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# FDI and Exports: the Case of the High Performing East Asian Economies

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## ABSTRACT

The paper investigates the flows of FDI and trade in eight high performing East Asian economies with a focus on the relationship between FDI and host country exports. The development and importance of FDI and trade for the region is described. The empirical part of the paper examines the relationship between FDI and host country exports, using data for the period 1980 to 2003. Time series regressions for individual economies as well as panel data estimation indicate that FDI inflows have a significant and positive effect on host country exports, suggesting that export-platform FDI may be important for the East Asian economies. No clear link between outflows of FDI and exports was found, allowing FDI outflows to function as both a complement and a substitute for source country exports. Granger causality tests find indications of FDI inflows causing exports, providing further evidence that the export-platform FDI strategy applies for the East Asian economies.

**Keywords:** foreign direct investment, East Asia, international trade, exports

**JEL classification:** F21, F23, F14

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# 1.0 Introduction

Multinational enterprises (MNEs) generate the global flows of foreign direct investment but they are also extremely important for global trade flows. UNCTAD (2004) estimates that MNEs account for around two-thirds of world exports. Since MNEs are responsible for a large proportion of world trade, one may conjecture that there is a close relationship between flows of FDI and trade. An MNE network, consisting of a parent and affiliates, generates simultaneous flows of goods and investments. There is an increasing body of knowledge and associated models which explain international trade, but there is less theoretical consensus about the relationship between trade flows and FDI. The fact that exporting and local production are alternative ways for an MNE to serve the demand in a foreign market suggests a substitutory relationship between FDI and trade. MNE production in the host country implies that local production is a substitute for exports from the home country. On the other hand, MNE affiliate production in a host country can generate a demand for intermediate goods from the parent, resulting in a complementary relationship between flows of FDI and trade (exports). Theoretical reasoning therefore supports both a complementary and a substitutory relationship between FDI and trade, providing a strong incentive for empirical analysis.

East Asia is a very challenging region for research on the link between FDI and trade since it is obvious that FDI flows have been of great importance for the region's successful development. Openness to trade and FDI, export orientation, factor accumulation as well as government policies have all played an important role in improving the standard of living in East Asia according to Stiglitz (1996) and the World Bank (1993). The success achieved by the East Asian economies and the dramatic increases in the size of FDI and trade flows in the region reinforce the argument that East Asia provides an exciting setting for an analysis of the relationship between FDI and trade. Dowling and Ray (2000) argue that openness and export-led growth has been essential for the high rates of economic growth that have been achieved. It should therefore be of particular interest to study the link between FDI and exports.

How have FDI flows affected flows of exports from the region? Does FDI generate exports or do exports generate FDI? Are inflows of FDI a prerequisite for a host country to develop into an exporting country? Did the East Asian economies develop into exporters before they started to receive substantial inflows of FDI? Is it possible that firms start to export to foreign economies and subsequently invest in those economies, for example in order to promote sales? Can a developing economy evolve into a major exporter without having attracted considerable

inflows of FDI? Are there special characteristics in East Asia important for the relationship between FDI and exports?

This paper aims to investigate the relationship between FDI and host country exports on the macroeconomic level for the East Asian economies.

From a policy perspective, why is it interesting to analyse the relationship between FDI and exports? Exports have a potential to stimulate economic growth in the exporting country through what is referred to as export-led growth. Exports can affect the economy as a whole through productivity enhancing externalities such as technology spillovers. If FDI is found to promote exports, FDI can indirectly enhance economic growth. The East Asian economies could thereby provide examples of the benefits of liberalising FDI and trade regulations. Developing economies which have as yet failed to embark on a path towards increasing standards of living could try to implement similar policies which were used in East Asia. However, there is also a possibility that outward FDI flows could reduce host country exports, providing an argument for governments to restrict outward FDI.

For the purposes of this paper we are mainly interested in what is sometimes referred to as the 'high-performing Asian economies' since we believe that FDI and trade have been particularly important for their development. The paper takes the definition in the World Bank (1993) identifying 'high performing' East Asian economies as a starting point. It seems reasonable to add China to this group based on its high rates of economic growth in recent time. We choose to exclude Japan for two reasons. Firstly, we want to focus on developing economies, but Japan was a high-income economy already in 1980. Secondly, Japan is a special case due to the extremely small volume of FDI it has attracted considering the size of its economy and it is unlikely that these flows could have had any effect on Japan's large export volume.<sup>1</sup> Accordingly, the country group studied in this paper includes China, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan and Thailand.

The remainder of the paper is organised as follows. Section 2 reviews the existing theoretical and empirical findings regarding the relationship between FDI and trade. Section 3 provides an overview of the role of FDI and trade in the East Asian economies, with a focus on the relationship between FDI and host country exports. Section 4 contains the empirical analysis. Section 5 concludes.

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<sup>1</sup>Section 3.2 of the introductory chapter includes some FDI data for Japan.

## 2. The relationship between FDI and trade

The objective of this section is to review the existing knowledge about the relationship between foreign direct investment and trade. Section 2.1 examines the theoretical findings and Section 2.2 reviews empirical studies.

### *2.1 Theoretical studies of FDI and trade*

Theoretical research regarding the relationship between FDI and trade has focused on the question whether these flows are complements or substitutes. A reason for the interest in this relationship is the link between MNE production and employment in the home country and MNE production in foreign countries. A fear among trade unions and workers is that increased MNE production in foreign host countries might substitute for MNE production in the home country, reducing employment.

The classical trade theories of Ricardo and Heckscher-Ohlin in their strict form do not allow for any conclusions about the relationship between FDI and trade since production factors are assumed to be immobile internationally. However, if the immobility assumption is relaxed, it becomes possible to analyse FDI in a Heckscher-Ohlin framework. One of the earliest examples of a study relaxing the assumption of internationally immobile production factors is the seminal paper by Mundell (1957). The paper develops a standard two-good, two-factor, two-country Heckscher-Ohlin trade model. Capital mobility between the two countries is introduced, and the Heckscher-Ohlin assumption of identical production functions is relaxed. In this setting, capital movement becomes a perfect substitute for trade. The equalisation of capital endowments removes the basis for trade. Trade barriers largely explain international capital movement in this kind of framework.

However, Markusen (1983) presents several models in which factor movements can result in an increase in the volume of trade. The models introduce reasons for trade that are not based on differences in relative factor endowments. Instead, the models show how conditions such as external economies of scale and different production technologies can function as a basis for trade. In all models, factor mobility causes differences in factor proportions, creating an

additional motive for trade in goods. Markusen (1983) concludes that the result of substitutability between FDI and trade found by Mundell (1957) is a special case only present in factor proportions models.

Markusen (1983) was not the first theoretical contribution arguing that a complementary relationship between FDI and trade is possible. Schmitz and Helmberger (1970) proved that it was possible to construct factor proportion models where capital movements and trade are complements. In order to make a complementary relationship plausible, the Heckscher-Ohlin assumptions of international production factor immobility and identical production functions is relaxed. Using a spatial equilibrium framework, Schmitz and Helmberger show that when going from a situation of factor immobility only allowing for trade, to a situation where capital is mobile internationally, trade increases when capital mobility is introduced. In a setting with trade in both products and factors, a complementary relationship between FDI and trade is possible.

Vernon (1966) introduced a locational dimension to the product life-cycle theory. This contribution made it possible to describe the relationship between exports and FDI on the aggregate level. To Vernon, the location of production was determined by the product-life cycle, and, eventually, increased competition would result in foreign production as a substitute for exports from the home country (U.S.) in order to reduce production costs. The model describes how a change in the location of production generates an outflow of FDI from the U.S. to low income countries and thereby replacing export flows. Thus, Vernon's product cycle model suggests a substitutional relationship between FDI and trade.

Horst (1976) provides a somewhat different example of a possible complementary relationship between FDI and exports. Horst argues that foreign investment is not limited to local production of final goods in the host country. The MNE investing in the host country also engages in non-manufacturing activities not directly related to production. These activities have the objective of increasing demand for the MNE good in the host country market. Horst (1976) suggests that these activities include advertising, retail distribution, technical assistance and adaption of the good to local preferences. Horst uses the concept of 'ancillary goods' to describe such activities. As a result, demand for other kinds of goods is established, possibly generating an increase in exports from the MNEs home country to the host country.

The OLI paradigm was developed by John Dunning (1977), and has had a large impact on FDI theories.<sup>2</sup> For the purpose of the paper at hand, the usefulness of the OLI paradigm is that it

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<sup>2</sup>The OLI paradigm is described in more detail in the introductory chapter of the dissertation.

can function as a framework for a discussion of whether an MNE serves a foreign market through exports or local production. The MNE's decision about exporting, licensing or investing is determined by the combination of ownership, location and internalisation advantages. The relationship between FDI and trade can be discussed in relation to these advantages. If the host country does not have a location advantage, the MNE will serve the foreign economy through exports, suggesting a substitutional relationship between FDI and trade.

The new trade theory emerging during the early 1980s generated more realistic general equilibrium trade models which could handle increasing returns to scale, imperfect competition and differentiated products. These models are based on the ideas of ownership and location advantages presented in the OLI paradigm. The new trade theory has been able to incorporate the relationship between FDI and trade. However, early models were not very helpful in handling MNEs and FDI due to the assumption of single-plant national firms, excluding the existence of MNEs, but more recent models allow for MNEs to arise endogenously.

New trade theory models distinguish between horizontal and vertical FDI. In the case of vertical FDI, the MNE decomposes the production process into stages according to factor intensity. Production activities are located in order to exploit differences in factor cost and therefore minimise production costs. Horizontal FDI, on the other hand, implies that the MNE is locating production close to the final market. The production process is duplicated and demand in foreign markets is served by local production, reducing trade costs.

Helpman (1984) and Markusen (1984) are among the first trade models that incorporate MNEs. Helpman (1984) presents a model of vertical MNEs and FDI. The paper develops a general equilibrium trade model based on differences in factor endowments. Firms are modelled as having one labour-intensive activity and one capital-intensive activity. Factor intensities differ between the two activities and they can be separated geographically. MNEs only arise if the differences in factor endowments are large enough. Markusen (1984) provides a general equilibrium model incorporating horizontal MNEs. The model is based on firm-level scale economies. The firm possesses a technical advantage, possibly in the form of an innovation, which can be used in several production facilities simultaneously without reducing its marginal productivity. The MNE therefore has an incentive to duplicate the production process, resulting in horizontal FDI.

The distinction between horizontal and vertical FDI as modelled in Helpman (1984) and Markusen (1984) and similar papers has important implications for the relationship between

FDI and trade. In the case of horizontal FDI, a substitutional relationship is expected. The MNE produces the good locally instead of exporting it from the home country. For vertical FDI, FDI is expected to have a complementary relationship to trade. Vertical FDI does not substitute for exports. Instead, demand for intermediate goods from the MNE affiliate can result in an increase in exports to the host country.

Brainard (1993) shows how including intermediate goods into a trade model allows for the possibility of a complementary relationship between FDI and trade. The paper develops a two-country, two-sector general equilibrium model with a three-stage production process where firms choose between exporting and cross-border investment. The decision depends on the tradeoffs between proximity to the market and concentration advantages due to scale economies at the plant level. These tradeoffs differ according to production stages and FDI and trade can exist simultaneously. One of the equilibrium outcomes implies that FDI stimulates intra-firm trade in intermediate goods while at the same time reducing trade in final goods.

The model in Markusen and Venables (1998) is similar to Brainard (1993) in the sense that MNEs tend to arise when firm-level scale economies and transport costs are large compared to plant-level scale economies. However, since the Markusen and Venables model has asymmetries in size and endowment between economies, the model is more in line with observations of actual flows of trade and investment than Brainard (1993). Suppressing MNEs in the model makes it possible to find the effect of FDI on trade. Starting from a situation with only national firms and introducing MNEs reduces the volume of trade as affiliate sales substitute for trade.

The distinction between horizontal and vertical FDI has been extended in recent so-called knowledge-capital models.<sup>3</sup> Examples of this type of model are presented in Carr et al. (2001) and Markusen and Maskus (2002). These models add more realism since they allow combinations of horizontal MNEs, vertical MNEs and national firms to arise endogenously. Knowledge-capital models consequently incorporate both a complementary and a substitutional relationship between FDI and trade.

As this review has made clear, theoretical contributions have focused on the link between outward FDI and exports. However, Ekholm et al. (2004) model a form of FDI where foreign direct investment is performed in order to create an export-platform in the host country. Such export-platform FDI is defined as MNE production in a host economy when the output is sold in

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<sup>3</sup>Knowledge-capital and trade models based on this concept are described in more detail in Section 4.4 of the introductory chapter.



third markets and not in the parent or host country market. Ekholm et al. construct a three-country model with two high-cost countries and one low-cost country. Numerical simulations of the model are performed in order to find conditions that tend to result in export-platform FDI. The probability of this type of FDI emerging in the model is determined by the interaction of shipping costs and cost advantages between the countries. An export-platform model consequently predicts a complementary relationship between inward FDI and host country exports. Barry and Bradley (1997) argue that Ireland has functioned as an export-platform for U.S. MNEs. It is possible that export-platform FDI is important for East Asia due to the importance of exports for these economies.

This review of the theoretical literature suggests that the form of FDI should have a strong influence on the relationship between FDI and trade. Table 1 presents a summary of the relationships suggested by the literature review.

**Table 1 The relationship between FDI and trade suggested by trade theory**

Form of FDI	The primary relationship between FDI and trade	References
Horizontal	Substitutional	Helpman (1984)
Vertical	Complementary	Markusen (1984)
Knowledge-capital based	Complementary or substitutional	Carr et al. (2001), Markusen and Maskus (2002)
Export-platform	Complementary (inward FDI and host country exports are complements)	Ekholm et al. (2004)

Theoretical models of horizontal MNEs predict a substitutional relationship between outward FDI and exports. In this case, local MNE production substitutes for exports. Vertical models primarily predict a complementary relationship due to an increase in demand for intermediate goods. Knowledge-capital models are able to incorporate horizontal and vertical MNEs simultaneously, and consequently both complementary and substitutional relationships between FDI and trade are possible. Export-platform FDI suggests a complementary relationship between inward FDI flows and host country exports.

Table 1 shows that trade theory can support FDI and trade being either complements or substitutes depending on the form that FDI takes. Empirical studies therefore have to be used in order to find the exact nature of the relationship.

## *2.2 Empirical research of FDI and trade*

A substantial body of empirical research on the link between FDI and trade has emerged. Empirical studies are heavily focused on FDI generated by developed economies. Similarly to the theoretical contributions, most of the research efforts have concentrated on the link between outward FDI and source country exports. One of the first studies is Horst (1972), analysing the relationship between U.S. exports and FDI to Canada. Horst finds that exports and foreign investments are alternative ways for U.S. manufacturing firms to supply the Canadian market.

Data for individual U.S. firms are used by Lipsey and Weiss (1984) in order to investigate the effect of foreign production on exports from the home country. They find that higher MNE affiliate sales in the host country were linked to higher exports from the MNE parent, that is, foreign production does not substitute for exports. The empirical results of the paper indicate that when a firm produces both final and intermediate goods, production of final goods in a host country can increase the exports of intermediate goods used in host country production from the source country.

Blonigen (2001) is the first study that takes advantage of product level data when trying to determine whether FDI and trade are complements or substitutes. The paper uses data on Japanese production in the U.S. and Japanese exports to the U.S. Blonigen (2001) finds strong substitution effects between production in the U.S. and exports to the U.S. for both automobile parts and consumer goods. However, the paper also finds strong complementary effects between automobile production in the U.S. and imports of automobile parts, providing empirical examples showing that intermediate goods can result in a complementary relationship between FDI and trade as suggested by Brainard (1993).

Head and Ries (2001) use a panel data set of 900 Japanese manufacturing firms to analyse the effect of an increase in a firm's foreign investment on firm exports. The hypothesis is that when a firm performs foreign direct investment in a host country, this stimulates the export of intermediate goods to the same country. This hypothesis is supported by the empirical analysis indicating a complementary relationship between outward FDI and exports.

Camarero and Tamarit (2004) estimate the demand for exports and imports of manufactured goods for a panel of EU countries and United States and Japan. For the majority of the countries, inward and outward FDI is positively related to trade. Camarero and Tamarit therefore conclude that their results mainly point to a complementary relationship between FDI and trade. There are few empirical studies analysing the link between inward FDI and host country exports. However, Blonigen et al. (2004) use data for U.S. FDI to a panel of 20 OECD economies for the period 1980 to 2000 in order to examine spatial correlation between FDI flows. They find evidence consistent with export-platform FDI into Europe.

This review of the empirical research indicates that studies using firm-level data tend to dominate. Furthermore, most empirical studies have focused on flows of FDI and trade between developed economies. To achieve a more complete picture it might be necessary to perform studies for developing economies and to use aggregate data. What about empirical research on FDI and trade in East Asia? There exist a number of studies such as Jeon (1992), Liu et al. (1997) and Farrell et al. (2004) which analyse determinants of FDI in East Asian economies, but what about studies of the relationship between FDI and trade? Several studies of Japan exist, see for example Eaton and Tamura (1996) and Bayoumi and Lipworth (1998). Kim and Kang (1996) investigate whether outward FDI substitutes for exports from the home country using industry level data for Korea and Japan. Kim and Kang conclude that outward FDI does not substitute for exports for either Korea or Japan. Lin (1995) studies the effect of Taiwan's outward and inward FDI on the bilateral trade with four other Asian economies using time series data. The paper finds that while outward FDI has a positive effect on exports, inward FDI does not affect Taiwan's imports.

Summarising this overview of earlier research, it can be argued that previous studies have focused on the relationship between outward FDI flows and exports in developed economies by using firm-level data. Accordingly, this paper provides a contribution by providing a study that includes an analysis of the link between FDI inflows and host country exports on the aggregate level for a group of East Asian economies.

### 3. FDI and trade in East Asia

This section provides a background description of FDI and trade in East Asia, focusing on the eight chosen economies. The objective is to illuminate the importance of FDI and trade for these economies and possibly find indications of a tentative relationship between FDI and exports.

The East Asian economies have been able to achieve very impressive rates of economic growth and some of them, such as Hong Kong and Singapore, should now be included in the high-income country group. Many earlier studies, including the World Bank (1993), Chen (1993) and Fukao et al. (2003), among others, argue that FDI and trade have been fundamental for this remarkable development. Marwah and Tavakoli (2004) show that FDI had a positive effect on economic growth in Indonesia, Malaysia, Philippines and Thailand, while Urata (2001) argues that FDI promoted exports from the region. It should therefore be interesting to present some data indicating the importance of flows of FDI and trade. Table 2 presents data for the group of East Asian economies analysed in this paper.

**Table 2 East Asia share of world trade and world FDI flows, per cent**

	1960	1970	1980	1985	1990	1995	2000	2002
	a	a						
Share of world exports	3.6	3.5	6.5	7.1	8.6	12.2	15.9	18.8
Share of world imports	2.5	2.8	4.2	4.8	6.4	10.1	10.0	11.0
Share of world outward FDI flows	..	<0.1	0.9	4.4	4.9	11.9	7.0	5.6
Share of world inward FDI flows	..	3.8	6.3	7.7	9.9	21.0	9.8	11.3

Source: Based on World Development Indicators and UNCTAD (2004)

Notes

“..” indicates missing data

a: excluding China

Table 2 indicates that the East Asian economies have become increasingly important over time for world trade, both as exporters and importers. The increase in the world export share from the region since 1980 is particularly impressive. The East Asian share of world exports tripled between 1980 and 2002. What about FDI? There was a large increase in the region’s share of world FDI flows between 1970 and 1995. Since then, however, East Asia has lost some of its importance for global FDI flows.

While all of the East Asian economies which are the subject of this paper have been successful in improving their standard of living they have used different paths to reach that success, as argued by Fischer (1996). But are there any characteristics of FDI or trade shared by these economies? It is clear that export-orientation and FDI have been fundamental for success. Over time, there has been a liberalisation of FDI regimes in East Asia, providing further stimulus for FDI inflows. However, there are substantial differences in the importance of FDI for individual economies as depicted in Table 3. The table presents inward and outward stocks of FDI for the years 1980 and 2003.

**Table 3 Importance of FDI for the East Asian economies**

Economy	Inward FDI stock per capita in 1980, USD	Inward FDI stock per capita in 2003, USD	Outward FDI stock per capita in 1980, USD	Outward FDI stock per capita in 2003, USD
Hong Kong	35 276 (1)	54 992 (1)	29 (2)	49 281 (1)
Singapore	2 570 (2)	34 659 (2)	1 543 (1)	21 391 (2)
Malaysia	376 (3)	2 381 (3)	14 (3)	1 198 (4)
Taiwan	135 (4)	1 501 (4)	5 (4)	2 886 (3)
Indonesia	69 (5)	266 (8)	..	13 (8)
Korea	35 (6)	991 (5)	3 (5)	721 (5)
Thailand	21 (7)	595 (6)	<1 (6)	53 (6)
China	1 (8)	389 (7)	..	29 (7)
<i>EU-15</i>	<i>609</i>	<i>8 765</i>	<i>607</i>	<i>10 605</i>

Source: Based on FDI data from UNCTAD (2004) and population data from WDI (2005).

Population data for Taiwan has been collected from the U.S. Census Bureau (2005).

Note:

“..” indicates missing data

The two city state economies, Hong Kong and Singapore, have large inward stocks of FDI per capita, while China, Indonesia, and Thailand only have attracted limited inflows of FDI per capita. Outward stocks of FDI are smaller than inward stocks for all economies, except Taiwan. Again, Hong Kong and Singapore have the largest outward stocks per capita while the stocks for China, Indonesia and Thailand are small.

What about export flows? Table 4 presents exports per capita for the years 1980 and 2003. The economies are ranked according to the export flow in 1980. Data for the group of EU-15 economies are added in order to allow for comparisons.

**Table 4 Exports per capita in 1980 and 2003, USD**

Economy	Exports per capita in 1980, USD	Exports per capita in 2003, USD
Singapore	8 039	33 786
Hong Kong	3 909	32 805
Taiwan	1 110	6 380
Malaysia	940	4 220
Korea	459	4 004
Indonesia	148	283
Thailand	139	1 064 <sup>a</sup>
China	24 <sup>b</sup>	340
<i>EU-15</i>	<i>2 017</i>	<i>7 380</i>

Source: based on trade data from Comtrade (2005) and population data from WDI (2005). Population data for Taiwan has been collected from the U.S. Census Bureau (2005).

Notes:

a: Data for 2001.

b: Data for 1984.

Table 4 indicates that all eight economies achieved large increases in exports per capita between 1980 and 2003. However, there is considerable variation in the size of the export flows. Singapore and Hong Kong have the largest flows of export per capita and are the only East Asian economies which show export figures that surpass those of the EU-15. Indonesia and China have the lowest export flows per capita.

A study of FDI and trade in East Asia needs to take into account the effect of the Asian crisis in 1997. Since the crisis had such a dramatic effect on the region, at first glance one would expect that the effect on FDI and trade would be considerable. A more detailed study of the data (Appendix A) reveals that there was a decrease in FDI inflows to the region between 1997 and 1998 of less than ten per cent. Already in 1999 (not shown) there was a large increase in inflows suggesting that the Asian crisis only had a limited effect on the total FDI inflow to the group of

East Asian economies. However, there are differences between individual economies. Indonesia, Singapore, Taiwan and Malaysia saw substantial decreases in FDI inflows in 1998, but for China inflows were stable and for Hong Kong, Korea and Thailand inflows even increased during 1998. The FDI data presented in Appendix A support the argument of Athukorala (2003) that the Asian crisis did not cause a major decrease in FDI inflows. Changes in trade flows were also limited. Between 1997 and 1998 there was a decrease in exports of around seven per cent, while imports fell by close to 16 per cent.

However, the effects of the crisis on FDI and trade might be obscured by the use of annual data. Dowling and Ray (2000) report that there was a large fall in exports during the latter part of 1997 and the first part of 1998. In 1999 imports were in line with the volume in 1997.

Which are the most important conclusions that can be drawn based on the discussion in Section 3? The section shows that both trade and FDI have become increasingly important for the East Asian economies. The share of world exports generated by the eight economies tripled between 1980 and 2002. The economies have also attracted growing FDI inflows resulting in increasing stocks of inward FDI. The section also indicates that there is considerable variation in the importance of FDI and exports between individual East Asian economies. While Hong Kong and Singapore have attracted large inflows of FDI as well as exports, countries such as Indonesia and Thailand have been less successful in generating exports and FDI inflows.

## 4. Empirical analysis

This section presents a more formal analysis of the relationship between FDI and exports. Section 4.1 discusses the data and presents the regression equation. Section 4.2 contains the empirical analysis.

### *4.1 Data and stationarity tests*

Bilateral data would have been preferable when analysing the relationship between FDI and exports allowing for a gravity approach using data for distance between the economies, their relative sizes with regard to GDP and bilateral FDI flows. Several studies of this type have been performed for the OECD economies, (e.g. Lipsey and Weiss, 1984; Blomström et al., 1988). Unfortunately, the lack of bilateral FDI data for the East Asian economies precludes using a gravity approach.

Instead, as a first step, this paper carries out time series and panel data estimations, using total exports as the dependent variable and total inflows and outflows of FDI as explanatory



variables. All variables have been normalised according to population. This results in the following time series equation:

$$EXP_t = \beta_0 + \beta_1 FDIIN_t + \beta_2 FDIOUT_t + \varepsilon_t \quad (1)$$

where  $EXP_t$  represents total exports per capita time  $t$ ,  $FDIIN_t$  is the inward flow of FDI per capita and  $FDIOUT_t$  is the outward flow of FDI per capita, and  $\varepsilon_t$  is the disturbance term

What signs do we expect the coefficients of the explanatory variables to take? For a host country that functions as an export-platform,  $\beta_1$  should have a positive sign if these investments represent export-platform FDI. However, if market-seeking FDI dominates, FDI inflows should not affect host country exports. The sign of  $\beta_2$  could be either positive or negative depending on whether outflows of FDI complement or substitute for source country exports.

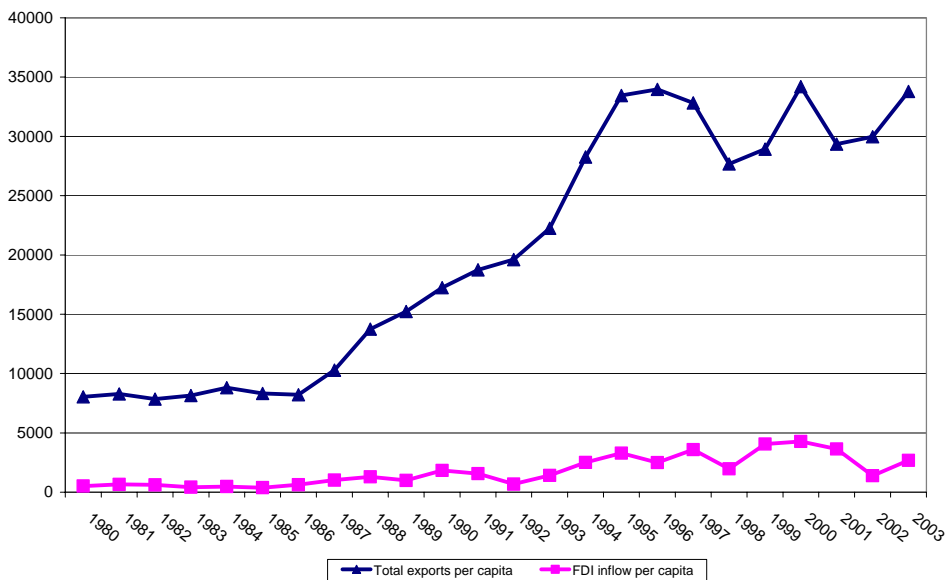
Table 5 presents a description of the regression variables, and Appendix B provides summary statistics and a correlation matrix for the original data. Data are available for the period 1980 to 2003.

**Table 5 Regression variables**

Variable	Explanation	Data source	Expected sign for coefficient
<i>Dependent variable</i>			
EXP	Total exports per capita, USD	Based on trade data from Comtrade (2005) and population data from WDI (2005)	na
<i>Independent variables</i>			
FDIIN	Inward FDI flow per capita, USD	Based on FDI data from UNCTAD (2004) and population data from WDI (2005)	+ (export platform FDI)
FDIOUT	Outward FDI flow per capita,	Based on FDI data from	?

	USD	UNCTAD (2004) and population data from WDI (2005)	
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However, relating the variables in levels might be inappropriate. Section 3 describes how the importance of both FDI and trade has increased for East Asia in the past decades. There have been large inflows of FDI and at the same time the volume of exports has increased. This suggests a potential nonstationarity problem. Performing regressions on nonstationary time series can result in spurious regression. It is therefore necessary to try to determine whether the data is stationary or not. The time series are plotted as a first step. Figure 1 describes the flows of total exports and FDI inflows per capita for Singapore and is generally representative for the development of FDI inflows and exports in the other seven economies.



**Figure 1 FDI inflows and exports for Singapore**

Figure 1 suggests that the export variable is likely to be nonstationary and possibly also the FDI inflows variable. A more formal analysis of the existence of nonstationarity involves performing a unit root test. Accordingly, the augmented Dickey-Fuller (ADF) test is performed on the individual time series for all eight economies. The ADF-test consists of estimating the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

where  $Y_t$  is the time series being investigated for nonstationarity,  $t$  is the trend variable and  $\varepsilon_t$  is the error term

The null hypothesis is that  $\delta = 0$ , implying the existence of a unit root and a nonstationary time series. The Schwarz information criterion is used in order to determine the number of lagged difference terms. Table 6 presents the results for the ADF-tests.

**Table 6 Unit root tests for regression variables in levels**

<b>China</b>	$\delta$ estimate	Observations*	Prob.**
Exports	1.16	15	-
FDI inflows	-2.62	22	0.28
FDI outflows	-4.11	21	0.02
<b>Hong Kong</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.04	18	0.15
FDI inflows	-3.18	23	0.11
FDI outflows	-3.54	23	0.06
<b>Indonesia</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-4.64	18	0.01
FDI inflows	-2.73	22	0.23
FDI outflows	-2.86	23	0.19
<b>Korea</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.64	22	0.05
FDI inflows	-3.71	18	0.05
FDI outflows	-1.92	23	0.61
<b>Malaysia</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-2.30	23	0.42
FDI inflows	-1.46	23	0.81
FDI outflows	-2.27	23	0.43
<b>Singapore</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-2.40	18	0.37
FDI inflows	-3.59	23	0.05
FDI outflows	-5.16	23	0.00
<b>Taiwan</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.41	23	0.07
FDI inflows	-5.08	22	0.00
FDI outflows	-3.88	22	0.03
<b>Thailand</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-2.33	21	0.40
FDI inflows	-6.86	20	0.00
FDI outflows	-2.16	23	0.49

\* After adjustments

\*\*The probability of observing  $\delta$  estimate less than or equal to the one observed given  $\delta=0$ . MacKinnon (1996) one-sided p-values.

The low number of observations unfortunately reduces the reliability of the test but Table 6 clearly indicates that the hypothesis of nonstationarity for the various regression variables cannot be rejected. The exports variable is especially problematic. To avoid the problem of spurious regression, the time series have to be transformed to make them stationary. Consequently, we take the first differences of the time series and the ADF-test is re-run. Table 7 presents the results of the ADF-test on the data in first difference form.

**Table 7 Unit root tests for regression variables in first difference**

<b>China</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-1.22	15	0.87
FDI inflows	-2.52	22	0.32
FDI outflows	-5.05	19	0.00
<b>Hong Kong</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.78	22	0.04
FDI inflows	-3.60	18	0.06
FDI outflows	-7.42	22	0.00
<b>Indonesia</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-4.65	22	0.01
FDI inflows	1.06	17	NA
FDI outflows	-6.35	22	0.00
<b>Korea</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-4.10	17	0.03
FDI inflows	-4.65	17	0.01
FDI outflows	-4.75	22	0.01
<b>Malaysia</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.94	22	0.03
FDI inflows	-4.89	22	0.00
FDI outflows	-5.12	22	0.00
<b>Singapore</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.74	21	0.04
FDI inflows	-4.69	20	0.01
FDI outflows	-4.32	17	0.02
<b>Taiwan</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-5.68	21	0.00

FDI inflows	-4.13	19	0.02
FDI outflows	-4.96	21	0.00
<b>Thailand</b>	$\delta$ estimate	Observations*	Prob.**
Exports	-3.54	20	0.06
FDI inflows	-3.83	18	0.04
FDI outflows	-4.02	22	0.02

\* After adjustments

\*\* The probability of observing  $\delta$  estimate less than or equal to the one observed given  $\delta=0$ . MacKinnon (1996) one-sided p-values.

Table 7 indicates that differencing has turned most of the time series stationary. However, some time series are still nonstationary in their first difference form, notably exports from China.<sup>4</sup> Due to the indication of nonstationarity, the empirical analysis is performed by using the data in first difference form. Differencing destroys some of the information about the long-run relationship between the time series but since this paper uses annual flows of FDI and trade this is not believed to be a serious problem as focus lies on the short-run relationship.

#### 4.2 Estimation and results

As a first step, individual time series regressions are performed for the eight East Asian economies using the data in differenced form. Table 8 presents the results.

**Table 8 Time series regressions**

Country	Constant	FDIIN	FDIOUT	R <sup>2</sup>	Adj. R <sup>2</sup>	N
China	16.569 (2.99)***	0.179 (0.20)	-4.618 (-2.26)**	0.12	0.02	19
Hong Kong	1251.833 (4.78)***	0.975E-01 (-0.23)	0.529 (1.38)	0.34	0.27	23
Indonesia	5.906 (1.41)	0.101 (0.13)	-0.669E-01 (-0.09)	0.02	0.01	23
Korea	128.464 (3.45)***	1.217 (0.82)	7.001 (2.42)**	0.34	0.28	23
Malaysia	135.171 (3.22)***	0.884 (0.97)	3.495 (2.17)**	0.42	0.36	23
Singapore	974.067 (2.19)**	2.135 (3.63)***	-1.024 (-2.01)*	0.38	0.32	23

<sup>4</sup>Appendix C presents a graph of the Chinese export flows.

Taiwan	211.870 (2.51)**	3.557 (1.75)*	1.440 (1.17)	0.27	0.19	23
Thailand	48.286 (4.16)***	-1.684 (-2.61)**	3.278 (0.62)	0.31	0.23	21

Note: t-statistics within parenthesis. The symbols \*, \*\* and \*\*\* denote statistical significance at the 10, 5 and 1 per cent level, respectively.

Table 8 reveals that the coefficient for *FDIIN* has a positive sign for all economies except Thailand. For Singapore and Taiwan, FDI inflows are found to have a significant positive effect on total exports but in Thailand inflows have a significant negative effect on total exports. The results are more mixed for the *FDIOUT* variable. The coefficient takes a positive sign for five economies out of eight. Furthermore, there are two cases of a significant negative effect of FDI outflows on exports (China and Singapore) and two cases of a significant positive effect (Korea and Malaysia). In short, the results of Table 8 seem to suggest that FDI inflows tend to increase total exports while FDI outflows can function both as a complement and a substitute for exports but the support is not very strong. The indications of a positive effect from FDI inflows support the idea of export-platform FDI in the East Asian economies.

However, the reliability of the results from the time series regressions is reduced by the low number of observations. The results for China are also highly suspicious since both the total exports and FDI inflows time series were still nonstationary even in differenced form.

To increase the number of observations, we turn to panel data estimations. The Hausman test suggests that a fixed effects model (FEM) should be used for the sample of East Asian economies.<sup>5</sup> The test statistics for the slope parameters are estimated by using the White heteroscedasticity consistent estimator. Table 9 presents the results for the total sample.

**Table 9 Fixed effects model, total sample**

Variable	B	Std. error	t-value	Sig.
FDIIN	0.873	0.355	2.46	0.015
FDIOUT	-0.336	0.317	-1.06	0.292
Dependent variable = Total exports		$R^2 = 0.37$		
Number of observations = 178		$Adj. R^2 = 0.28$		
<i>Hausman spec. test = 7.48</i> (Critical value at the 5 per cent level = 5.99)				

<sup>5</sup>Using a random effects model (REM) does not substantially alter the results.

Table 9 indicates that FDI inflows have a significant and positive effect on host country exports, providing further evidence for export-platform FDI. No indications that FDI outflows from the exporting country affect the volume of exports is found.

Since there were indications of nonstationarity also in the differenced time series for China, we re-run the regression, excluding the observations for China. The results are presented in Table 10.

**Table 10 Fixed effects model, reduced sample**

Variable	B	Std. error	t-value	Sig.
FDIIN	0.857	0.339	2.53	0.013
FDIOUT	-0.342	0.303	-1.13	0.261
Dependent variable = Total exports		$R^2 = 0.17$		
Number of observations = 159		$Adj. R^2 = 0.16$		
<i>Hausman spec. test = 7.36</i> <i>(Critical value at the 5 per cent level = 5.99)</i>				

The results for the reduced sample are very similar to the results for the total sample. Inflows of FDI are still found to have a significant positive effect on host country exports. FDIOUT is insignificant as for the total sample.

In order to provide a reference point for the results which have been found, another panel data regression is run on an additional sample of economies. The sample consists of the EU-15 economies and covers the same time period (1980 to 2003).<sup>6</sup> Unit root tests indicate that there are nonstationarity problems also in the EU-15 sample (not reported) so the regression is run on the data in differenced form. The Hausman test suggests that a random effects model should be used but the results when using a fixed effects model are similar.<sup>7</sup> The results are presented in Table 11.

**Table 11 Random effects model, EU-15**

Variable	B	Std. error	t-value	Sig.
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<sup>6</sup>There are inconsistencies in the reported FDI data for Belgium and Luxembourg so the observations for these two economies have been excluded.

<sup>7</sup>The null hypothesis for the Hausman test is that we have a random effect. The test statistic is chi-square distributed ( $\chi_k^2$ ) where  $k$  is the number of explanatory variables.

Constant	283.587	88.961	3.19	0.001
FDIIN	-0.462E-01	0.517E-01	-0.90	0.371
FDIOUT	0.188	0.630E-01	2.99	0.003
Dependent variable = Total exports		$R^2 = 0.16$		
Number of observations = 281		$Adj. R^2 = na$		
<i>Hausman spec. test = 0.78</i>				
<i>(Critical value at the 5 per cent level = 5.99)</i>				

Table 11 indicates that the results for the EU-15 economies differ from the results for the East Asian economies. For the case of the EU-15 economies, FDIIN has a negative coefficient but is not significant and consequently there is no indication of export-platform FDI inflows to the EU-15 economies. FDIOUT has a significant and positive coefficient, suggesting that FDI outflows complement exports, possibly as a result of an increase in demand for intermediate goods in the host countries.

If export-platform FDI indeed is important for the East Asian economies, FDI inflows should result in an increase in export flows from the host country. Granger causality tests can be used to analyse this. In general, the idea of Granger causality is that while past events can cause current events, future events cannot cause current events. In our case we want to examine whether FDI inflows Granger-cause export flows. The Granger causality test therefore involves estimating the following two regressions:

$$FDIIN_t = \sum_{i=1}^n \alpha_i EXP_{t-i} + \sum_{j=1}^n \beta_j FDIIN_{t-j} + u_{1t} \quad (3)$$

$$EXP_t = \sum_{i=1}^n \lambda_i EXP_{t-i} + \sum_{j=1}^n \delta_j FDIIN_{t-j} + u_{2t} \quad (4)$$

The null hypothesis is  $H_0: \sum \alpha_i = 0$ . The direction of causality suggested by the Granger causality test is sensitive to the number of lags which are used. Therefore, this paper performs all Granger causality tests for one, two and three lags. Since there is a limited number of observations available, it does not seem reasonable to use more than three lags. However, a more formal approach to determine the number of lags to use for Granger causality tests is to calculate the value of the Akaike Information Criterion (AIC). This criterion suggests that the lag with the lowest computed AIC value should be used.<sup>8</sup> The Granger causality regressions are estimated

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<sup>8</sup>The AIC is defined as:  $\ln AIC = \left(\frac{2k}{n}\right) + \ln\left(\frac{RSS}{n}\right)$  where k is the number of regressors, n is the number of observations and RSS is the residual sum of squares.



for one to four lags, for those economies where indications of Granger causality are found. The results are presented in Appendix E.

Granger causality tests are also sensitive to nonstationarity in the time series. Table 7 reveals that the time series for Chinese export flows and FDI inflows as well as Indonesian FDI inflows were still nonstationary even in first difference form. The Granger causality tests involving these time series are still presented for consistency reasons, but the interpretation of the results based on these time series should be done with extreme caution.

A summary of the results of the Granger causality tests for FDI inflows and exports are presented in Table 12. An asterisk indicates the number of lags suggested by the AIC. Table D.1 in Appendix D presents the detailed results.

**Table 12 Granger causality tests, exports and FDI inflows**

Economy	Causality	Number of lags
<b>China</b>	Independence	1-3
<b>Hong Kong</b>	Independence	1*
	Independence	2
	EXP Granger-causes FDIIN	3
<b>Indonesia</b>	Independence	1
	Independence	2
	FDIIN Granger-causes EXP	3*
<b>Korea</b>	EXP Granger-causes FDIIN	1
	EXP Granger-causes FDIIN	2*
	FDIIN Granger-causes EXP	3
<b>Malaysia</b>	Independence	1
	Independence	2
	FDIIN Granger-causes EXP	3*
<b>Singapore</b>	Independence	1-3
<b>Taiwan</b>	Independence	1
	FDIIN Granger-	2*

	causes EXP	
	FDIIN Granger-causes EXP	3
<b>Thailand</b>	Independence	1-3

For the case of China, Singapore and Thailand there is independence between the two time series for all three lags. There are five cases where FDIIN Granger-causes EXP and three cases where EXP Granger-causes FDIIN. For Korea, exports Granger-cause FDI inflows for the first two lags but for the third lag FDI inflows Granger-cause exports. For the case of Indonesia, Malaysia and Taiwan, Granger causality from FDIIN to EXP is found for the same number of lags suggested by the Akaike Information Criteria. In general, the results indicate that the direction of causality tends to go primarily from FDI inflows to export flows.

Finally, we also use Granger causality tests to further analyse the relationship between outflows of FDI and source country exports. Equations (3) and (4) are estimated, but using FDIOUT instead of FDIIN. The AIC values are also computed. Table 13 presents a summary of the findings while Table D.2 in Appendix D and Table E.2 in Appendix E present the complete results.

**Table 13 Granger causality tests, exports and FDI outflows**

Economy	Causality	Number of lags
<b>China</b>	Independence	1
	FDIOUT Granger-causes EXP	2
	EXP Granger-causes FDIOUT	3*
<b>Hong Kong</b>	Independence	1*
	FDIOUT Granger-causes EXP	2
	Independence	3
<b>Indonesia</b>	Independence	1-3
<b>Korea</b>	Independence	1-3
<b>Malaysia</b>	Independence	1-3
<b>Singapore</b>	EXP Granger-causes FDIOUT	1
	EXP Granger-causes	2

	FDIOUT	
	EXP Granger-causes FDIOUT	3*
<b>Taiwan</b>	Independence	1-3
<b>Thailand</b>	FDIOUT Granger-causes EXP	1
	FDIOUT Granger-causes EXP	2*
	FDIOUT Granger-causes EXP	3

The results for outflows of FDI and exports are mixed. For four out of the eight economies, there is independence between FDIOUT and EXP for all three lags. In the case of Singapore, exports Granger-cause FDI outflows for all three lags while for Thailand outflows of FDI Granger-cause exports for all lags.

Summarising the results of the Granger causality tests, there are indications that FDI inflows tend to Granger-cause exports, providing further evidence for export-platform FDI in the East Asian economies. There are mixed results for the relationship between outflows of FDI and exports.

## 5. Conclusions

The paper has argued that the high performing East Asian economies provide a particularly interesting setting for an analysis of the relationship between FDI and trade. Export-orientation and FDI inflows have provided major contributions to the region's impressive increase in income levels. The paper therefore focuses on the link between FDI flows and exports for China, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan and Thailand.

The study has described the development of FDI and trade flows in the region with a focus on the period after 1980. FDI and trade have become increasingly important for the economies in East Asia.

Unit root tests detected nonstationarity in the time series data. The time series were therefore transformed to first difference form and both time series regressions for individual economies as well as panel data regressions were performed. These regressions provided indications of a positive effect of FDI inflows on host country exports, suggesting that export-platform FDI inflows may be important for the region. The results for the effect of FDI outflows

on source country exports are mixed, suggesting that outflows of FDI can constitute both complements and substitutes to exports as suggested by the theoretical literature.

Granger causality tests indicate that FDI inflows cause export flows. This provides further evidence that export-platform FDI is present in the East Asian economies.

The results of this paper suggest that inflows of FDI tend to have a positive effect on host country exports, possibly due to MNEs performing export-platform FDI. What implications does this finding have for host country policies in other developing economies? The paper has provided several references claiming that export orientation has been important for the improvement in standard of living in East Asia during the past decades. Since the finding of this paper suggest that FDI inflows tend to increase host country exports, inflows of FDI should be encouraged. Liberalising FDI regulations could therefore result in an increase in inflows, possibly stimulating exports and eventually increasing the standard of living in developing economies.

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*Appendix A The effect of the Asian crisis on FDI inflows and trade*

**Table A.1 FDI inflows and the Asian crisis, millions of USD**

	1995	1996	1997	1998	1999
China	37 521	41 726	45 257	45 462	40 319
Hong Kong	6 213	10 460	11 368	14 766	24 580
Indonesia	4 346	6 194	4 678	-241	-1 866
Korea	1 249	2 007	2 640	5 039	9 436
Malaysia	5 815	7 297	6 323	2 714	3 895
Singapore	11 591	9 131	13 608	7 690	16 067
Taiwan	1 559	1 864	2 248	222	2 926
Thailand	2 070	2 338	3 882	7 491	6 091
Sum	70 364	81 017	90 004	83 144	101 447

Source: UNCTAD (2004)

**Table A.2 Trade flows and the Asian crisis, millions of USD**

	1996		1997		1998	
	EXP	IMP	EXP	IMP	EXP	IMP
China	151	138	182	142	183	139
	047	833	791	370	803	483
Hong Kong	180	198	188	208	173	184
Indonesia	742	541	062	615	986	501
	49 727	42 925	53 220	41 679	48 373	27 336
Korea	124	144	129	138	125	116
	402	724	991	097	106	393
Malaysia	78 280	76 063	78 570	76 937	73 172	57 296
Singapore	124	130	124	131	108	101
	649	943	431	651	506	406
Taiwan	115	102	122	114	110	104



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	942	370	081	425	582	665
Thailand	55 628	71 843	57 759	62 084	53 118	42 107
Sum	880	906	936	915	876	773
	417	242	905	858	646	187

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Source: Comtrade (2005)

## *Appendix B Summary statistics and correlation matrix*

**Table B.1 Summary statistics, total sample**

Variable	Variable cases	Mean	Standard deviation	Minimum	Maximum
EXP	186	6 030.88	9 411.99	23.99	34 191.79
FDIIN	193	434.54	1 052.17	-48.94	9 286.25
FDIOUT	190	361.42	1 023.59	-5.81	8 901.84

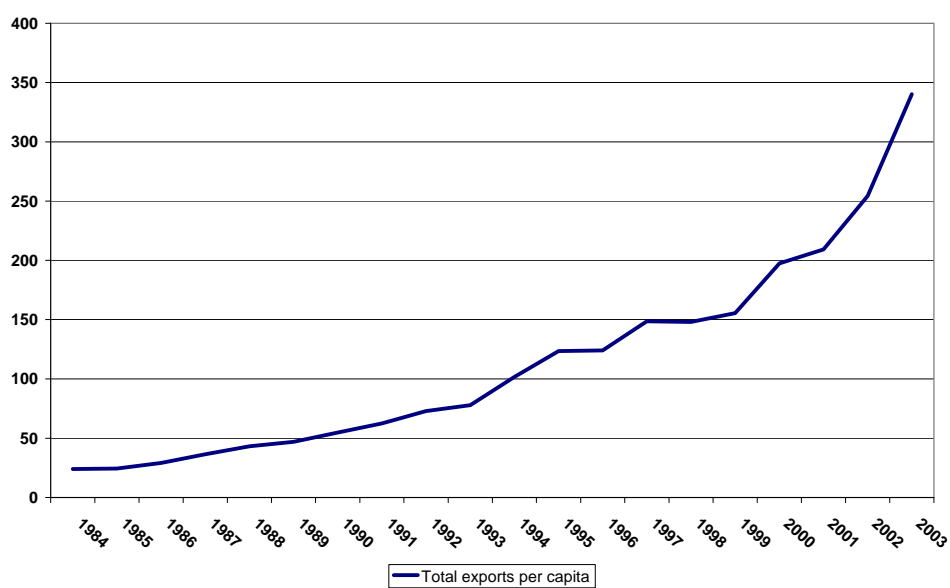
**Table B.2 Correlation matrix, total sample**

Variable	EXP	FDIIN	FDIOUT
EXP	1		
FDIIN	0.400**	1	
FDIOUT	0.247**	0.792**	1

\*\* indicates that correlation is significant at the 1 per cent level

\* indicates that correlation is significant at the 5 per cent level

*Appendix C*



**Figure C.1 Total exports per capita for China, USD**

## Appendix D Granger causality tests

**Table D.1 Granger causality tests, exports and FDI inflows**

<b>China</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	0.348	Do not reject
EXP → FDIIN	1	0.123	Do not reject
FDIIN → EXP	2	0.100	Do not reject
EXP → FDIIN	2	0.171	Do not reject
FDIIN → EXP	3	1.859	Do not reject
EXP → FDIIN	3	0.201	Do not reject
<b>Hong Kong</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	2.994	Do not reject
EXP → FDIIN	1	1.760	Do not reject
FDIIN → EXP	2	2.188	Do not reject
EXP → FDIIN	2	1.459	Do not reject
FDIIN → EXP	3	0.600	Do not reject
EXP → FDIIN	3	3.420	Reject
<b>Indonesia</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	1.406	Do not reject
EXP → FDIIN	1	0.103	Do not reject
FDIIN → EXP	2	3.043	Do not reject
EXP → FDIIN	2	1.027	Do not reject
FDIIN → EXP	3	5.737	Reject
EXP → FDIIN	3	1.538	Do not reject
<b>Korea</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	2.739	Do not reject
EXP → FDIIN	1	9.779	Reject
FDIIN → EXP	2	3.450	Do not reject
EXP → FDIIN	2	4.737	Reject
FDIIN → EXP	3	3.484	Reject
EXP → FDIIN	3	2.656	Do not reject

<b>Malaysia</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	0.040	Do not reject
EXP → FDIIN	1	0.095	Do not reject
FDIIN → EXP	2	0.262	Do not reject
EXP → FDIIN	2	0.600	Do not reject
FDIIN → EXP	3	3.530	Reject
EXP → FDIIN	3	2.072	Do not reject
<b>Singapore</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	0.001	Do not reject
EXP → FDIIN	1	1.111	Do not reject
FDIIN → EXP	2	2.039	Do not reject
EXP → FDIIN	2	2.249	Do not reject
FDIIN → EXP	3	1.253	Do not reject
EXP → FDIIN	3	0.301	Do not reject
<b>Taiwan</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	0.009	Do not reject
EXP → FDIIN	1	0.197	Do not reject
FDIIN → EXP	2	6.451	Reject
EXP → FDIIN	2	0.440	Do not reject
FDIIN → EXP	3	4.861	Reject
EXP → FDIIN	3	1.942	Do not reject
<b>Thailand</b>			
Direction of causality	Number of lags	F value	Decision
FDIIN → EXP	1	0.004	Do not reject
EXP → FDIIN	1	0.498	Do not reject
FDIIN → EXP	2	2.403	Do not reject
EXP → FDIIN	2	0.039	Do not reject
FDIIN → EXP	3	2.549	Do not reject
EXP → FDIIN	3	3.522	Do not reject

**Table D.2 Granger causality tests, exports and FDI outflows**

<b>China</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	0.214	Do not reject
EXP → FDIOUT	1	0.833	Do not reject
FDIOUT → EXP	2	7.467	Reject
EXP → FDIOUT	2	1.887	Do not reject
FDIOUT → EXP	3	1.806	Do not reject
EXP → FDIOUT	3	6.729	Reject
<b>Hong Kong</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	1.787	Do not reject
EXP → FDIOUT	1	0.022	Do not reject
FDIOUT → EXP	2	2.719	Reject
EXP → FDIOUT	2	0.066	Do not reject
FDIOUT → EXP	3	1.147	Do not reject
EXP → FDIOUT	3	2.051	Do not reject
<b>Indonesia</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	0.225	Do not reject
EXP → FDIOUT	1	0.071	Do not reject
FDIOUT → EXP	2	0.310	Do not reject
EXP → FDIOUT	2	0.049	Do not reject
FDIOUT → EXP	3	1.041	Do not reject
EXP → FDIOUT	3	0.027	Do not reject
<b>Korea</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	0.040	Do not reject
EXP → FDIOUT	1	0.153	Do not reject
FDIOUT → EXP	2	0.038	Do not reject
EXP → FDIOUT	2	1.166	Do not reject
FDIOUT → EXP	3	0.167	Do not reject
EXP → FDIOUT	3	1.406	Do not reject
<b>Malaysia</b>			
Direction of causality	Number of lags	F value	Decision

FDIOUT → EXP	1	0.447	Do not reject
EXP → FDIOUT	1	0.168	Do not reject
FDIOUT → EXP	2	0.730	Do not reject
EXP → FDIOUT	2	0.575	Do not reject
FDIOUT → EXP	3	0.994	Do not reject
EXP → FDIOUT	3	0.523	Do not reject
<b>Singapore</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	0.170	Do not reject
EXP → FDIOUT	1	10.347	Reject
FDIOUT → EXP	2	1.447	Do not reject
EXP → FDIOUT	2	10.458	Reject
FDIOUT → EXP	3	2.932	Do not reject
EXP → FDIOUT	3	9.821	Reject
<b>Taiwan</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	1.356	Do not reject
EXP → FDIOUT	1	0.346	Do not reject
FDIOUT → EXP	2	0.211	Do not reject
EXP → FDIOUT	2	0.361	Do not reject
FDIOUT → EXP	3	0.225	Do not reject
EXP → FDIOUT	3	0.529	Do not reject
<b>Thailand</b>			
Direction of causality	Number of lags	F value	Decision
FDIOUT → EXP	1	4.551	Reject
EXP → FDIOUT	1	1.037	Do not reject
FDIOUT → EXP	2	6.808	Reject
EXP → FDIOUT	2	1.369	Do not reject
FDIOUT → EXP	3	5.081	Reject
EXP → FDIOUT	3	1.894	Do not reject

*Appendix E Akaike Information Criterion (AIC)*

**Table E.1 AIC values for exports and FDI inflows**

Economy	Number of lags	AIC value
Hong Kong	1	17.771
	2	17.889
	3	18.084
	4	18.224
Indonesia	1	9.101



	2	9.075
	3	8.449
	4	8.684
Korea	1	13.914
	2	13.573
	3	13.575
	4	13.579
Malaysia	1	14.272
	2	14.360
	3	14.014
	4	14.089
Taiwan	1	15.268
	2	14.648
	3	14.733
	4	14.915

**Table E.2 AIC values for exports and FDI outflows**

Economy	Number of lags	AIC value
China	1	9.021
	2	8.441
	3	8.185
	4	8.283
Hong Kong	1	17.828
	2	17.838
	3	17.979
	4	18.054
Singapore	1	18.894
	2	18.859
	3	18.175
	4	18.753
Thailand	1	11.326
	2	11.129
	3	11.194
	4	11.505