest, the positive link between FDI and export performance of host economies potentially result from two channels. The first channel is export activities of MNCs. When MNCs produce more diversified and/or more sophisticated products than those previously produced by local firms, the activities of MNCs will result in more diversified and sophisticated export baskets of host economies. The second channel is spillover effects. Through the direct or indirect contact with MNCs, local firms acquire new and/or more advanced capabilities and become capable of producing and exporting products that they were not able to produce before due to the lack of necessary capabilities[9]. The second channel has more growth-enhancing effects than the first channel[10].

Evidence in FDI literature that supports the existence of spillover effects also suggests transfer of productive capabilities from MNCs to local firms. It should, however, be acknowledged that even if capabilities are successfully transferred to local firms, it is another issue whether local firms can venture into new production activities by using acquired and accumulated capabilities. This is because venturing into new activities entails a significant amount of uncertainty about the profitability of the new venture. As a result, the first entrant into the new activity has to engage in "cost discovery" (Hausmann and Rodrik 2003), and when the cost of entering new markets for first

[7] Harding and Javorcik (2011) proxy for FDI inflows using survey information on sectors treated by national investment agencies as priority sectors for investment. The purpose of this practice is to remove endogeneity bias.

[8] Rodrik's paper (2006) has been subject of criticism by several scholars. Yao (2009), for instance, argues that although it is tempting to think that the export surge of machinery and electric machinery and parts sectors in China represents technological upgrading in China's exports, close quantitative analysis reveals that the rise of these sectors in China is closely associated with its processing trade regime and foreign outsourcing to China--this casts a doubt on technological upgrading of Chinese firms.

[9] The idea that accumulation and acquisition of productive capabilities leads to upgrading and diversification of export sectors comes from the "capabilities theory", in which a country needs a specific set of inputs, or capabilities that include both physical capitals and human capitals as well as organizational know-how, to produce a product (Hidalgo 2011). In other words, the capabilities theory addresses that a country's production and export are determined by a number of specific set of capabilities that is locally available. Hence, in order to upgrade and diversify their production systems, a country must first develop and accumulate various and advanced capabilities. Sutton and Trefler (2011) develop a theoretical model in which international differences in the capabilities of firms in different countries drive differences both in their export baskets and their incomes.

[10] Ferreira (2009) argues that export diversification only through the export activities of MNCs has small growth enhancing effects. Ferreira carefully studies the case of Costa Rica and supports this argument. Costa Rica has attracted foreign companies in sectors with high technological contents, starting around the beginning of the 1990s, as the result of the creation of export processing zones. Consequently, Costa Rica succeeded in increasing and diversifying its exports significantly; however, Ferreira argues that the entrance and operation of MNCs such as Intel and Microsoft has not generated much spillover effects to the rest of the economy, meaning that there is almost no transfer of new productive capabilities from MNCs to local firms. This failure was mostly due to 1) the difficulties of meeting a number of requirements, 2) strict intellectual property rights, and 3) most inputs are produced by MNEs themselves or come from a single global supplier.

movers is too high, new and/or more advanced products will never get produced even if all the necessary set of inputs (capabilities) were present within a host economy. Therefore, transfer of capabilities does not automatically lead to export upgrading and/or diversification.

The existing research on this topic is still scarce, and empirical findings are limited mostly to country and regional level studies. This paper contributes to literature by empirically investigating the relationship between FDI and changes in the composition of export baskets for a large number of countries over the long period of time. As far as the author knows, this is the first study that tests the relationship between FDI and export diversification as well as between FDI and export sophistication, and compare their results. It is also the first study that utilizes a dynamic panel data model based on system GMM to test this relationship.

2.2. Export Performance and Economic Growth

2.2.1. Export Diversification and Economic Growth

One of the early founders of economics, David Ricardo, argued that countries should specialize, not diversify, in order to foster economic growth. This is because countries can maximize their productive potential by focusing on production of products that they are best at. Recent studies cast a doubt on this argument and many scholars today argue that export diversification contributes to an acceleration of growth. According to this literature, there are three main channels through which export diversification promotes faster economic growth.

First, export diversification promotes economic growth by improving terms of trade for developing countries. According to the work of Singer (1950) and Prebish (1950), concentration on primary products which are the major exports for developing countries lead to deteriorated terms of trade, income volatility, and ultimately slower economic growth. Hence, increasing the number of export products, particularly manufactured products, improves the terms of trade and assists developing countries to achieve faster growth.

Second, by increasing the number of export sectors, countries can reduce the risk of export instability. For most developing countries with scarce financial resources, export is an important source of foreign exchange which can be used to import materials and capitals from abroad, and to make domestic investment. Relying on a limited number of commodities for exports, however, entails a significant risk in front of high elasticity of demand and volatile prices in international markets. Therefore, increases in the number of export sectors can contribute to growth in the long run by stabilizing export earnings. This argument is more commonly known as the “portfolio-effect” of diversification (Ferreira 2009).

Third, improved production techniques associated with export diversification are likely to benefit other industries through a number of knowledge spillover benefits. The possible sources of these spillovers include productivity enhancements resulting from new techniques of production, new management, marketing practices, better forms of organization, and labor training (Nicet-Chenaf and Rougier 2008; Hezer and Nowak-Lehmann 2006). These benefits, in turn, enhance the aggregate productivity level of country, and eventually serve to foster economic growth.

Various recent empirical works support the positive relationship between export diversification and economic growth. Hesse (2008) finds robust empirical evidence of the positive effect of export diversification on per capita income growth by using the dynamic panel data for 99 countries from 1961 to 2000. Using Chilean data, Herzer and Nowak-Lehmann (2006) also provide empirical support that both horizontal and vertical diversification[11] benefit economic growth. Their findings suggest that the Chilean economy has benefited greatly from export diversification. Furthermore, Lenderman and Maloney (2007) in a dynamic cross-country panel model find that the high level of export concentration lowers overall economic growth. They propose that the negative effects of export concentration were due to deterioration of terms of trade. In addition, Feenstra and Kee (2004) show that a 10 percent increase in export variety in a country's industries raises a country's productivity by 1.3 percent.

2.2.2. Export Sophistication and Economic Growth

There is a widely shared consensus that the export-led growth strategy incorporated in East Asian countries was the engine behind their miraculous growth. Many developing countries followed their success stories and initiated the same type of policies to encourage exports such as reductions of trade barriers and the set-up of free economic zones (FEZ). There has been, however, little emphasis paid on the importance of export composition for growth.

In recent years, Hausmann et al. (2006) argue that the type of goods in which a country exports has important implications for subsequent economic growth; in other words, what a country exports, not just the mere fact of exporting, matters for long-run economic growth. Based on cross-country panel regressions, they empirically test the relationship between a country's level of export sophistication and subsequent economic growth by developing the new measure of export productivity called EXPY. The important implication of their finding is that a country with the

[11] According to Taylor (2007), horizontal export diversification refers to an increase in the range of products exported, and vertical export diversification occurs when a country shifts from primary to manufacturing exports.

higher level of sophistication of export baskets grows faster[12]. According to their explanation, this is because there is elastic demand for goods associated with higher productivity levels in world markets, so that a country can export them in large quantities without significant adverse terms-of-trade effects, resulting in a greater volume of foreign exchange earnings. They express the relationship between export sophistication and economic growth by stating "countries become what they export".

If this proposition, "countries become what they export", is indeed true, then identifying factors that determine the country's level of export sophistication should be an important research target for academics, and should have the important implications for policy makers in developing countries. The work by Hausmann, Hwang, and Rodrik (2006) has spurred various researchers to investigate the key determinants of export sophistication. For example, Santos-Paulino (2008) shows that the level of sophistication of country's export baskets is determined by the counties' fundamentals such as country size, real income, and human capital endowments by employing the system GMM approach. Wang and Wei (2008) use a similar index of export sophistication to account for the rising sophistication of China's exports. Their findings reveal that improvement in human capital and government policies in the form of tax-favored high-tech zones contributes significantly to the rise in China's export sophistication, and thereby economic growth. In addition, many case studies are conducted in order to verify the positive link between export sophistication and to discover reasons for success and failure of export upgrading in various countries (see, for example Hausmann (2007) on Peru; Usui (2011) on Philippine; Abdon and Felipe (2011) on Sub-Saharan Africa; Freitas and Mamede (2008) on Portugal).

3. Measurement of FDI and Export Performance Variables and Data Sources

This section introduces and describes key variables used for empirical estimation.

3.1. Foreign Direct Investment

Foreign direct investment (FDI) is measured as both flow[13] and stock, and is available in the UNCTAD database[14]. In order to correct differences in market size, we follow the standard practice and adjust both FDI flow and stock by presenting them as a ratio of GDP[15] [16].

[12] Lall et al. (2005) also devised a similar measure of export productivity called 'normalized sophistication index' and find the positive correlation between this variable and the per capita income of the countries that export the product.

[13] FDI flows have three components; equity capital, reinvested earnings, or intra-company loans. FDI inflows may have a negative sign if at least one of these three components is negative and not offset by positive amounts of the remaining components (UNCTAD).

Figure 1 presents the world total FDI inflow from 1980 to 2007. In the year 2007, the world total FDI inflow was about US$ 18,000 billion (measured at current price), more than 25 times larger than in 1980 (US$699 billion). Except for a few periods, the total volume of FDI inflow in the world increased constantly over the last three decades. The rate of increase became faster after 1990, the fall of the Berlin Wall. Figure 2 and 3 show the world total FDI inflow and stock as a ratio to GDP. Both measures experienced a dramatic increase from 1980 to 2007.

In addition, in order to investigate whether FDI flows differently across development levels, Figure 4 shows the total FDI inflow by five development level categories according to the 2007 World Bank Classification[17] (see Table 4). As clearly shown in the graphs, the OECD countries received the largest share, indicating that an increase in the cross-border activities of firms occurred chiefly between developed nations. MNCs, although much smaller, expanded its activities to non-OECD and Upper and Lower middle income countries as well. On the other hand, the volume of FDI inflow into low income countries stagnated from 1980 to 2007-- This is perhaps because MNCs do not perceive low income countries as an attractive market or location to produce despite low wages. Figure 5 looks at the flow of FDI as a ratio to GDP. Unlike Figure 4, all income categories received the similar amount of FDI relative to the size of their economy.

3.2. Export Diversification

A variety of methods have been employed in the literature for measuring export diversification[18]. This study follows a practice by Hwang (2006) and Harding and Javorcik (2010), and develops a measure of export diversification based on a Herfindhal index[19]. First, we calculate the Herfindahl index of export shares in country *c* at time *t* based on export data at the SITC 4 digit level;

$$\text{Herfindahl}_{it} = \left(\left(\sum_{i=1}^{N} {}^{x_{it}}/_{X_{it}} \right) * 100 \right) \quad (1)$$

[14] Data on FDI in UNCTAD is generally corrected by national governments in the host countries and submitted to the UNCTAD's database. This raises the possibility of measurement error.

[15] It should be noted that there is a debate about the use of FDI stock. Contessi and Weinberger (2009) argue that FDI stock can suffer from discrepancies between original book and market value as the value of firms and FDI stock change, making their inter-temporal comparison problematic.

[16] This study uses the aggregated FDI data without any information on the use of FDI and the source of FDI. Some authors, however, argue the importance of considering which industries FDI flows and where they come from. For instance, Banga (2006) studies the impacts of US and Japanese MNCs on the export intensity of Indian firms and finds that the impacts of FDI have a stronger contribution towards export diversification of Indian firms. Similarly, Javorcik and Spatareau (2011) show that the impacts of FDI on the productivity of Romanian firms differ according to its source, whether from U.S. or Europe.

[17] The World Bank divides countries according to GNI per capita. The groups are: low income, $1,005 or less; lower middle income, $1,006 - $ 3,975; upper middle income, $3,976 - $12,275; and high income $ 12,276 or more.

[18] For instance, Carrere et al. (2007) and Besedea and Pruna (2008) count the number of active trade flows between country pairs in each year, Nicet-Cheaf and Rouiger (2008) use a variant of Finger-Kreinin's indicator of the similarity of trade structure, and Hummels and Klenow (2005) uses the measure of intensive and extensive margin of exports. Moreover, Agosin et al. (2009) uses the Gini and Theil index to measure export diversification.

[19] One caveat on using the Herfindahl index is that it cannot capture all exports of an economy such as services (Hesse 2008).

where x_{it} is the export value of product from country *i* at time *t* and X_{it} is the total export from country *i* at time *t*. Next, using this index, we calculate the export diversification index;

(100 - Herfindahl_{it}) = Export Diversification (ED) Index (2)

The ED index takes the range from 0 to 100. The greater the value of ED index, the more diversified the country's export basket is. Here, diversification means no heavy-reliance on a particular commodity for export. Data on export are obtained from the World Trade Flows database from Feenstra et al. (2005) as well as the United Nations COMTRADE database.

Figure 5 shows the mean value of the ED index for all sample countries from 1980 to 2007. It is surprising to see that the average ED index remains almost unchanged from the beginning of the 1980s to 2007. This graph suggests that countries on average achieved well-diversified export baskets at the early 1980s and managed to maintain the high level of their diversity throughout the rest of years.

As firms in more developed countries tend to possess a wider variety of productive capabilities than firms in developing countries, it is natural to assume that developed countries can produce and export more diversified products—hence, they record a higher score of the ED index than developing countries. In order to verify this argument, we closely investigate the value of the ED index according to the development level of countries. Figure 6 presents the average ED index according to the level of development. One important point to notice immediately is how significantly the value and variation of the ED index differ across countries with different income levels. To compare with OECD countries, non-OECD countries have much lower scores of the ED index and the values of the ED index vary widely during sample years. For Low, Lower Middle, and Upper Middle income countries, the trend of diversification is upward, while for non-OECD countries it is relatively downward. The decreasing trend for non-OECD countries might be due to the fact that there are many oil-exporting counties in this category (see Table 8). Heavy-reliance on oil tends to generate a sharp kurtosis in a distribution of export baskets, resulting in a low score on the ED index.

3.3. Export Sophistication

In order to measure a country's level of export sophistication, we rely on Hausmann et al. (2006)'s index of the productivity of a country's export basket called EXPY. In calculating EXPY, they first

develop an index that measures the level of sophistication of a product, called PRODY. This index is a weighted average of the GDP per capita of the countries exporting products. Algebraically:

$$PRODY_k = \sum_j \frac{\left({}^{x_{jk}}/_{X_j}\right)}{\sum_j \left({}^{x_{jk}}/_{X_j}\right)} Y_j \qquad (3)$$

where x_{jk} is the value of exports of good k by country *j*, X_j is the total value of country *j*'s exports, and Y_j is the per capita level of income of country *j*, measured as the real GDP per capita in PPP. The greater the value of PRODY for a product *k* is, the more sophisticated it will be. The underlying assumption of this index is that products produced and exported by the rich countries require more advanced and complex set of capabilities and thus more sophisticated[20]. The sophistication level associated with a country *j*'s export EXPY is in turn defined by;

$$EXPY_j = \sum_k \left({}^{x_{jk}}/_{x_j}\right) PRODY_k \qquad (4)$$

This is the weighted sum of the productivity level associated to each exported good k, $PRODY_k$, with the weights being simply the value shares of the products in that country's total exports. This index captures country's ability to export products that are produced and exported by the rich countries. The bigger the value of EXPY is, the greater the level of sophistication of country's export baskets is[21].

We compute the product level sophistication index, PRODYk, for each year between 1980 and 2006 using the COMTRADE international trade data for SITC 4 digit (Rev.2). Then, we calculate the level of sophistication of export baskets for each country.

Figure 7 presents the mean value of EXPY for all sample countries from 1980 to 2007. Although the average value of EXPY experienced up and down from 1980 to 1993, it begun to increase constantly and significantly, starting around the mid-1990s. The overall upward trend of EXPY indicates that countries in 2007, on average, exported more sophisticated products than they did in 1980. However, because there is a significant variation in the value of EXPY within sample

[20] For instance, during 1999 to 2001, the product with the highest PRODY was flat rolled iron or non-alloy steel, whereas the product that has the lowest score of PRODY was vanilla beans (Hausmann et al. 2006)

[21] Kumakura (2007) criticized the export sophistication index since 1) EXPY can be highly influenced by the size of each country's export basket, 2) the PRODYs of most products are determined largely by the export patterns of rich countries, and 3) EXPY tells very little about how well each country's exporting industries are performing in international markets. Receiving similar criticisms from several scholars, Hausmann and Hidalgo (2009) improved EXPY and developed the new index that measures the level of complexity by using the method of reflections.

countries, it is necessary to further investigate how the trend of EXPY differs according to a country's income level.

As higher income countries tend to produce and export more advanced products, more economically developed countries should have a higher value of EXPY. In order to confirm this relationship, we average the EXPY score by income level and present it in Figure 8.Clearly, more developed countries have the higher average EXPY, whereas the less developed countries have the lower average EXPY. There is, however, an increasing trend for all development levels from 1980 to 2007. In other words, the composition of export baskets became upgraded in all development level categories.

4. Empirical Framework

This section discusses the empirical framework of this paper. In order to analyze the relationship between FDI and export composition of host countries, we first develop the following fixed effects panel data model;

$$\log(Y_{it}) = \alpha + \beta_1 FDI_{it} + X_{it} + U_i + U_t + V_{it} \qquad (5)$$

where Y_{it} indicates the logarithm of ED index and EXPY of country *i* at year *t* and FDI is FDI inflow to a county *i* at year t-5[22] and FDI stock at year *t*, both of which is presented as a ratio to GDP. I expect the coefficients of these FDI variables to be positively correlated with ED index and EXPY if FDI contributes to export diversification and sophistication of host countries. We use the five-year lagged FDI inflow and stock in order to capture spillover-effects as it takes time for productive capabilities to be transferred to local firms and to be adopted within and outside host industries. It should be acknowledged, however, that the coefficients of the two FDI variables also account for the effects of MNCs' export activities on the composition of host country's export baskets. There are two scenarios where the exports of MNCs influence diversification and sophistication of host countries simultaneously; 1) when MNCs, using a host economy as an export platform, produce and export more sophisticated products that were not being produced in the host economy before and 2) when the export activities by MNCs increase the share of export of a product with high PRODY which was being produced earlier, but was not a major component of export baskets. In both scenarios, developing country's export baskets should become more diversified and upgraded.

[22] 5-year lagged FDI inflow is typically used as a predictor of spillover effects. (see for instance, Kemeny 2010)

The empirical specification also includes a number of control variables (X), including the logarithm of the lagged per capita GDP to control the level of development, the logarithm of population to take the relative size of economy into account, inflation to control the macroeconomic stability, and lastly, an index of trade openness calculated as the total volume of trade (export + import) divided by GDP[23]. We expect per capita GDP, population, and trade openness to be positively correlated with the level of export diversification and sophistication, whereas we expect inflation to be negatively correlated with the level of export diversification and sophistication(see Table 2 and 3 for the summary statistics and the correlations between the variables, respectively). The specification also includes unobserved country-specific (U_i) and time-specific effects (U_t). Lastly, V_{it} is an error term.

Estimating this fixed effects model (1), however, will yield biased and inefficient coefficient estimators[24] as this model is subject to the three following econometric problems. First, in this model, the FDI variables are assumed to be exogenous and causality runs from FDI to export diversification and sophistication. However, in reality causality may run in both directions-- from export diversification and sophistication to FDI and vice versa[25]. In this case, these variables will be correlated with the error term, generating inefficient estimators. Secondly, time-invariant country characteristics (fixed effects) such as geography, may be correlated with the explanatory variables. Lastly, the model may be subject to autocorrelation as the past values of EXPY and the ED index are expected to have a significant effect on current values. This is simply because what countries export today will be influenced by what they exported yesterday. The presence of non-stationarity leads to biased estimators and spurious regressions.

In order to correct these econometric problems, I employ the dynamic panel data model based on the system GMM method initiated by Arellano and Bover (1995) and fully developed by Blundell and Bond (1998). While the dynamic panel model and fist-differencing can solve the second and third econometric problems, the system GMM can control the issue of endogeneity by including lagged versions of repressors as instruments. The following is the baseline estimation model of this paper;

$$\log(Y_{it}) = \alpha + \beta_1 \log(Y_{it-1}) + \beta_2 \Delta FDI_{it} + X + U_i + U_t + V_{it} \quad (6)$$

$$\Delta \log(Y_{it}) = \alpha + \beta_1 \Delta \log(Y_{it-1}) + \beta_2 \Delta FDI_{it} + \Delta X + \Delta U_t + \Delta V_{it} \quad (7)$$

[23] As this measure may not be necessarily highly correlated with the extent of various trade barriers of countries, it might be more ideal to use an index that includes all the barriers distorting trade. See Dollar (1992) and Sachs and Warner (1995) for more conclusive trade openness indices.

[24] Though problematic, we estimate the equation (1) with FE and summarize empirical results in Appendix 1.

[25] Rodrik (2003) points out the presence of the similar problem when studying the impacts of FDI on growth. His argument is that many scholars assume that high GDP per capita is driven by FDI, but as foreign companies invest in countries with high GDP per capita, the causality may run the other way around. Aitken and Harrison (1999) also suggest the existence of endogeneity of FDI at a firm-level analysis

where Y_{it-1} is the ED index and EXPY of country *i* at period *t-1* and the other variables are the same as the equation (5). In this system GMM model, lagged differences of endogenous variables are used as instruments in the level equation (6), and lagged levels of the endogenous variables are used as instruments in the first differenced equation (7), thereby controlling endogeneity of explanatory variables. In the following analysis, the lagged EXPY and ED index as well as the FDI variables and per capita GDP are treated as endogenous variables. Normally, the valid instruments for endogenous variables are two lags and above[26].

There are several conditions that must be satisfied in order to obtain robust results from system GMM. First, estimations must fulfill the Arellano-Bond (AR) test. This test checks whether there is a serial autocorrelation in the residuals of the specification which leads to inconsistent estimators. In order for estimators to be consistent, the first order autocorrelation of the residuals (AR 1 test) needs to be rejected; and the second order autocorrelation (AR 2 test) needs to be accepted. Secondly, in order to show that applied instruments are jointly valid, the model needs to reject the null hypothesis for the Hansen test of overidentification. In addition, a number of instruments used in the model must be smaller than a number of groups in data; otherwise, the power of Hansen's j test is diluted, and it may falsely reject the null hypothesis (Roodman 2008).

All of the estimations are performed by one-step GMM. One-step GMM is considered to be more efficient than two-step GMM since the standard errors of the GMM estimators are known to be downward biased[27].

5. Estimation Results

In this section, we estimate the above equations, (6) and (7), to investigate how the entrance and activity of MNCs influence the level of export diversification and sophistication in host countries. One and more period lagged variables (up to two or three lags depending on the length of time periods in each model specification) of the endogenous variables are used as instruments in the difference equation (7), while the current and one period lagged differences are used in the level equations.

5.1. Export Diversification and FDI

[26] The command to perform system GMM in Stata is "xtabond2" (Roodman 2008).

[27] In order to correct the downward bias that occurs under the two-step GMM estimation, the use of Windmejier's finite sample correction for the two-step covariance matrix is required (Windmejier 2005).

Table 5 reports estimated coefficients from the system GMM when using the ED index as a dependent variable. We find that both FDI variables have a positive but no-statistically significant effect on the level of export diversification. These empirical results can be interpreted in two ways. First, the results imply that the export activities by MNCs within host countries do not have significant impacts on the host country's exports. If the volume of their export is significant, it should influence the composition of host country's export basket to the direction of either a higher degree of specialization or more diversification. Second, no-statistically significant coefficients for both FDI variables might indicate the absence of capabilities transfer-- or even if there was a successful transfer and spread of new capabilities to local economies, they fail to make the use of those new capabilities to produce new products.

With regard to the other control variables, all the variables except for the logarithm of the lagged per capita GDP turn out to be statistically significant. These results suggest, as expected, that countries that are more open for trade, more populous, and more stable in macroeconomy tend to have more diversified export baskets. Meanwhile, the non-statistically significant coefficient for the lagged per capita GDP implies that the level of per capita income is not an important variable in explaining a variation in the ED index. To sum, these coefficients for control variables imply that country characteristics are important in determining the degree of export diversification.

The results in column (2) are robust as it satisfies the three conditions for the system GMM estimation. The AR test rejects the null hypothesis of the first order autocorrelation, but accepts the null hypothesis of the second order autocorrelation. The Hansen test shows the applied instruments are jointly valid as the null hypothesis is not rejected. Lastly, the number of instruments is less than the number of groups. Meanwhile, in column (1), Hansen's overidentification test fails to accept the null hypothesis, implying that there is a possibility that applied instruments are not jointly valid.

5.2. Export Sophistication and FDI

Table 6 summarizes results from the system GMM estimation with EXPY as a dependent variable. The signs of estimated coefficients for both FDI variables are consistent with the main argument of this paper. Since both coefficients is positively and statistically significantly related to EXPY, these findings suggest the possibility of the transfer of more advanced productive capabilities from MNCs to local firms so that local firms are now capable of producing and exporting more sophisticated products than before. It should be reminded that the positive coefficients also imply that the export activities of MNCs influence the host country's export basket-- MNCs produce and export higher productive products than those previously produced by local firms.

As for the other controls, we find a positive correlation between GDP per capita and EXPY, which, as expected, implies that more developed countries export more sophisticated products. The estimated results also indicate that countries more open for international trade tend to have higher EXPY. This positive relationship can be accounted for by the fact that more opened countries are able to contact with more developed economies, thereby having greater chance to learn and obtain more advanced technologies and knowledge[28]. Additionally, there is a positive relationship between the population size and EXPY, suggesting that more labor abundant countries tend to export higher productive products[29]. Lastly, a negative relationship between inflation and EXPY means that more countries which are unstable in macroeconomy export products that are less sophisticated. The negative correlation between inflation and EXPY might be spuriously generated as there is a possibility of autocorrelation for inflation. All the coefficients are statistically significant and robust as both system GMM estimations satisfy the three conditions.

5.3. Summary of the Estimation Results

By applying the dynamic panel model based on system GMM, we find no-statistically significant relationship between FDI and export diversification, and positive and statistically significant correlation between FDI and export sophistication. What do these results imply? Before jumping into a conclusion, we extend the analysis to investigate how FDI has different impacts on developed and developing countries, which will be discussed in the next section.

6. Differences between Developed and Developing Countries

This section further extends the empirical investigation in Section 5 by allowing the impacts of FDI to differ between developed and developing countries. The reason behind this is that the entrance and activity of MNCs are likely to have different impacts on rich and poor countries. we have argued so far that MNCs bring new and more advanced productive capabilities to host countries, leading to more diversified and more sophisticated export baskets of host countries. This argument assumes that firms in host countries have less diversified and less sophisticated capabilities; however, it is highly likely that firms in developed countries possess capabilities that are equivalent to those of MNCs in terms of sophistication and diversity. Therefore, it is natural to expect smaller impacts of FDI for developed countries and greater impacts for developing countries. Furthermore,

[28] Wan (2004) developed the Catching up model to explain that countries will be able to sustain economic development through technological progress resulting from the increased contact with high-technological countries.

[29] The positive relationship between population and EXPY contradicts with the finding of Hummels and Klenow (2005) that labor abundant countries tend to export lower priced products.

as shown in Section 4 (see Figure 7 and 9), developed countries tend to have more diversified and more sophisticated export baskets. Therefore, the composition of developed countries' exports is likely to be less affected by exporting activities by MNCs, whereas their activities are likely to have significant impacts on developing countries' export baskets.

In the following subsections, we introduce the econometrical model to investigate the different impacts of FDI on export diversification and sophistication between developed and developing countries. I then present empirical results and their implications.

6.1. Model Specification

In order to treat the impacts of FDI on developed and developing countries separately, we first create two dummy variables; DC that takes value 1 if a country belongs to OECD and 0 otherwise, and LDC that takes 1 if a country does not belong to OECD and 0 otherwise. The FDI variable without interaction is dropped to avoid perfect collinearity. The sample countries are divided into these two categories according to the World Bank Classification in 2007. Table 7 lists 30 countries that belong to the OECD category. Then, we construct two interaction terms: FDI*DC and FDI*LDC. The coefficients of these two interaction terms allow me to compare different effects of FDI depending on the level of development.

In addition, we create a dummy variable for countries that are heavily dependent on oil for their exports (around 50% or above)-- This is because the heavy reliance on oil is likely to disturb the process of export diversification and sophistication and thus oil-dependent countries need to be treated differently from other countries. Countries that are categorized as heavy oil exporters are summarized in Table 8. Most of them belong to the Non-OECD category. Including these variables, we now estimate the following dynamic panel model;

$$\Delta \log (Y_{it}) = \alpha + \beta_1 \Delta \log (Y_{it-1}) + \beta_2 \Delta \text{FDI*DC} + \beta_3 \text{FDI} * \text{LDC} + \beta_4 \text{DC} + \beta_5 \text{Oil} + X + U_t + U_i + V_{it} \quad (8)$$

$$\Delta \log (Y_{it}) = \alpha + \beta_1 \Delta \log (Y_{it-1}) + \beta_2 \Delta \text{FDI*DC} + \beta_3 \text{FDI} * \text{LDC} + \beta_4 \text{DC} + \beta_5 \text{Oil} + \Delta X + \Delta U_t + \Delta V_{it} \quad (9)$$

where Y_{it} is the logarithm of ED index and EXPY of a country *i* at the period *t*, while FDI*DC and FDI*LDC represent an interaction term between FDI and development level dummies. DC and Oil are dummy variables as described above. we expect the DC dummy to be positively correlated with the ED index and EXPY since developed countries have more diversified and sophisticated export baskets. On the other hand, we expect the Oil dummy to be negatively related to the ED index and

positively correlated with EXPY since oil-exporting countries have more specialized export baskets and have higher EXPY because the value of PRODY for oil tends to be high. X is a vector of control variables, the same as ones used before-- As we already have the DC dummy that divides sample countries according to their income level, we do not include the logarithm of lagged per capita GDP as a control variable. U_t is year fixed effects and V_{it} is an error term. This model is estimated again by using system GMM in order to control endogeneity of explanatory variables.

6.2. Export Diversification and FDI

In Table 10, we present the estimated coefficients when using the ED index as a dependent variable. The column (1) shows that the estimated coefficient for the interaction term between the five-year lagged FDI inflow and LDC dummy is positive and statistically significant, whereas the interaction term between FDI inflow and DC has a positive but non-statistically significant correlation with the ED index. The positive coefficient for FDI at t-5*LDC implies that developing economies became capable of producing and exporting a wider variety of products than before the entrance of MNCs by acquiring new capabilities through the spillover-effects of FDI. The different impacts of FDI on developed and developing countries result from the two following reasons; 1) firms in developing countries possess capabilities that are less diversified than those of MNCs, and thus are more affected by the spillover-effects of FDI, and 2) developing countries' less diversified export baskets are more likely to be significantly influenced by the export activities of MNCs. For the other control variables, the lagged ED index, population, and DC dummy are positively related to the ED index, whereas inflation and Oil dummy is negatively correlated.

On the other hand, the coefficients for FDI stock in column (3) are not statistically significant, indicating that FDI stock is not important in explaining variation in the ED index. With regard to the other variables, the coefficients in column (2) are the same as ones in the first column. Results in all three regressions satisfy the three conditions for the system GMM estimation to be robust.

6.3. Export Sophistication and FDI

The column (1) in Table 10 summarizes empirical results for EXPY and the five-year lagged FDI inflow. The estimated coefficients for the two interaction terms present the positive sign for developing countries at 5 percent statistical significance and the negative sign for developed countries with no statistical significance. Therefore, the lagged FDI inflow has a positive effect only

on developing countries' export upgrading. Regarding to the other variables, all of them except for inflation have positive and statistically significant coefficients, as expected.

In columns (2), we provide results for FDI stock. Whereas the interaction terms between FDI stock and LDC are positive and statistically significant, the coefficients for the other interaction terms are negative with no statistical significance. These coefficients imply that in developed countries FDI variables have no significant effect on export upgrading, while FDI upgrades export baskets in developing countries. The positive and statistically significant coefficient supports the possibility of the existence of capabilities transfer and building by local firms. However, it needs to be noted again that these results are driven not only by capabilities transfer and upgrading of production in host economies, but also by the export activities of MNCs. For the other variables, the results are similar to ones obtained in column (1). In both regressions, Hansen's over-identification test fails to accept the null hypothesis. Other two conditions are satisfied, however.

6.4. Implications

Estimating the system GMM model (8) and (9) yields results that are different from ones obtained in Section 5 (see Table 11 for summary). More precisely, new results show that the five-year lagged FDI inflow has positive impacts on both export diversification and upgrading, whereas FDI stock correlates positively only with export sophistication. Furthermore, these positive effects of FDI exist only for developing countries. How can these results be interpreted?

With regard to lagged FDI inflow, the positive coefficients for both EXPY and the ED index support the above argument that the presence and activity of MNCs result in a transfer of productive capabilities to local firms, and by utilizing those capabilities local firms start to produce and export more diversified and sophisticated products. In addition, the positive coefficients also imply that the export activities of MNCs make a developing country's export basket more diversified and more sophisticated.

On the other hand, the results on FDI stock provide a more complicated picture: FDI stock affects EXPY positively and statistically significantly (only for developing countries), while it has no impacts on the ED index. Normally, an increase in export of more high productive goods should result in either specialization or diversification of export baskets; however, as the coefficient of FDI stock for the ED index is not statistically significant, there exists no such relationship between FDI stock and export diversification. What is happening in a developing country's export basket? One possibility is that less sophisticated products that firms in host countries produced and exported before the entry of MNCs become no longer competitive as higher productive goods are being produced and exported now. As a consequence, those 'inferior' products disappear from a host

country's export basket. In addition, if local firms who produced low-productive products before were able to acquire and accumulate productive capabilities from MNCs, those firms would eventually shift their production to higher productive goods. In other words, there is a shift of production resources away from uncompetitive sectors to more competitive ones. As a result, the positive impacts of increase in export of advanced products on the level of export diversification are canceled out by the disappearance of low productive goods from export baskets over time; hence, FDI stock contributes to export upgrading, but does not affect export diversification[30].

7. Conclusions

Various recent studies highlight the important role that export diversification and sophistication play in promoting faster and sustainable economic growth. This study argues that FDI promotes export diversification and sophistication of host countries through export activities by MNCs and transfer of productive capabilities from MNCs to local firms. In order to empirically test this relationship, we develop a dynamic panel data model based on system GMM which permits us to control for endogeneity and omitted variable bias. The result of our empirical analysis shows that there exists a positive relationship between the five-year lagged FDI inflow and two export variables, and between FDI stock and export sophistication, thereby providing support for the possibility of successful capabilities transfer and building by local firms. However, as FDI stock does not have any statistically significant effects on the level of export diversification, it is unclear whether FDI contributes to faster economic growth through the channel of the overall export performance.

The findings presented in this paper have policy implications for developing countries. First, for policy-makers who aim to achieve economic growth through export upgrading, policies attracting FDI flows will be effective since the presence and activities of MNCs in host economies potentially lead to capabilities transfer to local firms (see Balasubramanyam and Salisu (2001), Hanson (2000), and Harding and Javorcik (2010) for the discussion as to which policy is effective in increasing the volume of FDI inflow). Moreover, adopting a policy that fosters an environment to promote capabilities transfer and building will strengthen the positive impacts of FDI on export upgrading. Examples of such policy are mandating worker training, requiring joint ventures, and local content requirements. Second, policy makers should keep in mind that FDI may bring a negative consequence on the diversification level of export baskets as the entrance and activity of

[30] we also estimate the equations (6) (7) and (8)(9) by using FDI inflow at the period t. Results are provided in Appendix A. Theoretically, FDI Inflow at the period t should have no impacts on the level of export diversification and sophistication as it takes time for the activities of MNCs to influence host economies. However, the empirical results show that FDI inflow is positively correlated with export sophistication (not with export diversification). This result provides skepticism about the overall empirical framework of this study.

MNCs might negatively influence domestic producers of lower-productive goods. If policy makers would like to avoid a temporary increase in unemployment rate, they should incorporate policies that encourage MNCs and other domestic firms to hire laid off workers in low-productive domestic industries.

There are some limitations to this paper and they suggest directions of future research. First, this paper uses only one measure of export diversification based on a Herfindahl index; however, since export data for different sectors are subject to different levels of disaggregation, it is hard to combine different export sectors into one coherent Herdindahl index (Imbs and Wacziarg 2003). Therefore, it would be important to recheck the relationship between FDI and export diversification by using different measures such as a Gini index and Theil index. Second, this study makes no reference to how the effects of FDI might differ according to the use and source. Considering the source and destination of FDI can be important as previous studies show that FDI from different sources will have different impacts (Banga 2006; Javorcik and Spatareanu 2011), and that FDI have different impacts in different industries (Lall 2000). Therefore, the use of more disaggregated data on FDI, if it were available, would improve this study. Lastly, although the use of system GMM removes biases and inefficiencies arisen from the presence of endogeneity within the model, it does not confirm whether the causality actually runs from FDI to export performance. In order to further investigate the causal relationship between these variables, the application of co-integration or vector-autoregressive model would be required.

Table 1: Variable and Source

Variable	Source
EXPY	based on COMTRADE SITC 4 digit (Rev.2)
Export Diversification Index	based on COMTRADE SITC 4 digit (Rev.2)
FDI Inflow	UNCTAD
FDI Stock	UNCTAD
Real GDP	World Development Indicators
Population	World Development Indicators
Inflation (GDP deflator)	World Development Indicators
Trade Openness	World Development Indicators
Oil	based on World Bank's Classification
DC & LDC	based on World Bank's Classification

Table 2. Summary statistics for the whole period (1980-2007)

Variable	Obs.	Mean	Std. Dev.	Min	Max
EXPY	4351	6155.302	3114.788	786.933	26203.9
Export Diversification	3295	83.0335	19.737	1.284	99.375
FDI/GDP	4322	0.018	0.04	-0.639	0.825
FDIstock/GDP	4453	0.184	0.476	0	11.554
GDP per capita	4351	6113.049	9291.403	62.237	72637.4
Population	4923	30814.1	115678.5	38.989	1300000
Inflation	4507	56.717	603.114	-53.709	26762.02
TradeOpenness	4619	0.832	0.501	0.048	4.534

Source: UN COMTRADE, UNCTAD, World Development Indicators

Table 3. Correlations between variables

Variable	EXPY	ED	FDI Inflow	FDI Stock	GDP per capita	Population	Inflation	Trade Openness
EXPY								
ED	0.394	1						
FDI Inflow	0.2419	0.0604	1					
FDI Stock	0.3139	0.0978	0.5155	1				
GDP per capita	0.7527	0.253	0.2237	0.3274	1			
Population	0.129	0.2903	-0.2491	-0.2593	-0.0181	1		
Inflation	-0.03	-0.0356	-0.0266	-0.0293	-0.0348	0.01	1	
Trade Openness	0.2419	0.0377	0.3716	0.5511	0.1651	-0.4447	-0.0348	1

Table 4. Number of countries by region and income level

Variable	Number of Countries
East Asia & Pacific	27
Europe & Central Asia	46
Latin America	31
Middle East & North Africa	21
North America	3
South Asia	6
Sub-Saharan Africa	43
OECD	30
Non-OECD	19
Upper Middle	48
Lower Middle	49
Low	30

Source : World Bank

Table 5: System GMM Estimation

Dependent Variable: Export Diversification Index

	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
FDI Flow t-5	0.638	0.574		
FDI Stock			0.016	0.017
ln ED t-1	0.786 ***	0.078	0.785 ***	0.08
TradeOpenness	0.019	0.014	0.026 *	0.014
lnGDPpc t-1	-0.01	0.014	-0.008	0.013
lnPop	0.013 ***	0.004	0.011 ***	0.004
Inflation	-0.000 **	0.000	-0.000 *	0.003
1980-1984	Base		Base	
1985-1989			0.028 **	0.014
1990-1994	0.032 **	0.13	0.031 **	0.014
1995-1999	0.0351 *	0.012	0.003	0.013
2000-2004	0.006	0.009	0.001	0.013
2005-2007	-0.004	0.007	0.004	0.012
Obs	2443		2879	
# of Groups	158		167	
# of Instruments	140		161	
AB(1)	0.000		0.000	
AB(2)	0.194		0.167	
Hansen test	0.271		0.334	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01

Table 6. System GMM Estimation

Dependent Variable: EXPY				
	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
FDI Flow t-5	0.216 *	0.125		
FDI Stock			0.026 ***	0.007
lnEXPYt-1	0.819 ***	0.056	0.806 ***	0.04
TradeOpenness	0.045 **	0.019	0.0497 ***	0.017
lnGDPpc t-1	0.031 *	0.017	0.029 **	0.011
lnPop	0.013 **	0.005	0.014 ***	0.002
Inflation	-0.000 **	0.000	-0.000 ***	0.002
1980-1984	Base		Base	
1985-1989			0.04 ***	0.008
1990-1994	-0.21	0.007	0.019 **	0.008
1995-1999	0.013	0.007	0.057***	0.01
2000-2004	0.028	0.011	0.07 ***	0.011
2005-2007	0.029	0.013	0.07 ***	0.012
Obs	3376		4010	
# of Groups	174		174	
# of Instruments	140		162	
AB(1)	0.000		0.000	
AB(2)	0.895		0.554	
Hansen test	0.061		0.139	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01

Table 7. List of OECD countries

Australia	Japan
Austria	Republic of Korea
Belgium	Luxembourg
Canada	Netherlands
Czech Republic	New Zealand
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Slovak Republic
Germany	Slovenia
Greece	Spain
Hungary	Sweden
Iceland	Switzerland
Israel	United Kingdom
Italy	United States

Source: World Bank

Table 8. List of oil-exporting countries

Country	Income Category
Angola	Lower Middle
Nigeria	Lower Middle
Iraq	Lower Middle
Venezuela	Upper Middle
Algeria	Upper Middle
Gabon	Upper Middle
Libya	Upper Middle
Bahrain	Non OECD
Iran	Non OECD
Kuwait	Non OECD
Oman	Non OECD
Qatar	Non OECD
Saudi Arabia	Non OECD
United Arab Emirates	Non OECD
Norway	OECD

Source: World Bank

Table 9. System GMM Estimation with Interaction Terms

Dependent Variable: Export Diversification Index				
	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
FDIFt-5*DC	0.3323	0.376		
FDIFt-5*LDC	0.745 *	0.407		
FDIS*DC			-0.077	0.094
FDIS*LDC			0.025	0.019
lnEDt-1	0.725 ***	0.106	0.718 ***	0.102
TradeOpenness	0.016	0.013	0.027 *	0.015
lnPop	0.015 ***	0.005	0.013 ***	0.004
Inflation	-0.000 **	0.000	-0.000 *	0.002
DC	0.041 **	0.021	0.0677 **	0.033
Oil	-0.113 **	0.057	-0.125 **	0.015
1980-1984	Base		Base	
1985-1989			0.026 *	0.014
1990-1994	0.007	0.006	0.034 **	0.016
1995-1999	-0.02 **	0.01	0.013	0.015
2000-2004	-0.032 ***	0.012	0.006	0.016
2005-2007	-0.029 **	0.013	0.009	0.015
Obs	2455		2897	
# of Groups	159		169	
# of Instruments	97		113	
AB(1)	0.000		0.000	
AB(2)	0.186		0.162	
Hansen test	0.397		0.458	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01
FDIF and FDIS represent FDI inflow and FDI stock, respectively.

Table 10. System GMM Estimation with Interaction Terms

Dependent Variable: EXPY	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
FDIFt-5*DC	0.102	0.471		
FDIFt-5*LDC	0.477 **	0.222		
FDIS*DC			-0.06	0.459
FDIS*LDC			0.02 ***	0.005
lnEXPYt-1	0.747 ***	0.05	0.824 ***	0.039
TradeOpenness	0.092 ***	0.024	0.071 ***	0.018
lnPop	0.01 *	0.005	0.008 **	0.004
Inflation	-0.000	0.000	-0.000 *	0.002
DC	0.174 ***	0.052	0.135 ***	0.038
Oil	0.036 *	0.021	0.033 *	0.016
1980-1984	Base		Base	
1985-1989			0.04 ***	0.008
1990-1994	-0.016 **	0.007	0.019 **	0.008
1995-1999	0.017 **	0.008	0.057***	0.01
2000-2004	0.039 ***	0.012	0.07 ***	0.011
2005-2007	0.046 ***	0.015	0.07 ***	0.012
Obs	3376		4010	
# of Groups	174		174	
# of Instruments	141		113	
AB(1)	0.000		0.000	
AB(2)	0.634		0.543	
Hansen test	0.006		0.001	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01
FDIF and FDIS represent FDI inflow and FDI stock, respectively.

Table 11. Summary of Empirical Results

	FDI Inflow at t-5		FDI Stock	
	DC	LDC	DC	LDC
Export Diversification	P & NS	P & S	N & NS	P & NS
Export Sophistication	P & NS	P & S	N & NS	P & S

P: positive, N: negative
NS: not significant, S: significant

Figure 1

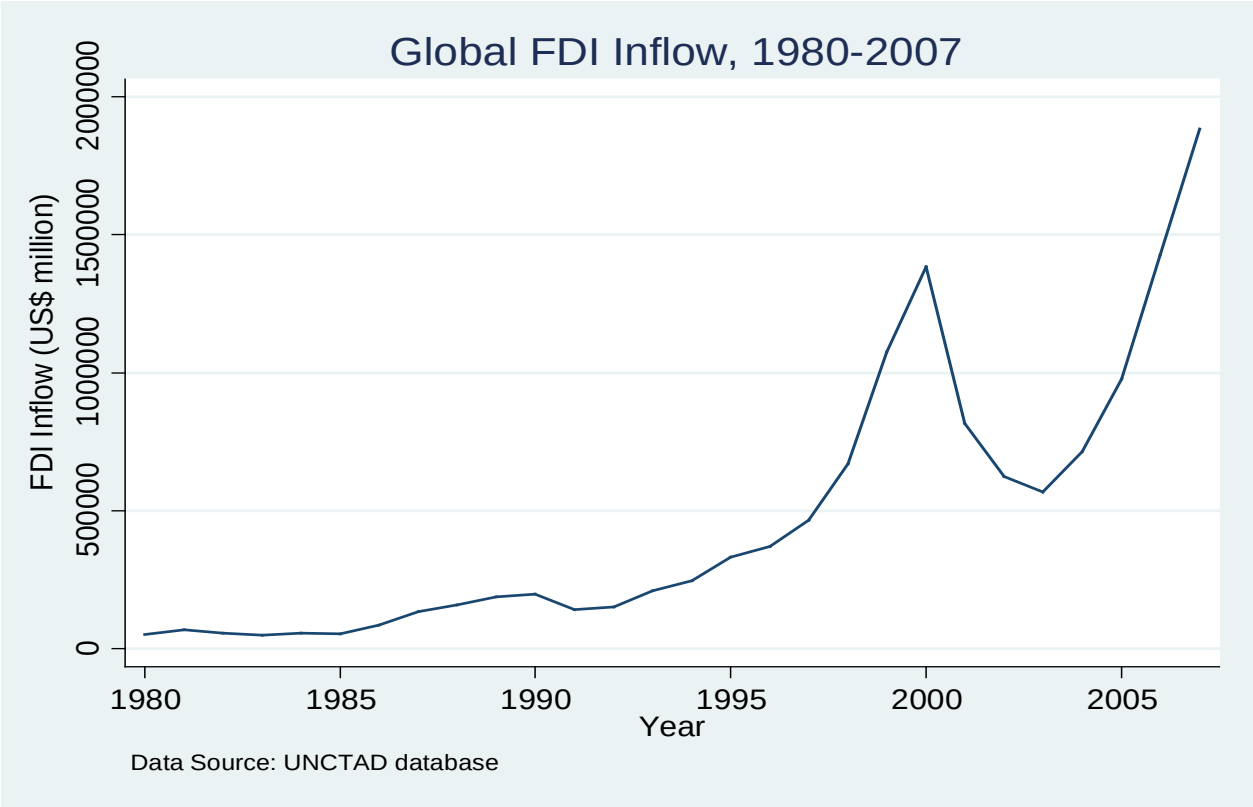


Figure 2

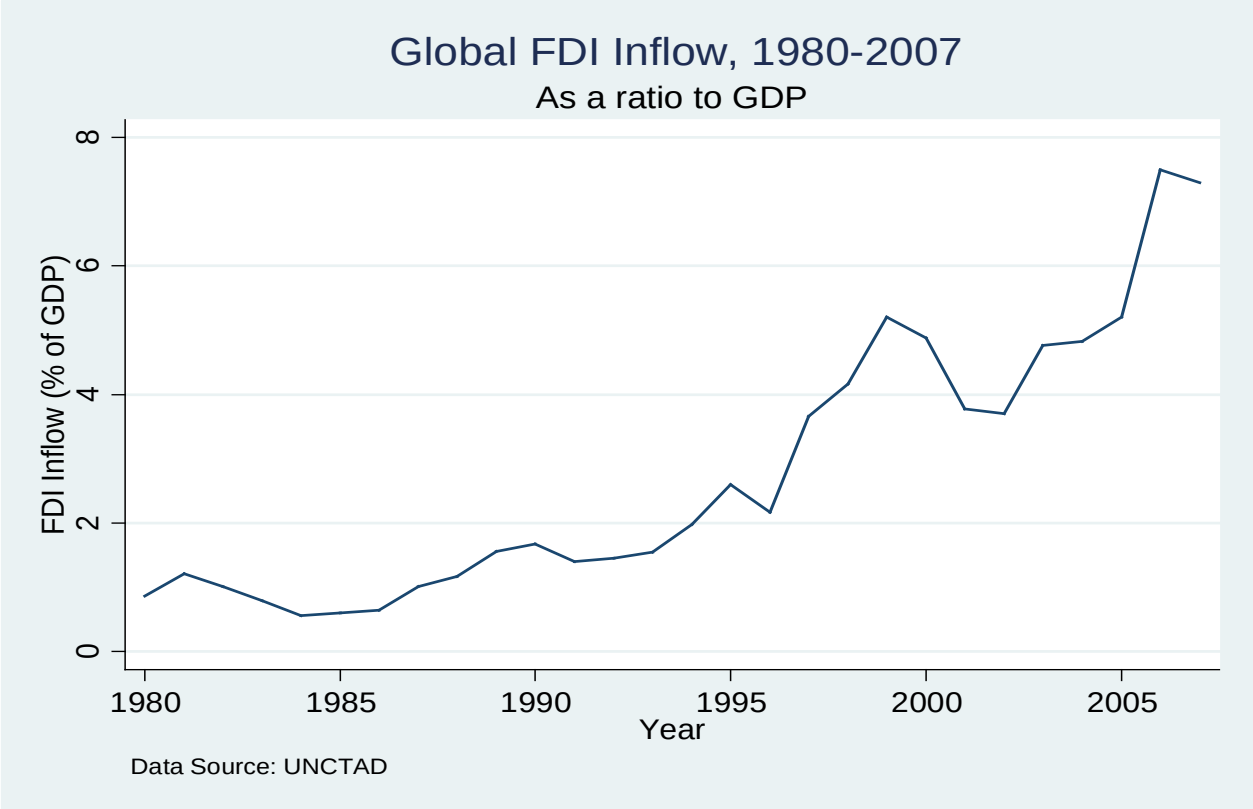


Figure 3

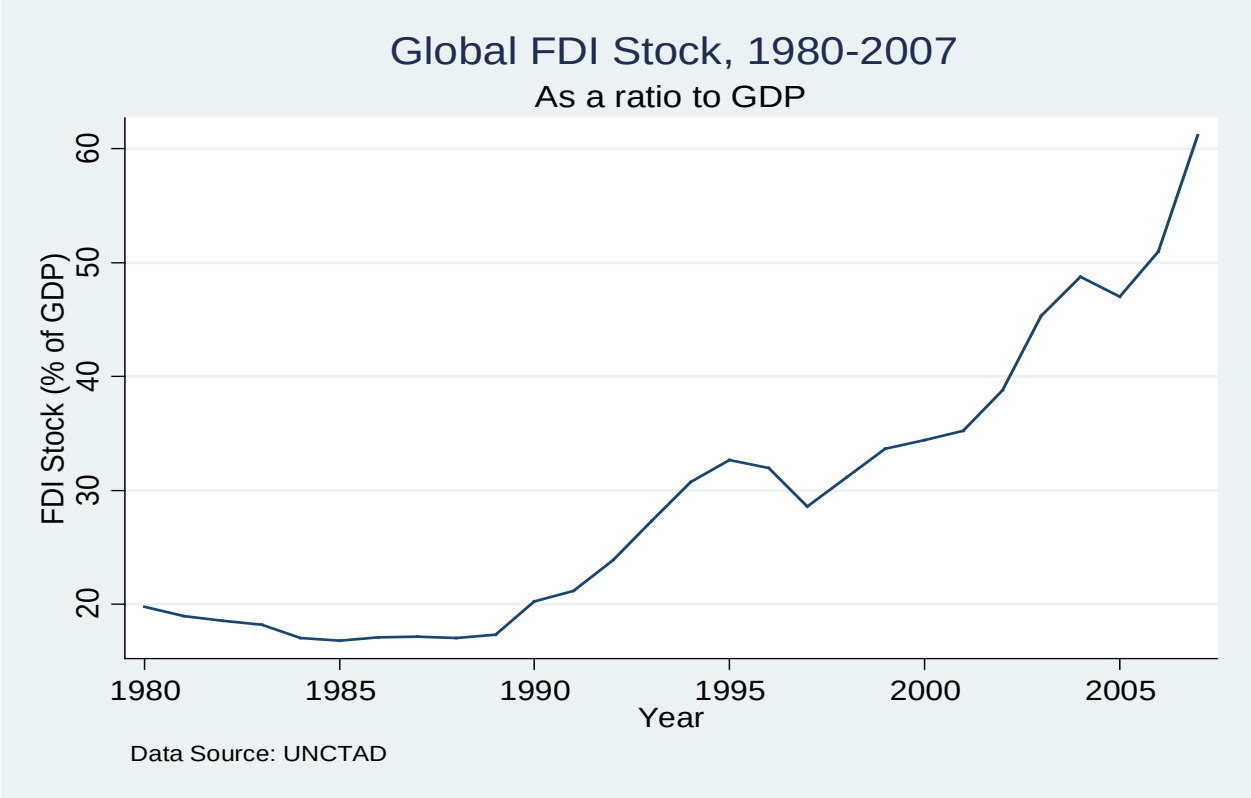


Figure 4

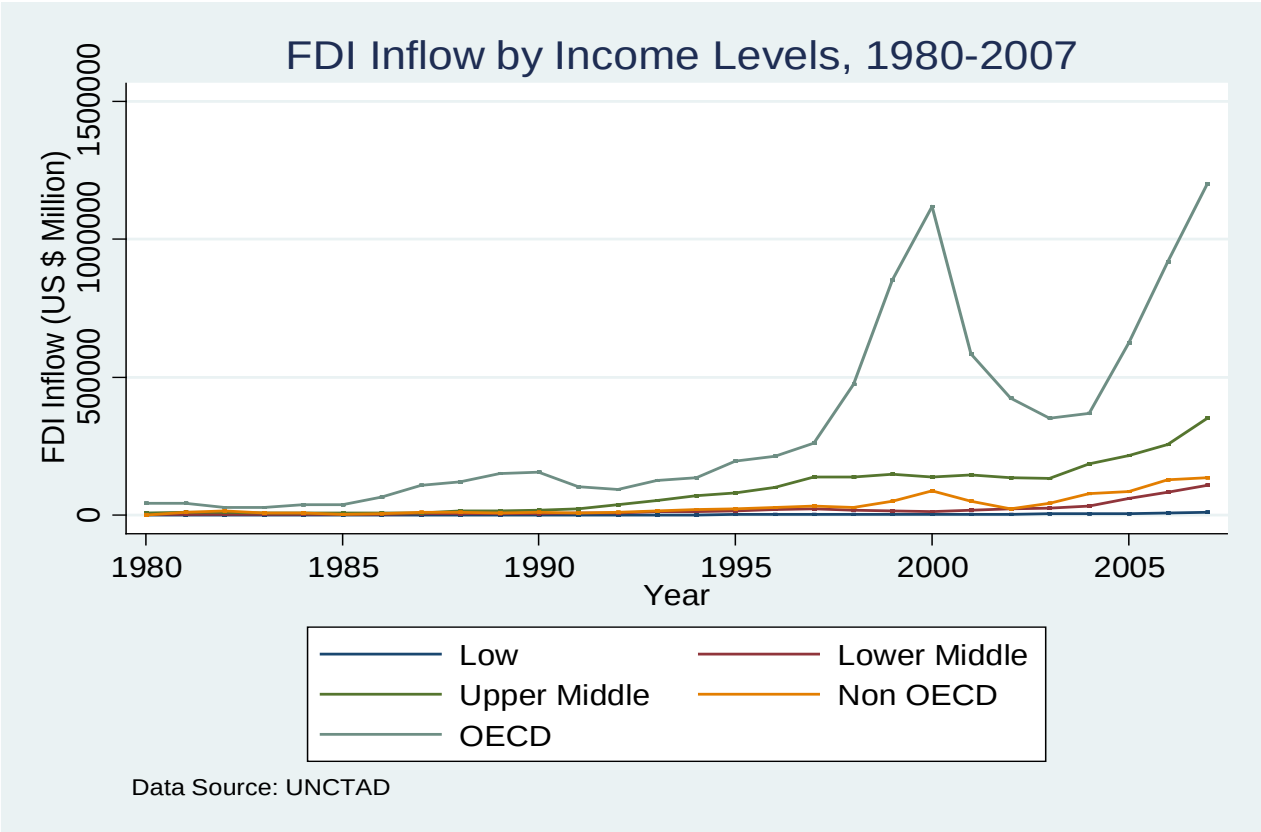


Figure 5

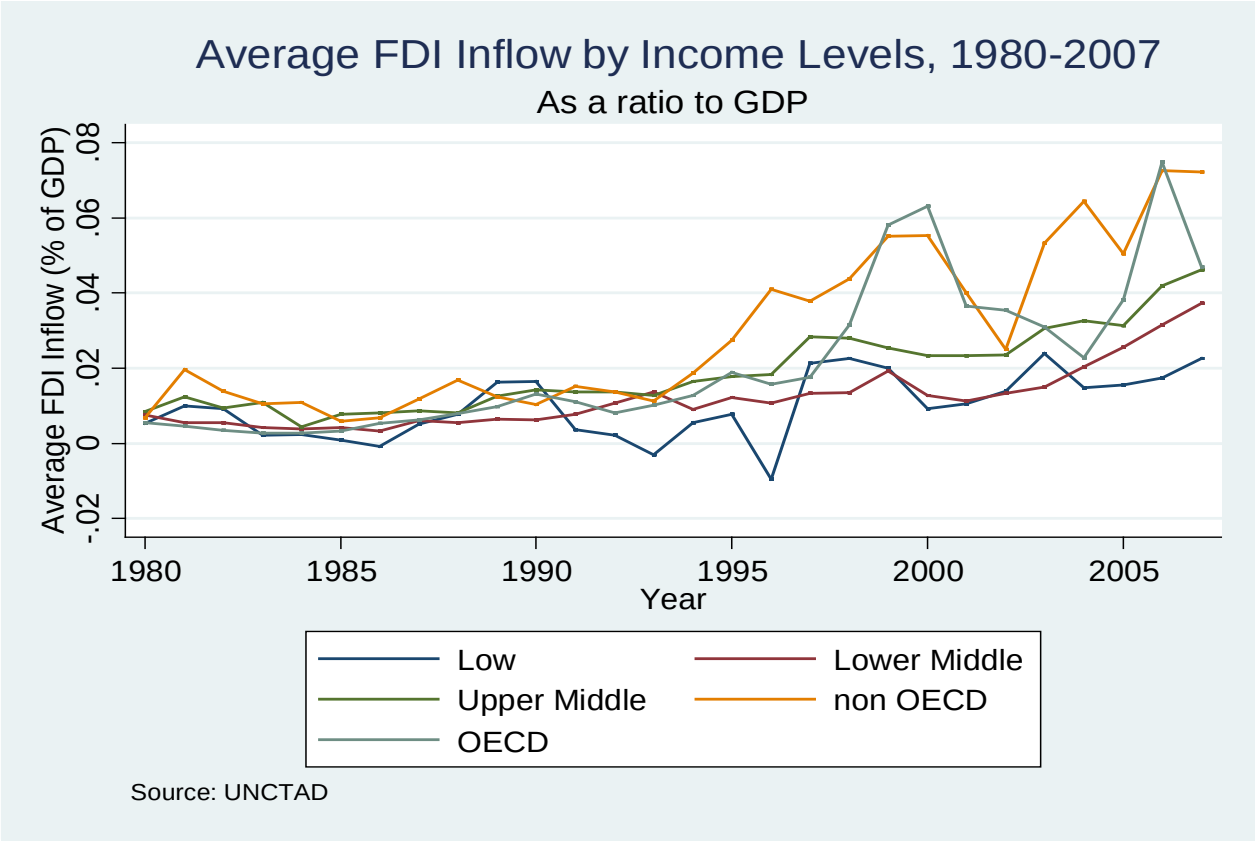


Figure 6

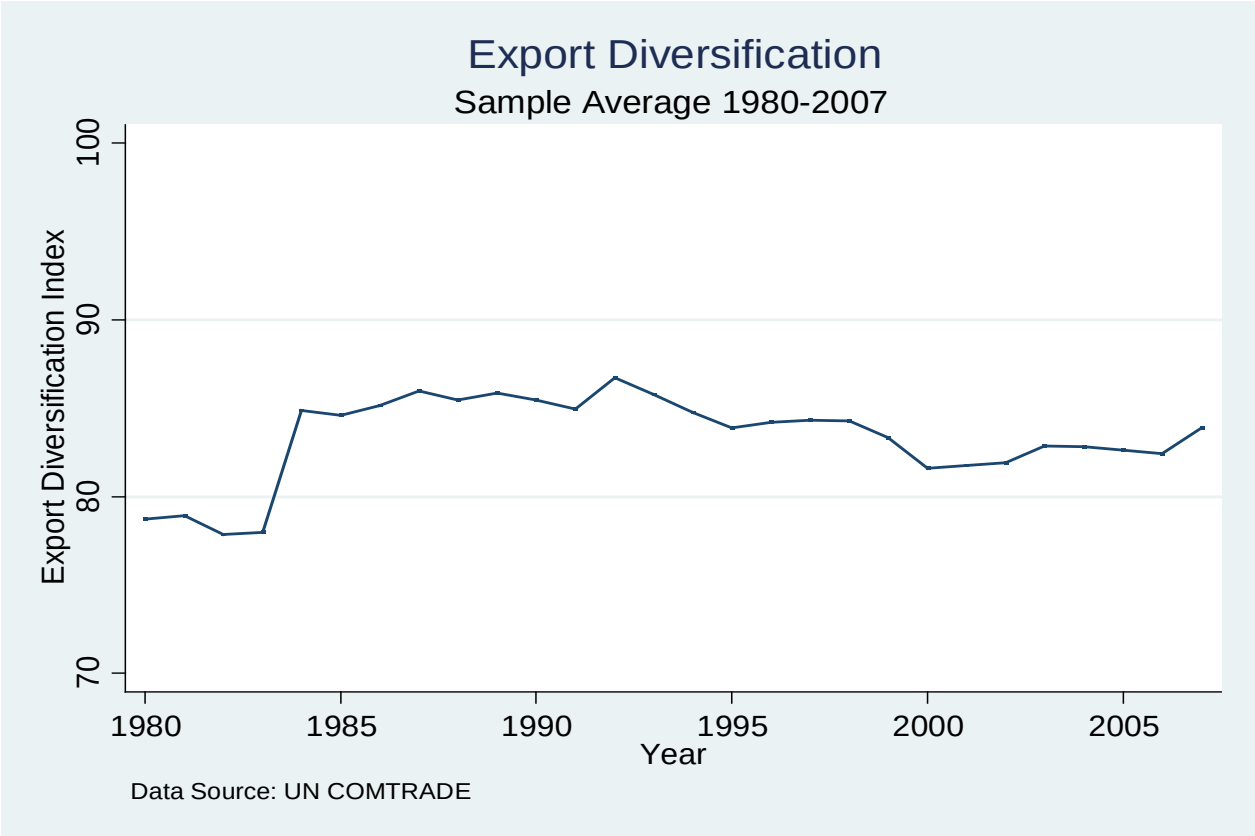


Figure 7

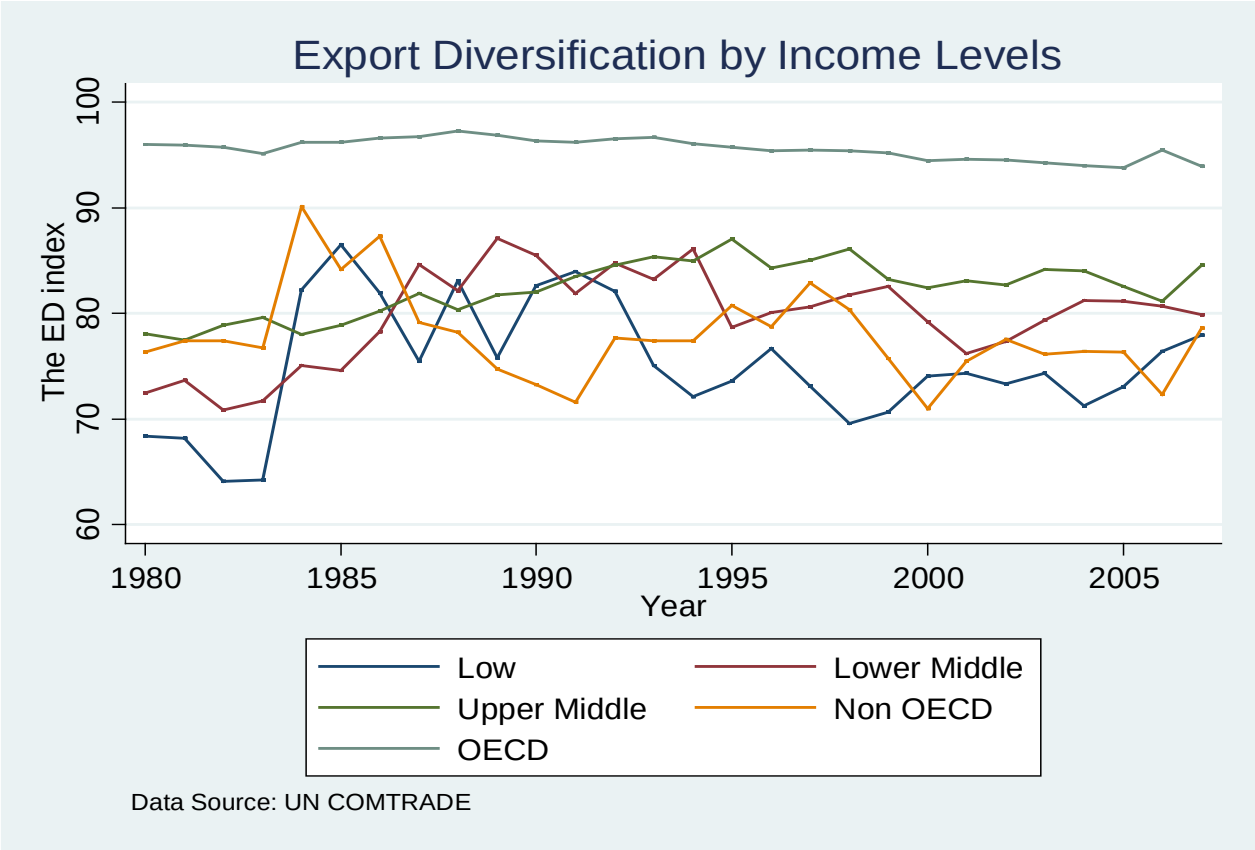


Figure 8

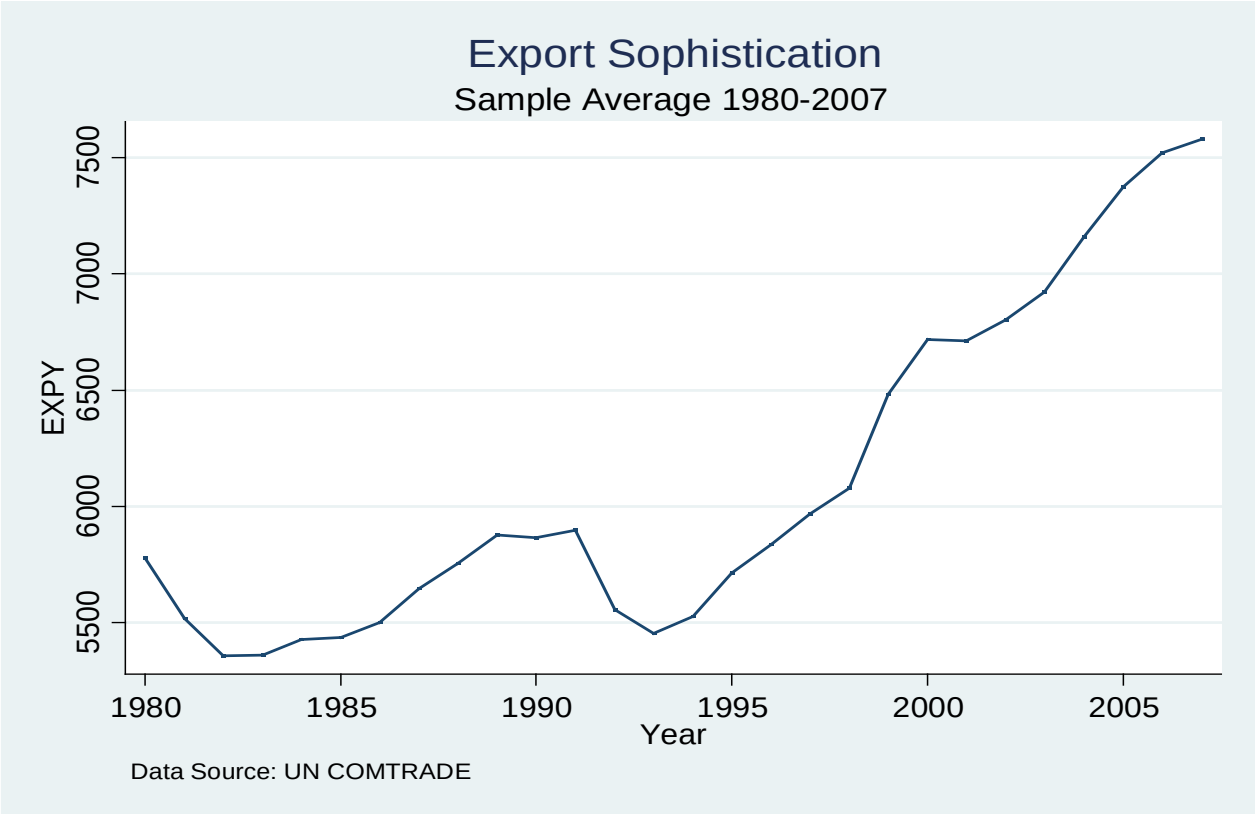
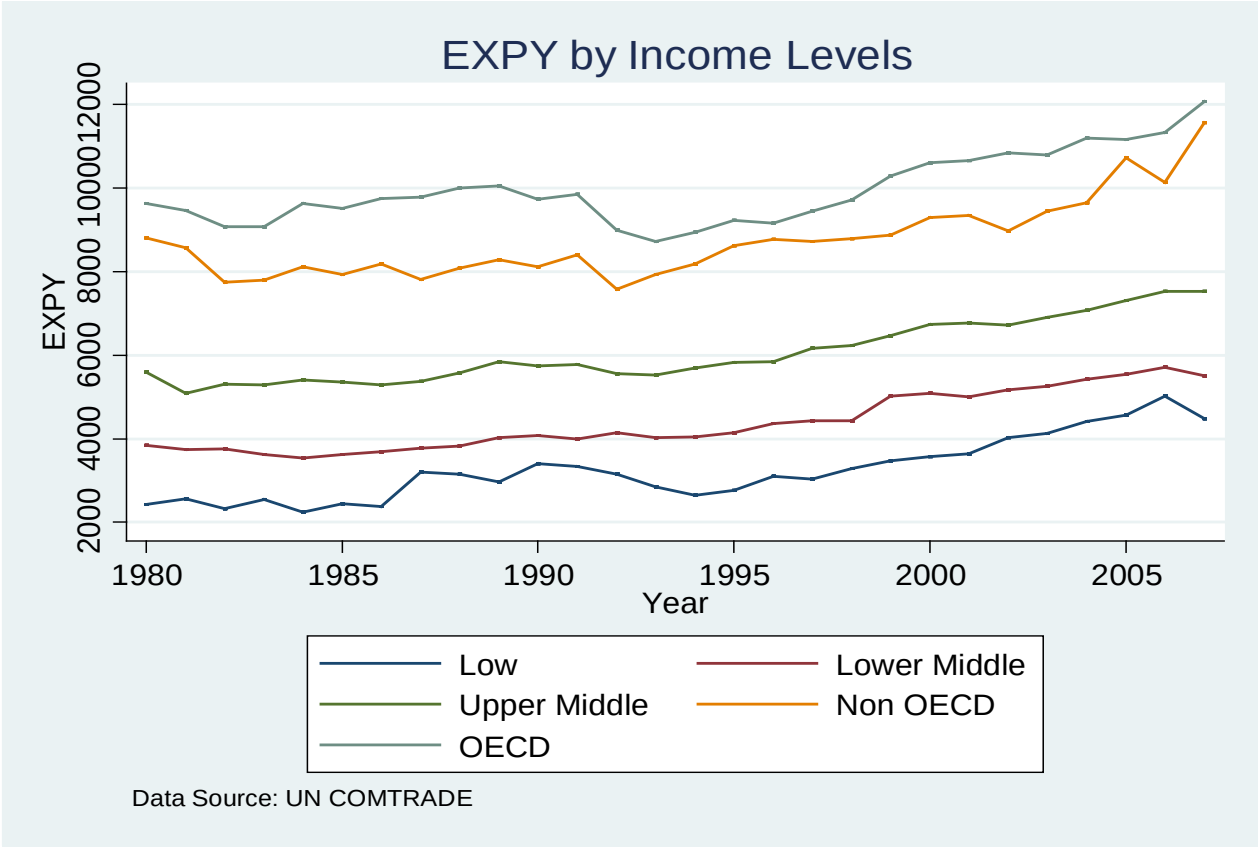


Figure 9


EXPY by Income Levels
EXPY
2000
4000
6000
8000
10000
12000
1980
1985
1990
1995
2000
2005
Year
Low
Lower Middle
Upper Middle
Non OECD
OECD
Data Source: UN COMTRADE

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Appendix

Table A1. System GMM Estimation Using FDI inflow at the period t

Dependent Variable	ED Index		EXPY	
	Coefficient	Standard Error	Coefficient	Standard Error
FDI Flow t	0.115	0.146	0.24 **	0.115
ln ED t-1	0.794 ***	0.074	0.727 ***	0.067
TradeOpenness	0.017	0.011	0.06 ***	0.019
lnGDPpc t-1	0.006	0.01	0.052 **	0.025
lnPop	0.011 ***	0.003	0.02 ***	0.006
Inflation	-0.000 ***	0.000	-0.000 ***	0.000
1980-1984	Base		Base	
1985-1989	0.021	0.013	0.037***	0.008
1990-1994	0.023 *	0.013	0.022 **	0.008
1995-1999	0.003	0.012	0.061***	0.01
2000-2004	-0.001	0.012	0.082 ***	0.011
2005-2007	0.003	0.012	0.084 ***	0.012
Obs	2909		4068	
# of Groups	167		175	
# of Instruments	161		164	
AB(1)	0.000		0.000	
AB(2)	0.181		0.519	
Hansen test	0.297		0.176	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01

Table A2. System GMM Estimation with Interaction Terms Using FDI inflow at the period t

Dependent Variable	ED Index		EXPY	
	Coefficient	Standard Error	Coefficient	Standard Error
FDIF*DC	0.001	0.137	-0.102	0.127
FDIF*LDC	0.774 *	0.405	0.61 *	0.319
lnEDt-1	0.741 ***	0.093	0.741 ***	0.05
TradeOpenness	0.015	0.014	0.091 ***	0.021
lnPop	0.013 ***	0.004	0.012 **	0.005
Inflation	-0.000 **	0.000	-0.000	0.000
DC	0.0533 **	0.02	0.189 ***	0.048
Oil	-0.111 **	0.051	0.055 **	0.022
1980-1984	Base		Base	
1985-1989	0.024 *	0.013	0.04 ***	0.009
1990-1994	0.03 **	0.014	0.023 **	0.008
1995-1999	0.001	0.013	0.056 ***	0.011
2000-2004	-0.003	0.014	0.079 ***	0.013
2005-2007	0.009	0.013	0.081 ***	0.016
Obs	2920		4068	
# of Groups	169		175	
# of Instruments	113		116	
AB(1)	0.000		0.000	
AB(2)	0.187		0.498	
Hansen test	0.216		0.001	
Wald (p)	0.000		0.000	

Note: t-statistics is based on robust standard errors.
P-value in parentheses
Significance: * p<0.1; ** p<0.05; ***p<0.01
FDIF and FDIS represent FDI inflow and FDI stock, respectively.