

Technological competitiveness, trade and foreign direct investment

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Technological Competitiveness, Trade and Foreign Direct Investment

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Abstract:

This paper seeks to assess the importance of country-level determinants in affecting the international competitiveness of a country, defined both by export shares and shares in FDI, within a common framework based on a neo-Schumpeterian approach which regards technology as playing a central role in competitiveness. The relationships are tested with data for 40 developing and industrialised countries, and country determinants are found to play a similar role in explaining both inward and outward investment and exports. However, the explanatory power of the model varies over countries, explaining almost all the variation in competitiveness of the developing countries and a much lower proportion of the variation for industrialised countries. Technological capabilities, and the level of development of the country, are found to be two of the key determinants of competitiveness. We conclude that country determinants are equally effective in explaining both trade and FDI, but that in the case of industrialised countries there are additional factors, such as firm specific competitive advantages, which are not related to country-specific characteristics, and are important determinants of competitiveness.

Technological Competitiveness, Trade and Foreign Direct Investment

I: Introduction

The post-war era has been a period of significant growth in both world trade and foreign direct investment (FDI) by multinational enterprises (MNEs). The two are closely interconnected as trade is increasingly internalised by MNEs, with almost one-third of world trade estimated to be conducted on an intra-firm basis (UNCTAD, 1994). The competitiveness of a country, i.e. its ability to compete on international markets, is determined by its trade performance, the activities of foreign-owned affiliates, and the investments of its MNEs overseas. However, the literature on the theory and determinants of trade and FDI have remained largely independent of each other. This paper seeks to address this shortcoming by evaluating these issues within a common framework, based on a neo-Schumpeterian approach that regards technology as playing a central role in competitiveness.

This paper aims to extend the neo-Schumpeterian approach to trade, which stresses the importance of absolute differences in technology in influencing export performance, to consider the absolute advantage of a country (and specifically the firms within a country) in a broader sense than its trade performance alone. For the purposes of this paper, absolute advantage is seen to operate in two distinct ways. The first, and that emphasised by the neo-Schumpeterian school (see for instance Dosi, Pavitt and Soete 1990), is trade performance, and in particular the market share of a country on world export markets. The second, which has largely been neglected by the neo-Schumpeterian approach, is the outward foreign direct investment undertaken by a country's firms, and the inward foreign direct investment undertaken by foreign firms. Both the trade performance of a country and its position with respect to outward investment, are products of the absolute advantage of that country with regard to her competitors. By extending the neo-Schumpeterian framework to include foreign direct investment, a more coherent picture of the effects of technology on a country's competitiveness can be obtained, than by examining trade flows alone.

The technological capabilities of a country (its national system of innovation), affect the export competitiveness of firms within the country, and in particular the sectoral structure of export performance. In addition, technological capabilities influence the existence of MNEs

in a particular country and affect the competitive advantage of those MNEs. As a result, outward investment from a country is partly determined by the national system of innovation of the country. At the level of the firm, the technological capabilities of a firm, as well as leading to improved export performance (see Wakelin, 1995), bestow a particular competitive advantage on the firm, which the firm may wish to internalise through foreign direct investment rather than exports. Thus the technological capabilities of a country, and of the firms in that country, have an impact not only on export performance, but also on the outward investment pattern of a country, and provide a common determinant of both export performance and outward investment.

This paper abstracts from firm specific characteristics, and considers the country level determinants of both export performance and FDI. A number of country determinants are considered in the model including technology (both that embodied in innovations, and disembodied in the skills of the workforce), the level of development of the country, relative market size, and resource availability. Section Two of the paper outlines the theoretical background to the paper, and in particular highlights the similarities between the relevant approaches to trade and FDI. Section Three sets out the empirical model to be tested and explains the data set used in the estimations. Section Four presents and discusses the results, while Section Five gives some conclusions.

II: Theoretical Background

Understanding the role of MNEs has become critical to understanding economic growth and competitiveness, both as a result of the extent of foreign direct investment activities and their increasing domination of international trade. Since 1981, FDI flows have consistently grown faster than GDP or exports on a worldwide basis. In 1991 the global sales of MNEs exceeded \$4.8 trillion, compared with world exports of goods and non-factor services in the same year of \$4.5 trillion (UNCTAD, 1994). Despite the fact that fully one-third of world trade in 1991 was estimated to represent intra-firm trade, trade theories have largely excluded FDI from their theoretical framework and from empirical analysis. On a theoretical level this is due to the assumptions of perfect competition which underpin neoclassical trade theory. Assuming constant returns to scale means that the size of the firm is of no importance, and firms are characterised as atomistic price takers. In order to consider both the role of technology in trade and the behaviour of MNEs, the heterogeneity of firms

needs to be recognised, and this recognition is one of the unifying characteristics of both the FDI literature and the neo-Schumpeterian approach to trade. At the empirical level, the role of FDI has been neglected largely due to the difficulties in modelling the myriad of dynamic interactions and evolutionary processes that underlay MNE activities, and the lack of data with which to test them (Chesnais, 1995).

Our intention in the current paper is to demonstrate that the approach taken by the neo-Schumpeterian school to trade and competitiveness provides an excellent basis with which to bridge the gulf between the trade literature and the received approach to FDI and competitiveness. Despite the growing significance of FDI, little has been done to study its relationship to trade and competitiveness within a unified framework, with a few notable exceptions (see for instance Cantwell, 1989, 1991). This paper aims to assess to what degree a neo-Schumpeterian approach to trade and competitiveness, as developed by Dosi, Pavitt and Soete (1990), can be applied to both FDI and export performance.

There are three main strands of the approach which have much in common with the literature on MNEs, that is the emphasis on technology, the importance of country specific determinants and the emphasis on absolute (or competitive) advantage. Each of these factors is discussed in turn below in some detail.

1. Technology Differences in technology are increasingly taken as an important motivation for both trade and FDI. A conceptualisation of the innovation process as cumulative and firm specific underlies both some approaches to trade (Dosi, 1988), and to FDI (Cantwell, 1989). In the FDI literature (see for instance Dunning, 1993) technology has been considered as conferring ownership advantages to firms. Technology may be said to consist of, (a) ownership advantages that are generally firm specific, both of the codifiable and non-codifiable variety, and which include knowledge pertaining to organising intra-firm transactions efficiently, and, (b) the knowledge inherent in industry and country specific structure of markets that relate to the organisation of efficient transactions (Narula 1993). These ownership advantages provide one of the reasons for a firm preferring direct investment, which internalises these advantages, over arms-length transactions.

In the trade literature the cumulative nature of innovation and skills is used as an explanation for the continuing existence of technology gaps over time, in direct contrast to the automatic diffusion of technology assumed by neoclassical trade theory. Firms, sectors and countries can create specific competitive advantages through innovation, due to the

cumulative nature of innovation and innovatory capabilities. Certain features of innovation highlighted by Dosi (1984, 1988) and Freeman (1982), lead to this accumulation. Among these are the often tacit and non-codifiable nature of technology; the importance of learning-by-doing and learning-by-using in technological change; and the potential to appropriate some of the benefits from innovation. These factors lead to the localisation of the benefits of innovation, and act against its automatic diffusion. Because of the localised nature of the search for innovation and its specificity to the innovating firm, there are costs associated with the adoption of innovation by non-innovating firms. In other words, technology is only partially appropriable by other firms, and the extent to which it can be appropriated depends on the similarity of the firms' environments and past technological capabilities. As present patterns of innovation are influenced by past experience and skills, present innovation occurs as a result of past innovation, and firms, sectors and countries can maintain particular competitive advantages over time giving a basis for trade.

Although technology is primarily a firm-specific phenomenon, it is possible to speak of national technological advantages, which are more than the summation of technological advantages across firms in a given industry in a particular country. Technology is localised in nature, not only at a firm-level because of its path dependency, but also on a country-specific basis, since the interlinkages between users and producers in the innovatory process result in a unique technological profile for each country (Lundvall, 1992). The common institutional framework within the country also influences the development of a technological profile. These national systems of innovation are taken as an important determinant of both export performance of the country and the FDI behaviour of the country's firms. The emphasis on the innovation process as local, cumulative and firm, sector and country specific, provides one of the unifying features between the neo-Schumpeterian approach to trade and the literature examining the behaviour of MNEs.

2. Country specific characteristics The competitiveness of firms are influenced not only by their firm specific technological capabilities, but also by the general economic structure of the country in which the firm is located. These are termed location advantages in the eclectic paradigm (Dunning 1993), since all firms in a given country have potential access to them. This "structural competitiveness" of the country can affect the competitiveness of the firms in the country, as Chesnais (1992) put it:

“their competitiveness will also stem from economy-specific long term trends in the strength and efficiency of a national economy's productive structure, its technical infra-structure and other factors determining the externalities on which firms can build”.

In the trade literature much empirical work has been devoted to analysing the role of country characteristics in trade performance, both in terms of a factor proportions view of trade¹, and more recently including differences in technology between countries as a determinant of trade, (see for instance Fagerberg, 1988, and Amable and Verspagen, 1995), the latter have found an important role for differences in technology in influencing the competitiveness of countries.

The importance of the different components of structural competitiveness in determining firm and national competitiveness varies both with the level of development of the country and the type of international economic activity undertaken. Less developed countries can be expected to be more influenced by natural resource availability, and relative costs than by "created assets" such as technology and skilled labour. As the economy of a country becomes increasingly capital and knowledge intensive, the technological assets of the firm may not be so closely linked to the natural assets of the home country from which its initial advantage was derived, but increasingly dependent on country-specific characteristics such as technology and infrastructure (Narula, 1995). In addition, firms located in industrialised countries may be less reliant on the characteristics of their home country, and more reliant on evolved firm specific characteristics which provide the firm's competitive advantage. This is as a result of the longer period of time firms in industrialised countries have had to develop firm specific characteristics, and the "created" nature of most of the firm assets in industrialised countries. The firm specific advantages of innovation have been shown to have a strong impact on the export performance of UK firms (Wakelin, 1995), although the sectoral pattern of innovation also played a role in UK firms' export performance. Thus the balance between firm specific characteristics and country characteristics can be expected to change according to the level of development of the country.

The role of country-specific characteristics in determining the competitiveness of firms is also determined by the extent of multinationality of the firm and the nature of its

¹ This is an extensive literature, see for instance Leamer (1980) and Wood (1994).

international economic activity. On the one extreme, the ownership advantages of purely domestic-owned firms producing for the local market or for exports are likely to have a stronger relationship with structural competitiveness variables of its home country than a foreign-owned multinational firm based in that country. Such a MNE will have firm-specific assets that derive from the country-specific characteristics of its home and host country, and depending on the extent of its international operations, as well as other locations. This relationship with the home country may be even weaker for outward FDI, especially if the motivation for such outward investment is to acquire strategic assets (Dunning and Narula 1995).

In this paper country characteristics are considered as determinants of export performance and FDI activity for a variety of countries, including both developing countries, newly industrialised countries and industrialised countries. These country determinants are expected to be more effective at explaining the behaviour of developing than industrialised countries. In addition, only the characteristics of the home country in the case of outward investment, and the host country for inward investment, are considered as determinants, neglecting the host and home country characteristics respectively. This represents only a partial explanation for FDI activity, since FDI is influenced by the balance between the ownership, location and internalisation advantages of the host and home country (Dunning 1988, 1993).

3. Absolute advantages and competitiveness Both the FDI literature and the neo-Schumpeterian approach to trade also stress absolute (or competitive) advantage, based on firm specific ownership advantages in the former approach and technological advantages in the latter. Hirsch and Bjaoui (1985) argue that firms' competitive advantages can be independent of factor intensities, but at the same time there is not necessarily a contradiction between the Heckscher-Ohlin approach to trade and firm level advantages. The latter may be consistent with factor endowments, making more intensive use of the more abundant factors of production. Alternatively, competitive advantage may be based on the superior proprietary knowledge of a firm in a way unrelated to factor intensities. As a result both factor endowments and firm specific advantages are determinants of a country's competitiveness.

The competitive advantage of firms is an absolute advantage over other firms.

Comparative advantage acts at the level of the country and influences the pattern of trade specialisation of a country, and thus the sectoral structure. The competitive advantage of firms may be compatible, and interact with comparative advantage, or contradict it. In the work of Dosi, Pavitt and Soete (1990) absolute differences in technology are considered to be more important than endowment based comparative advantage in explaining trade patterns. In their framework, within the trade pattern set out by absolute differences in technology, comparative cost considerations may be relevant, but it is absolute differences in technology which predominate. This view, that the 'competitiveness' of a firm or a country is defined by the presence of an absolute advantage, and not by comparative advantage is also implicit to much of the FDI literature.

III: The Empirical Model

The empirical model tested in this paper aims to estimate the importance of country characteristics in explaining both FDI and exports. Three separate relationships are estimated, one for relative export market share and the other two for relative market shares in inward and outward investment respectively. The estimations are made across 40 countries², with the data pooled across four years, 1975, 1979, 1984 and 1988, using ordinary least squares (OLS). The countries were selected on the basis of the availability of FDI stock figures for those years. The export dependent variable used was each country's exports relative to exports for the entire sample of 40 countries, normalised by the ratio of that country's population, to the population of the whole sample. Likewise the stock of outward investment relative to the stock for the whole sample normalised by relative population, and the stock of inward investment relative to the stock for the sample over relative populations were used for FDI. These dependent variables give an indicator of each country's export or FDI market share with the 40 sample countries taken as a proxy for the world market. The dependent variables are normalised by relative population in order to take account of the impact of varying country size on exports and FDI. By using market shares as the dependent variables, the estimations aim to measure the absolute advantage of countries on international markets,

² These countries are: Bangladesh, China, India, Taiwan, Malaysia, Korea, Indonesia, Sri Lanka, Thailand, Pakistan, Hong Kong, Japan, Canada, Australia, New Zealand, Fiji, Papua New Guinea, Nigeria, South Africa, Brazil, Equador, Venezuela, Mexico, United States, Spain, Portugal, United Kingdom, France, Germany, Netherlands, Denmark, Norway, Finland, Sweden, Austria, Belgium, Italy, Turkey, Switzerland and Singapore.

both in terms of exports and FDI.

The same explanatory variables are included in each estimation, with the inclusion of additional variables to capture the impact of inward investment on export performance and outward investment, and the impact of trade intensity on inward and outward investment, in order to examine the interlinkages between export intensity and FDI. The explanatory variables cover a number of country characteristics, including the level of development of the country, the technological capabilities of the country, primary resource availability, and relative market size. Following from the theoretical section, technology is taken to be one of the fundamental determinants of international competitiveness in this model, although it is expected to be of greater significance in explaining the competitiveness of the industrialised countries in the sample than for the developing countries. Technology is divided into both embodied technology, i.e. innovations, and dis-embodied technology proxied by human capital. Previous macroeconomic studies have used R&D expenditures (Clegg, 1987, Magnier and Toujas-Bernate, 1994) as a proxy for innovation. However, as such data are not available for a sufficiently large number of countries for the same years, we will use the ratio of patents granted in the country in question to the total number of students at the tertiary level as an indicator of a nation's technological capability (PATPER)³. We hypothesise that the higher the ratio of patents granted to the skilled population (PATPER), the greater the competitiveness of the country on export markets, and the greater the advantage of that country to MNEs either as a host or a home country. Secondly, human capital is included as a separate explanatory variable as an indicator both of the level of infrastructure available in the country, and the level of skills in the country, the latter indicating disembodied technical progress. Papanastassiou and Pearce (1990) have used the proportion of scientists and engineers in total employment, while Dunning (1980) used a skilled employment ratio (the ratio of salaried employees to production workers). Again due to limited data availability, we are unable to use either of these indicators. Instead, we take a ratio of total enrolment of students at the tertiary level⁴ to total population of the country in question (HCPOP). The development and availability of tertiary education

³ Sources: UNESCO Statistical Yearbook, 1991, and United Nations Statistical Yearbook, various issues. There are certain limitations of patents as a measure of innovative activity, see Pavitt (1985) for a survey of the issues involved.

⁴ Source: UNESCO Statistical Yearbook, 1991.

varies widely among countries, and a large proportion of tertiary level students as a percentage of population indicates a well developed infrastructure, and skill base. In general we hypothesise that a higher percentage of skilled personnel (HCPOP), will have a positive impact on competitiveness.

An indicator for the level of development of the country was also included in the estimations. Three proxies for the level of development were used, and a number of separate estimates were made using each alternative proxy. these were GNP *per capita* (GNPPOP), gross fixed capital formation *per capita* (GFCFPOP) and aggregate demand *per capita* (ADEMDPOP). The variable which maximised the explanatory power of the estimation was selected. The variables could not be included together as they are highly collinear, so a single indicator of development was preferred. A higher level of development is assumed to be associated with higher export shares and higher shares of outward and inward investment.

A variable for the availability of natural resources is also included in the estimation, based on the percentage of each country's exports made up of primary commodities (XP)⁵. Particularly in the case of the developing countries in the sample, natural resources are expected to be an important source of competitiveness, with export shares being positively determined by the existence of natural resources. This is also the case for a number of industrialised countries such as Australia, although we would expect natural resources to play less of a role in the competitiveness of the industrialised countries. Several studies have examined the effect of the relative abundance of natural resources on the extent and nature of its inward and outward FDI. Swedenborg (1979) and Rugman (1987) have both shown that the possession of natural resources influences the pattern of outward FDI activity by Swedish and Canadian firms respectively. Conversely, it will also affect the pattern of inward FDI - this has been demonstrated by, among others, Kumar (1990), Owen (1982) and Lecraw (1991).

A country that is well endowed in natural resources will, *ceteris paribus*, attract a larger proportion of inward investment, than would a country without such an abundance at the same stage of development. For both developed and industrialised countries we expect that the higher the host country's primary exports as a percentage of the total exports (XP), the greater will be its share of inward investment . Since a high primary export share implies

⁵ Source: World Development Report, various issues

a low manufacturing export share, and in the absence of a significant external stimuli to encourage growth of created asset based ownership advantages of firms, outward FDI would be lower given the limited scope of the ownership advantages of their domestic firms. Therefore, the higher the home country's primary exports (XP) the smaller we expect its outward FDI share to be.

Although demand factors can be considered as consisting of two main features—quality of demand and quantity of demand (Narula, 1993), given the complexities of measuring quality of demand in aggregate terms, we include a variable for the quantity of demand, or market size. Smaller countries are expected to have higher *per capita* shares in export markets due to the small size of the domestic market. Relatively large countries can be more dependent on the domestic market and less engaged in international trade. The larger the market size of the host economy, the greater the attraction for foreign investors since the economies of large scale production are likely to be captured. Therefore the stock of inward FDI to a country is likely to be greater when the size of the market is larger. Previous studies have proxied this with real or real lagged GNP (Culem 1988), GNP, population (Alam 1992, Kobrin 1976) or GDP (Veugelers 1991, Alam 1992). However, location decisions are based not on absolute market size but on relative market size⁶, especially when economies of scale are concerned. What we suggest is that there exists an ideal or optimal market size, and the closer host country markets are to this, the more FDI they will attract. The smaller countries are relative to this ideal market, the more likely they are to have higher export shares. We therefore normalise the aggregate private consumption figures for all countries by that of the 'ideal' market. We assume that Germany presents such an ideal market and divide the private consumption of each country by that of Germany to yield our independent variable that measures relative demand (RELDEMD)⁷.

In the case of outward FDI, large domestic markets present considerable opportunity for growth of sales. Therefore, the attraction of foreign markets, *ceteris paribus*, will be considerably less. This is especially true in the case of MNEs from industrialised countries. However, in the case of outward FDI from developing countries, investments are not

⁶ Dunning (1980) examines a relative market size variable and finds that it is a significant determinant of FDI.

⁷ Private Consumption figures are taken in current prices. Source: IMF, International Financial Statistics Yearbook, 1991.

normally associated with a saturation of the home market. Rather, FDI is often complementary to domestic markets - they are made to seek strategic assets (including technology and capital), and are often either encouraged by government policy, or as a means to circumvent it. In other words, we feel that home country market size is not a determinant of outward FDI from developing countries: for industrialised countries, the greater the home country market size, the smaller the share of outward investment .

In addition to these explanatory variables which are common to the estimations using all three dependent variables, the interrelationships between FDI and trade are also considered in the estimations. For the trade and outward investment estimations, this means including the stock of inward investment *per capita* (IWPOP) as an explanatory variable in the estimations. Both export shares, and shares of outward investment are expected to be positively related to the level of inward investment. In the case of exports, firms frequently undertake inward FDI in a country and then subsequently export from that country, in particular this may occur when the country is part of a customs union (such as the European Union) or a free trade agreement, and thus has preferential access to markets. Only in the case where the domestic market of the host country provides a large enough market, would we expect inward investment not to be associated with exports. Competitive countries, which have a higher level of outward investment, are also likely to attract high inward investment, with firms seeking out the highly developed assets of the competitive country. Thus we would expect a positive relationship between inward investment (IWPOP) and outward investment shares.

The development of a firm's ownership advantages is influenced by the extent to which it is exposed to international competition. Economies which are protected from the activities of foreign-owned enterprises by pursuing an import-substituting policy not only limit the extent of their imports, but effect the quality and quantity of their exports, due to the limited nature of the ownership advantages of their firms. For the estimations with the inward investment share as the dependent variable, trade intensity (TI), measured by the sum of exports and imports of each country over its population, is included to capture the degree to which the country participates in international markets. Countries that have an import-substituting policy orientation will attract relatively less inward FDI than countries with export-oriented economy which tend to have a high trade intensity. We expect that the greater a country's participation in international trade (TI), the larger will be its inward FDI

per capita.

To summarise, the three relationships estimated are given below. The export relationship estimated is:

$$\frac{X/\sum_i X}{pop/\sum_i pop} = f(gnppop, patper, hcpop, xp, reldemd, iwpop) \quad (1)$$

where the dependent variables is the ratio of export (X) share to population (pop) share, where the market is defined as the sum over i, all the countries in the sample, and the explanatory variables are as defined earlier.

The relationship with outward investment is given below:

$$\frac{OW/\sum_i OW}{pop/\sum_i pop} = f(gnppop, patper, hcpop, xp, reldemd, iwpop) \quad (2)$$

where OW is the stock of outward investment.

Analogously, the relationship for inward investment is given below with trade intensity (TI) in place of inward investment as an explanatory variable:

$$\frac{IW/\sum_i IW}{pop/\sum_i pop} = f(gfcfpop, patper, hcpop, xp, reldemd, ti) \quad (3)$$

where IW is the stock of inward investment. For the inward investment estimation, gross fixed capital formation *per capita* (GFCFPOP) is the development proxy which maximises the explanatory power of the estimation, while for the other two estimations GNP *per capita* (GNPPOP) is preferred.

The heterogeneous nature of the countries included means that a number of different estimations were made. First, a restricted model including all the countries in a single estimation was made. Second, an unrestricted model was estimated allowing the estimated coefficients to vary according to two separate groups of countries, developing countries and industrialised countries. For both the export estimation and the inward investment estimation the restricted model was rejected relative to the model allowing separate coefficients for the two groups, indicating that the determinants of FDI and export performance vary over these

two groups of countries. The restricted model was not rejected for the outward investment model, very little outward investment is undertaken by the developing countries, and as a result, the results are presented for the industrialised countries alone for the outward investment model⁸.

However, even with separate estimations for developing and industrialised countries, there is a great deal of heterogeneity among the developing countries, which include both newly industrialised countries (NICs) such as Singapore and Taiwan, and relatively undeveloped countries such as Papua New Guinea. As a result, the estimation including all the developing countries together was taken as the restricted model, and an unrestricted model allowing the coefficients to vary over the two groups, NICs and developing countries, was estimated for both inward investment and exports. In both cases the restricted model was not rejected, indicating that there is no significant variation among the determinants of exports and FDI over these two groups of countries⁹.

IV: The Results

Exports (Estimations 1&2)

The regressions for export market share were made separately for developing (Estimation 1) and industrialised countries (Estimation 2) and are presented in Table 1. As expected, the explanatory power of the estimation was considerably higher for developing countries than for industrialised countries. Thus country-level determinants explain a greater part of the export performance of developing than industrialised countries, indicating that other factors - such as firm specific competitive advantages - are of more importance than country determinants in the context of industrialised countries. For developing countries, their firms' competitive advantages may be more closely related to their country characteristics, since their export activities appear to be largely explained by a combination of country-level determinants.

****TABLE 1 ABOUT HERE****

In the case of the export competitiveness of the industrialised countries the positive

⁸ This has no affect on the results although the explanatory power of the estimation is lower considering the industrialised countries alone.

⁹ Time dummies were also included in each estimation, in order to test for structural breaks across the four years included. As none of the time dummies were significant, they are not included in the final specification.

and significant independent variables are PATPER and GNPPPOP, at 6% and 5% respectively, indicating that technological capability and the level of development are the most important factors in determining the export competitiveness of industrialised countries. The human capital variable has the expected positive sign but is not significant, this may be partly due to weaknesses in the proxy, and the greater efficiency of PATPER in capturing technological capabilities. RELDEMD is negative and significant at the 1% level, confirming our hypothesis that countries which have a relatively small domestic market tend to have a higher propensity to export. Seeking foreign markets permits small countries to achieve economies of scale in their domestic production activities, while large countries which are already able to achieve scale economies due to the size of their home markets have a relatively lower propensity to export. XP is negative but insignificant, and reflects the relatively few industrialised countries in our sample with an absolute advantage in natural resources. The uniformly high levels of inward FDI amongst most of the industrialised countries may be the reason why IWPOP is positive but insignificant.

In the case of the developing countries' export competitiveness (Estimation 2), both technological capability (as measured by PATPER) and the level of inward investment *per capita* are also positively significant at the 1% level. When considering the estimations separately for NICs and other developing countries¹⁰, the positive and significant relationship between the patent variable and the export share is found to be only for the NICs. This is consistent with our expectations, as the NICs are up-grading into high valued-added export markets in which technological capabilities form a significant part, where as many of the other developing countries have production concentrated in low value added sectors in which export performance is determined more by relative costs and resource availability than technology. The significance of the inward investment variable suggests that for countries with a high level of inward FDI *per capita* tend to be more competitive on international trade markets. Through inward FDI, the export competitiveness of developing countries appears to be enhanced. It is important to note that our dependent variable measures the export competitiveness of both domestically and foreign owned firms in a given country. Indeed, in some countries where the encouragement of inward FDI for export-oriented production is an important component of economic policy, as in much of East Asia,

¹⁰ The estimations are not shown here, as the separation was rejected by an F-test.

export competitiveness may actually effectively measure the export competitiveness of inward FDI. High inward FDI also indicates that the country has assets which are of interest to MNEs, and these same assets may provide the basis for a relatively high share in world exports.

The primary resource variable (XP) has a negative coefficient that is significant at the 10% level. Although these results may seem to go against conventional wisdom, given that developing countries' exports tend to be resource intensive, it is perhaps worth emphasising that our dependent variable is the market share of exports estimated in terms of *value*. Given that resource intensive exports from developing countries tend to be of a low value-added nature, the market share in terms of value of these countries is low, relative to the capital and knowledge intensive exports of industrialised countries. Indeed, developing countries which have a relatively high market share of exports tend to achieve this through the exports of manufactured goods. As much of the literature on small open economies has noted, countries with small domestic markets tend to both export more, and to attract relatively more inward FDI, a tendency captured by the negative and significant (at the 10% level) value of the relative demand variable RELDEMD. The negative coefficient on the development variable (GNPPOP) is due to collinearity between inward investment, patents and development. As would be expected all three show a strong positive relationship, with more developed countries having higher technological capabilities and higher levels of inward investment. A simple correlation between GNPPOP and the export dependent variable, indicates a positive and highly significant relationship between the two.

The results from Estimations 1 and 2 suggest several points. First, the human capital variable HCPOP appears to be an imperfect indicator of technological infrastructure. While the other technology variable, PATPER is positively significant for both estimations, HCPOP is positive but not significant for both. In general, the same factors appear to be significant for both sets of countries, with the exception of inward investment which is significant only for the developing countries. Overall, the level of development, technological capabilities and relative market size appear to be the most important determinants of export performance. However, it should be noted once again that while the estimation for developing countries has an adjusted R^2 of 0.88, that for the industrialised countries is only 0.31, a considerable difference. It appears that while the same determinants may be significant their ability to explain export performance varies considerably over the two groups of countries.

Outward Investment (Estimation 3).

As indicated earlier, industrialised countries account for almost 90% of outward FDI activity, while the majority of developing countries in the sample either have little or no outward FDI. As a result, the estimations for outward investment shares were made using only the sub-sample of industrialised countries, in order to facilitate comparison between the estimations¹¹. Table 2 presents the results of this estimation.

****TABLE 2 ABOUT HERE****

Only two variables are significant determinants of outward FDI for industrialised countries, the technology variable and inward investment. The level of development variable GNPPOP is highly collinear with inward investment, leading to the negative coefficient on GNPPOP. A separate estimation excluding IWPOP and including GNPPOP gives a positive and significant relationship between GNPPOP and outward investment. In the estimation presented here, IWPOP indicates both the level of inward investment and the level of development of a country, both of which appear to positively influence outward investment. PATPER is positive and significant at the 1% level, indicating that technological capabilities are by far the most important country-level determinant of the share in outward FDI¹². The significance of IWPOP points to the strong interrelationships between the industrialised countries due to the extent of intra-Triad FDI activity which has resulted in a high level of cross investment. Thus a high outward share of FDI is associated with high levels of inward FDI activity, a trend that is closely linked with the globalisation of the Triad.

Overall the most important determinants influencing the level of outward investment of the home country appear to be the technological capabilities of the home country (providing a competitive advantage to the home countries' firms), the level of development of the country and the level of inward investment.

Inward Investment (Estimations 4 & 5)

In the case of inward FDI market shares, the estimation including developing and

¹¹ The results do not change between estimations using the whole sample, and with the industrialised countries alone, although the explanatory power of the latter is lower than when the whole sample is included.

¹² An estimation containing only PATPER has an explanatory power of 47%.

industrialised countries together was rejected relative to an estimation separating the two groups of countries, thus the results are presented separately for industrialised and developing countries (Table 3). As with export shares, the explanatory power of the estimation was considerably higher for developing countries than for industrialised countries, confirming that country-level characteristics play less of a role in explaining the inward investment share of industrialised countries. Due to the high collinearity between GFCFPOP and trade intensity (TI) it was necessary to drop one of them from the estimations. Separate estimations were made with each variable and the estimation with the highest adjusted R^2 , that including trade intensity, was used as the final estimation.

****TABLE 3 ABOUT HERE****

For the industrialised countries, the share of inward FDI seems to be positively influenced by both technological capability (PATPER) and human capital availability (HCPOP) at the 1% level. In other words, countries with strong national systems of innovation attract a large proportion of inward FDI. XP, the natural resource variable, is positive and significant at the 1% level, indicating that the presence of natural resources also acts as an important location advantage attracting inward investment. Relative market size, RELDEMD, had the expected negative sign but was not found to be a significant factor. Given that a large and increasing share of inward FDI to industrialised countries comes from other industrialised countries, the increasing integration between the countries of the Triad, and the fact that their MNE activity is directed towards rationalising production, the economies of scale associated with these countries are no longer effectively measured by their actual domestic market size. For instance, while Belgium on its own represents a small market, by virtue of its membership of the EU, MNEs investing in production facilities there have access to the entire EU. In other words, RELDEMD may be an imperfect indicator of actual market size.

The trade intensity variable, TI, is positively and significantly related to inward investment. Thus countries which are open to trade are more likely to attract inward investment. In addition, there may be some endogeneity here as inward investment leads to increased exports (see the earlier estimations) as firms may then use the host country as an export base. Overall, the countries in the sample show a positive relationship between their level of exports and both inward and outward investment, indicating a complex relationship

between trade and FDI.

For the developing countries, neither PATPER nor HCPOP are significant, indicating that much of inward FDI to these countries is aimed at exploiting non-technology related competitive advantages. The positive and significant coefficient on the natural resource variable XP (at 1%), and the positive and significant coefficient on RELDEMD (at 10%) seem to confirm this, suggesting that inward FDI to developing countries is motivated primarily towards exploiting their natural resources, and secondarily to taking advantage of large domestic markets. Larger countries are also likely to have larger endowments of labour (given their greater size measured by demand), which gives them a cost advantage in labour intensive production, and may be one factor which attracts higher shares of inward investment (the positive coefficient on RELDEMD). The trade intensity variable TI is also positively significant for the developing countries at 1%. Again, open countries appear to be more attractive to inward investment, and there may be some reverse causation between inward investment and exports.

As with the separate estimations for export shares, the estimation for the developing countries has a much greater explanatory power than that for the industrialised countries. The difference in this case is between an adjusted R^2 of 0.87 for the developing countries, and 0.41 for the industrialised countries. Again it appears that factors other than country-level determinants are of greater significance to industrialised countries, while a model based on country characteristics is effective in estimating both shares of inward investment and exports of the developing countries.

There are a number of common determinants which can be seen for all the estimations. One is the importance of technology in influencing both exports and FDI. In the case of industrialised countries, exports and inward and outward investment are all positively and significantly influenced by technological capabilities, measured by the ratio of patents to human capital. The other technology variable, directly measuring human capital, also has a positive and significant relationship with inward investment, although not with exports. For the developing countries, export shares are positively influenced by the patent variable. Thus it appears that particularly for the industrialised countries, technology, or the national system of innovation of the country, is one of the key country determinants of international competitiveness, and one of the determinants which can be used to explain both export

behaviour and FDI.

The connections between FDI (both inward and outward investment) and exports, have also been explored in this paper. Using inward investment as an explanatory variable for both export shares and shares of outward investment, indicates a positive and significant relationship between them, although inward investment only appears to have a significant affect on exports in the case of developing countries. Likewise, inward investment shares appear to be positively and significantly related to trade intensity. In general, countries with high shares of inward investment also appear to have high shares of outward investment, and countries which have a high trade intensity are more likely to have high shares of inward investment. Considering both outward investment and exports as indicators of competitiveness, a plot of the one against the other indicates a positive and linear relationship between the two. The majority of countries in the sample are grouped around the 45° line, with a few countries showing either a higher share in exports than outward investment or vice versa. Those countries in the sample with a higher relative export share than relative outward investment are Singapore, Hong Kong, Belgium and Norway, while those with higher outward investment than exports are the Netherlands, Switzerland and the UK. The former are generally small countries which are highly integrated in international export markets. The latter group is also made up of small countries (with the exception of the UK), but ones which share a tradition of high levels of FDI. In general, outward investment and exports appear to be very strongly related, and given the estimations made in this paper, they also appear to be explained by similar country determinants.

V: Conclusions

This paper has aimed to explain both FDI and export behaviour using the same model of country determinants. The extent to which the model explains inward investment shares, outward investment shares and export shares is very similar. For the industrialised countries the country determinant model explains around 40% of the variation in both outward and inward investment shares, and around 30% of export shares. This is considerably lower than for the developing countries, in those estimations the country determinants model explains almost 90% of the variation in both inward investment shares and export shares (no estimation is made for outward investment shares). Thus the model appears to be equally effective in explaining both exports and FDI, although there is considerable variation between

developing and industrialised countries. In particular, technology appears to be a unifying factor in explaining both export shares and shares of FDI.

Country specific determinants are clearly the most important factors in explaining the competitiveness of developing countries, but the model is not so effective in the case of industrialised countries. This indicates that factors other than country-level determinants play an important part in the competitiveness of the industrialised countries. In the case of inward and outward investment, this may be the characteristics of the home and host country respectively, which are not included in the model. In addition, factors which are specific to firms, and are not captured by the country-level determinants may also be important. It seems evident that in the case of the industrialised countries, firm specific competitive advantages may correspond less closely with the country's absolute advantages than they do for developing countries, thus providing one explanation for the greater explanatory power of country determinants in the case of the developing countries. It is interesting to note, that firm specific competitive advantages appear to be important in explaining both export and FDI behaviour, whereas their relevance has mainly been acknowledged only in the case of FDI. It seems clear, that studies of export competitiveness also need to take into account factors other than country-level determinants, and that firm level studies may be able to shed light on the role of firm-specific factors in influencing trade performance.

Despite these limitations, the results do suggest some implications for policy makers. First, that the development of infrastructural facilities and the enhancement of national systems of innovation are of crucial importance in determining the international competitiveness of their industries. Despite arguments to the effect that globalisation among the industrialised countries has made country-specific factors such as structural competitiveness and national systems of innovation redundant in explaining the activities of MNEs, we have shown that this is in fact not the case. Indeed, perhaps more than ever, the role of government in facilitating the competitiveness of its domestic economy is ever more important, given the central role of technology (Davidson 1988, Dunning 1993). Indeed, Chesnais (1995) suggests that the primary means by which governments in the industrialised world can maintain some degree of economic sovereignty in light of globalisation is by maintaining the effectiveness of their national systems of innovation.

Second, government policy towards FDI cannot be considered in isolation from trade policy. The growth of intra-firm trade, and the extent to which FDI is both trade-

complementary as well as trade-substituting, requires that policy makers take a holistic approach. Contrary to Porter's (1990) view that high levels of inward FDI indicate a declining competitiveness, and outward FDI indicates a increasing competitiveness, our results suggest that in the case of developing countries at least, export competitiveness is significantly influenced by the activities of foreign-owned firms within the domestic economy, as are the outward activities of domestically owned MNEs from industrialised countries. However, it would be equally simplistic to argue that FDI activity always has a beneficial effect on the competitiveness of an economy. Several scholars (e.g. Dunning 1993, Cantwell 1987, 1991, Dunning and Narula, 1994) have argued that the impact of inward FDI varies, *inter alia*, according to the motivation of the FDI, the level of development of the host country and the existing level of technological competence of the recipient industry. Although our results hint at this complexity, a rigorous test of this approach would require an analysis for several countries using time series data on a sectoral basis.

The same caveats are also true with regards to outward FDI. However, unlike inward FDI and exports, outward FDI is not always indicative of the competitiveness of the home country: there is increasing use of FDI to acquire assets, in addition to the use of FDI to exploit the existing assets of the MNE (see contributions to Dunning and Narula [eds], 1995). This represents a means to promote the competitiveness of an economy, by exposing domestic firms to other national contexts and environments, thereby also allowing firms to avoid the constraints associated with developing technological capabilities suited solely to the home market. This underlies the growth of MNEs from the developing countries such as Thailand, Indonesia, Taiwan, India and China, to name but a few, who are engaging in FDI activity overseas with the active support of their home governments to acquire technological assets and competences in overseas locations with the intention of improving their competitive position.

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TABLE 1 Estimation results with export market share as the dependent variable

Estimation	Constant	GNPPOP	PATPER	HCPPOP	XP	RELDDEMID	IWPOP	Adj.R ²	N
1.	3.9284 (2.337)*	0.176E-3 (2.077)**	3.0174 (1.906)*	0.407E-4 (0.763)	-0.439E-2 (0.202)	-0.767 (3.505)***	0.514E-4 (0.088)	0.314	59
2.	0.834 (1.482)	-0.157E-3 (1.119)	13.541 (4.991)***	0.133E-4 (0.788)	-0.105E-1 (1.735)*	-1.6133 (2.071)**	0.542E-2 (8.773)***	0.884	43

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

TABLE 2 Estimation results with outward FDI market share as the dependent variable

Estimation	Constant	GNPPOP	PATPER	HCPPOP	XP	RELDDEMID	IWPOP	Adj.R ²	N
3.	2.098 (0.716)	-0.338E-4 (0.229)	10.727 (3.888)***	-0.424E-4 (0.457)	-0.192E-1 (0.505)	0.305 (0.800)	0.259E-2 (2.557)**	0.402	59

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

TABLE 3 Estimation results with inward FDI share as the dependent variable

Estimation	Constant	TI	PATPER	HCPPOP	XP	RELDDEMID	Adj.R ²	N
4.	-6.200 (2.911)***	0.377E-3 (2.372)**	9.5388 (4.269)***	0.198E-3 (2.576)*	0.963E-1 (2.965)***	-0.374 (1.128)	0.405	59
5.	-1.575 (2.692)***	0.137E-2 (12.31)***	-3.766 (1.199)	-0.189E-4 (1.147)	0.252E-1 (3.988)***	1.224 (1.761)*	0.875	43

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level