DETERMINING FDI FLOWS INTO SCANDINAVIA: THE ROLE OF PHYSICAL AND INTELLECTUAL INFRASTRUCTURE

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Abstract

In a recent global competitiveness report by the IMF, the four Nordic countries all ranked in top ten, attesting to the region's growing attractiveness as a host location for MNCs. This paper investigates the driving forces determining foreign direct investment flows into Scandinavia. We use a panel data set covering FDI inflows to Denmark, Sweden, Norway and Finland for the period 1979-2000. Results suggest that, in addition to traditional determinants of FDI, technological advantages of the region are of particular importance for foreign investors. Thus, evidence is provided for the changing pattern of international production indicating strategic needs for MNCs to acquire assets and technology that are specific to particular locations.

Keywords: Scandinavia, FDI Inflows, Competitiveness, Knowledge Externalities

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1. Introduction

Competitiveness has become a central preoccupation of both advanced and developing countries in an increasingly open and integrated world economy. World output growth has slowed to one of its lowest rates in decades. According to the September 2002 issue of the International Monetary Fund's *World Economic Outlook*, global growth expanded by only 2.2 percent in 2001, the lowest growth rate since the global slowdown in the 1990s. However, these estimates mask important regional competitive differences: although the slowdown in the advanced countries has been remarkably synchronized, it has been less so for the Scandinavian region[1]. Hence, according to the *Global Competitiveness Report 2002*, published by the World Economic Forum, all four Scandinavian countries rank among top ten in global competitiveness[2], with Finland in second place only surpassed by the U.S. As a comparison, in 1997, only Norway was among top ten placed in 10th position. Clearly, the Nordic countries constitute an attractive region for investments, in spite of relatively high labor wages and taxes, but why? This paper aims at identifying the main drivers of foreign direct investment into the region by focusing on its relative comparative advantage stemming from agglomeration forces related to knowledge-driven economic activity.

While traditional trade theory emphasizes comparative advantage captured by differences in factor proportions, new trade theories draw attention to the role of market access as a determinant of industry structure (Amiti, 1998). Economic geography

[1] For the purpose of this study, we define Denmark, Finland, Norway and Sweden as part of Scandinavia, the Scandinavian Region, the Nordic Region and the Nordic countries, and we use these terms interchangeably throughout this paper.

[2]The index ranks 80 countries on factors related to technology, public institutions and the macroeconomic environment. Technological sophistication, innovativeness and entrepreneurship contributes to the high ranking of the Nordic countries and proves that market size is not the most important determinant of a competitive economy.

literature extends this line of research by combining trade costs with scale economies suggesting an agglomeration effect caused by backward and forward linkages in vertically related industries. Consistent with this, knowledge intensive economic activity is expected to locate in certain geographic regions in order to exploit knowledge spillovers via local proximity. Hence, in spite of increased globalization, for knowledge intensive developed countries, agglomeration factors seem to be the key drivers of FDI inflows. This paper draws on both traditional trade theory and the new trade and geography literature in explaining FDI flows into Scandinavia.

While the Nordic countries have quite different physical endowments they have similar GDP per capita and endowment of R&D personnel. The endowment of physical capital per worker differs considerably across the countries with Norway and Finland being more endowed than Denmark and Sweden (Torstensson, 1996). Torstensson (1996) found empirical evidence of a higher value added per employee for most industries in Sweden and Denmark compared to Finland and Norway. However, the mean year of schooling and the endowment of skilled R&D personnel exhibit no important differences, indicating similar endowments of human capital in the Nordic countries (Torstensson, 1996). In addition, Denmark, Norway, Sweden and Finland all have highly competitive economies in spite of relatively small home markets. Moreover, the region is characterized by stable governments, low crime rates and one of the highest standards of living in the world. Although the Scandinavian countries (Denmark, Norway, Sweden and Finland) are all characterized by relatively small home markets with relatively high labor costs, we argue that what makes these countries particularly attractive to FDI is a combination of *access* to knowledge assets and large markets (i.e. the European Single

Market, Russia and Eastern Europe). In particular, Finland's shared border and long tradition of trade with the former Soviet Union together with its good infrastructure has positioned it as a gateway to the "New Europe", Russia and the Baltics. Denmark is gathering significant attention as a distribution center due to its connection to the European mainland and its tradition for shipping. Norway has recently abandoned its economic isolationism and increased foreign interaction through liberalizations of trade laws. On the other hand, Sweden has traditionally been the high-tech and manufacturing powerhouse of Scandinavia with extensive international relations. Hence, the four Nordic countries can be regarded as an economically similar region in terms of attracting FDI inflows. Recognizing the importance of both new trade/new economic geography and comparative cost variables, we test the simultaneous effects of both sets of variables on data for Scandinavia. Since relative factor endowments are similar across the region, particular emphasis is placed on qualitative characteristics pertaining to the intellectual infrastructure, such as inventiveness and technological sophistication, as determinants of FDI inflows. The main argument is that new trade and new economic geography theories are of more relevance to the Nordic countries than the traditional factor-proportion theory due to the particular qualitative characteristics of these countries. Thus, we introduce three new variables in our model in accordance with new lines of research, as motivating FDI flows into Scandinavia.

This article is organized as follows: Section II provides a short review of relevant FDI theory and empirical evidence. Section III introduces the variables and develops testable hypotheses. Section IV describes the data and specifies the model. The results of the estimations are discussed in section V and section VI concludes the paper.

2. Theoretical Foundations and Empirical Evidence

A number of theories have been developed to explain foreign direct investment. A good overview of the main theories can be found in Agarwal (1980), Cantwell (1991), Dunning (1993), De Jong and Vos (1994), and Markusen (1995).

A main strand in the literature involves the Heckscher – Ohlin trade theory, which focuses on differences in relative factor endowments as determinants of trade patterns and specialization. The model rests on the basic assumptions of perfectly competitive environments, constant returns to scale and production of homogeneous goods.

'New trade' theories and the literature on 'geography and trade'[3], on the other hand, depart from the classical assumptions and add elements of increasing returns and differentiated production in an imperfectly competitive environment to explain trade and specialization (e.g., Krugman, 1991a, 1991b, Venables, 1996a). Globalization and the telecommunications revolution have shifted the nature of comparative advantage of the more advanced economies towards an increased reliance on knowledge-based economic activity (i.e. innovation and R&D). Consequently, economic activity based on knowledge assets tends to cluster within particular geographic regions in order to take advantage of knowledge spillovers via local proximity – the so-called agglomeration effects (for a discussion of agglomeration of innovative activity see Audretsch, 1998). Also, as pointed out by recent studies (e.g., Cantwell and Iammarino, 1998; 2000; 2001), agglomeration processes in innovative activities can be accelerated by the increasing role played by multinational firms as creators of innovation across organizational as well as national boundaries. Following this perspective, we argue that locational strategies by MNCs

[3] For a survey on the 'new economic geography', see Ottaviano and Puga, 1998, whilst for a critical overview of the new 'geographical turns' in economics, see Martin, 1999.

depend, in part, on the relative position of the region in a geographical hierarchy, as a consequence of the interaction of knowledge externalities and general location economies, which in turn shape the characteristics of the regional system considered. Hence, according to new trade theories, specific industries are expected to become geographically concentrated and specific countries seem advantageous in attracting certain types of FDI (Krugman & Venables, 1995). It follows, then, that it is the combination of quantitative and qualitative country characteristics, such as market size, R&D intensity, human capital, and institutional infrastructure that determines the location of foreign direct investments.

Empirically, the vast majority of the literature has been preoccupied with the traditional trade theoretic variables related to relative cost factors and market size. Culem, in his seminal work of 1988, examined the bilateral flows among six industrialised countries for the period 1969-1982 and concluded that relatively faster growing markets with regards to the home market of the investor and low relative unit labor costs reinforce FDI (also Pain, 1993, and Hatzius, 2000). Cushman (1985), investigating US inflows and outflows in a sample of developed economies, found that 'a rise in source country wages or cut in its labor productivity encourages FDI out of that country' (p.181). Lower unit labor costs in UK, Germany, the Netherlands and Japan were found to exert an important influence for US investments for the period 1973-1993 (Narula and Wakelin, 2001). Similarly, Liu *et al.* (1997) provided evidence of the fact that inward FDI in China was significantly determined by relative real wage and exchange rates, while Barrell and Pain (1999b) found that lower interest rates at home enhanced Japanese FDI in the US and EU.

Only recently have researchers begun to explore the influence of new trade theories on FDI location. Wheeler and Mody (1992) were among the first to find empirical evidence for agglomeration-related factors, such as quality of infrastructure, degree of industrialization and level of foreign investment in their study of US manufacturing FDI. The role of a good infrastructure was also emphasized by Cheng and Kwan (2000) when investigating the location of foreign activities in China. Head *et al.* (1995), stressed the importance of pure technological spillovers in their work on Japanese manufacturing in the US. Later, Braunerhjelm and Svensson (1996) showed that Swedish multinationals were positively affected by agglomeration forces in especially technologically more advanced industries, thereby providing support for the role of supply and demand linkages as well as knowledge spillovers. In addition, they found strong empirical evidence for the endowment of skilled labor. Agglomeration forces were also found to be at work in Knarvik and Steen (1999) in their study of the maritime industry in Norway. Some statistical support was furthermore obtained for two new variables, the relative R&D expenditure of the host country and the relevant scale of production, which were tested by Barrell and Pain (1999). Finally, Narula and Wakelin (2001) found evidence that the technological level of Germany, the Netherlands and Sweden, captured by the number of domestically produced patents, is a positive long-run determinant of US FDI, suggesting that US firms seek technological advantages in the above mentioned countries during the period 1973-1993. Very few studies have, however, explicitly combined variables from traditional and new trade theories simultaneously to explain FDI inflows (for exceptions see Papanastassiou & Pearce, 1990; Pugel *et al.*, 1996; Brainard, 1997).

3. Hypotheses Development

Drawing on both the comparative advantage theory and new trade theories, the following paragraphs introduce the locational determinants underlying FDI in the Scandinavian countries and states the hypotheses for empirical testing. By including both variables emerging from the neo-classical theory and variables pointing to new competitiveness and knowledge-related factors leading to agglomeration according to recent developments, we seek to test the simultaneous effects of both theoretical perspectives on the Nordic region.

It is worth noting here that 'agglomeration' in its origin refers to concentration of firms of the same industry in certain regions in order to gain from spillover effects among them. Nevertheless, we believe that agglomeration may be considered at different levels of aggregation. Abstracting a little from the original idea, we claim that particular host characteristics act as agglomerative forces 'pulling' foreign direct investment on the scope of benefiting from these nation-wide advantages.

Market size

Conceptually, market size has been positively related to the level of FDI (Buckley and Casson, 1981; Dunning, 1993) and has traditionally been tested as an important element of FDI location. The larger the host market the more appealing for would-be foreign investors due to a greater demand. New trade theories extend this line of argument by emphasizing the role of market access as a determinant of industrial structure. Thus, larger host markets are more attractive since the economies of large-scale production are more likely to be captured here and since trade (transportation) costs can

be reduced by locating production in the market with the highest demand (Krugman, 1980, Amiti, 1998a). In line with previous studies, real GDP can be used as a proxy for market size (**MS**). Although Scandinavia consists of relatively small markets, we expect market size to be positively related to FDI inflows because of its connectedness to larger markets, such as the EU, Eastern Europe and Russia (see Microsoft case A1 in Appendix A), hence:

*Hypothesis 1: **MS** is positively related to FDI inflows*

Export Orientation

The empirical literature on host countries has attached much importance to the role of FDI for the generation of exports. Most of these studies demonstrate that FDI creates considerable exports since foreign firms in general exhibit higher export intensity compared to their domestic counterparts (Jensen, 2002). Some studies furthermore indicate that FDI can play an important role towards diversification or upgrading of the export basket towards either capital and/or knowledge intensive industries (Jensen, 2002). In addition, Aitken *et al*. (1997) show that there may be important spillovers onto the exporting activities of domestic firms associated with the exporting activities of multinational firms. Hence, foreign affiliates locating in a specific country may have a larger market than the home market in mind. One indication of this may be found in the high export intensity of MNCs, which tend to be higher than domestic firms. Especially in small countries, local sales constitute a relatively small part of total affiliative sales. Hence, the more export a country has the more attractive they are for FDI because it indicates a connectedness to the world economy and it provides a motivation for foreign

firms to invest in these countries since, above and beyond the home market, they also have a high level of internationalization in the economy, thus providing a better market opportunity. Moreover, a high level of export indicates that firms within this economy have international market knowledge and possess globally competitive products. This is particularly important for knowledge intensive industries in technologically sophisticated countries, where access to knowledge-based agglomeration factors may provide a strong basis for competitive advantage. Examples of multinational firms investing in the Scandinavian countries in order to service other markets via export of technology intensive products include Microsoft's recent acquisition of Navision, a Danish provider of integrated business software solutions and US based TechTeam Global's, a provider of IT and business support services, recent establishment of a subsidiary in Sweden (see Appendix A, case A1 and A2 for details). Thus, we argue that MNCs invest in the Nordic countries, in part, in order to take advantage of access to larger adjacent markets (we use the same argument above in MS) and the international experience and globally competitive products of that country. It follows, then, that FDI is export oriented. Export orientation (**EO)** is measured as exports, normalized by the recipient economy's GDP, and, thus, we expect:

Hypothesis 2: ***EO*** *is positively related to FDI inflow*s

Labor costs

Traditional trade theories assume that investors make their decisions according to cost differentials. That is firms seek to exploit cheaper factor costs and, hence, are likely

to locate where wages are low. In the Nordic region, where the majority of production is downstream value-added, competitiveness is closely related to efficiency (efficiency-seeking motives, Dunning, 1993) and quality rather than pure cost considerations. Empirical evidence for this can be found in Molle and Morsink (1991), who employ a home wage level variable to proxy skilled manpower and the entrepreneurial competitiveness of a country. The positive impact on FDI in that study is attributed to the fact that high human capital intensity promotes outward FDI and hence the variable is not interpreted as a cost factor (Molle and Morsink, 1991). Similarly, Veugelers (1991) showed that foreign affiliates in Belgium reported a higher responsiveness in their location decision to the skill level of employees than to labor costs, which can be expected to be the same for our sample countries. Consequently, by correcting for hourly productivity a better measure for labor costs, originally developed by Culem (1988), denoted unit labor costs (**ULC),** is incorporated. Since unit labor costs take into account the new trade theories' perspective of productivity, it follows that:

Hypothesis 3: ***ULC*** *is negatively related to FDI inflows*

Cost of Capital

The decision as to where to raise funds for multinationals depends on the lending rate and the level of risk (perceived or real) involved. For instance, if risk averse in terms of exchange rates, multinationals tend to borrow where assets are located, i.e. in the host countries of their FDI.

Alternatively, they can borrow in their home market or in a third market where the interest rate is low. The premise is that there is imperfect international capital mobility, and that interest rate differentials are not entirely compensated by expected changes in exchange rates. Therefore, as long as there are separate currencies within the region studied[4], the effect of interest rate differences will affect FDI flows. The underlying mechanism for this influence on FDI flows rests with the financially integrated multinational firm refinancing its FDI in response to changes in relative interest rates, in order to maximize its wealth. Multinational enterprises are assumed to have information about and access to the cheapest sources of financing due to the geographic diversification of their assets (Kravis & Lipsey, 1982, Culem, 1988). Hence, one would expect a low interest rate in a given host country to increase the tendency of foreign direct investors to borrow in that country rather than in their home country or elsewhere. Since domestically raised funds are not recorded in the balance of payments accounts, where our FDI inflow data originate, the cost of capital is expected to be positively related to FDI inflows. This is consistent with Culem's (1988) assertion that 'if true FDI is defined as the total financial involvement of foreign investors in a host country, one must expect a positive discrepancy between true and recorded FDIs which is *a decreasing function of the interest rate in the host country*' [italics added]. Cost of capital (**CC**), then, is captured by the relative lending rate in the host country and one would expect:

*Hypothesis 4: **CC** is positively related to FDI inflows*

[4] Our panel data cover the period from 1979-2000 and thus are not influenced by the introduction of the Euro in January of 2002 as a result of the EMU. Furthermore, of the Scandinavian countries only Finland has ratified the single currency. Sweden and Denmark remain outside the Euro Zone and Norway is not a member of the European Union.

Physical Infrastructure

Countries with favourable economic environments, such as the Scandinavian countries, are more likely to attract FDI than countries with less favorable economic environments, leading to fixed capital accumulation in these countries. In our model, the effect of physical infrastructure abundance is investigated by including a relative measure of the gross fixed capital formation in the host country. The logic is that 'capital attracts capital' since multinationals seek to locate in economically attractive regions as evidenced by a relatively high level of fixed gross capital formation. Empirical evidence of agglomeration of economic centres suggests that existing industrial structure is a major determinant of inward FDI (e.g., Krugman, 1991; Krugman & Venables, 1995; Markusen & Venebles, 1995). For instance, Bajo-Rubio (1990) tests Spain's physical capital intensity as a factor determining its inward FDI on the basis that MNCs with large capital requirements can face better conditions of large minimum investments when locating in a foreign market. Similarly, Clegg and Green (1999) incorporated a physical capital intensity variable within the EC when examining US investments and obtained a positive significant sign for UK, France Germany and the Netherlands, indicating a similar factor abundance between the home and the host countries. Furthermore, due to incomplete information, multinationals are likely to follow other multinationals and locate in similar regions in an effort to reduce uncertainty regarding the location decision and the existence of high fixed capital may be regarded as a signal of previously established firms. This isomorphic mechanism, termed *mimetic isomorphism* by DiMaggio and Powell (1983), often leads to geographic clustering of firms, such as was the case in Silicon Valley. Thus, economies with a relatively high fixed capital endowment are likely

to be attractive markets for foreign investors seeking to increase their participation through the acquisition of existing firms or the establishment of greenfield operations (see Flextronics case A3 in Appendix A). Thus, a positive relationship between FDI inflows and physical infrastructure (**PHIN**) as proxied by the rate of gross fixed capital formation, as a proportion of GDP, is expected.

*Hypothesis 5: **PHIN** is positively related to FDI inflows*

Technological Sophistication

Globalization and the telecommunications revolution have led to a shift in the comparative advantage of advanced economies toward increased importance of knowledge-based innovative activity (Audretsch, 1998). According to new growth theories (e.g., Romer, 1986; Sala-I-Martin, 1990), knowledge-enhancing activities create externalities, which are then diffused to other firms, thereby reducing their costs. Consequently, knowledge-spillovers become increasingly important for firm's competitiveness and induce firms to locate in certain geographical regions. Criscuolo and Narula (2002), posit that the knowledge base at a national level "supplements and supports firm-specific innovation" and that this "general knowledge" has characteristics of a public good and is potentially available "to all firms that seek to internalise it for rent generation" (p.7). The Scandinavian countries are specialized in knowledge intensive industries[5] and access to knowledge spillovers is a key locational determinant for

[5] Although Norwegian firms traditionally have been involved in natural-resource based sectors, there is a considerable group of firms which has gradually diversified or specialized into higher value-adding activities and another group that has always operated in specialized science-based sectors. Examples of

multinationals investing in this region. According to OECD (2002), research and development (R&D) is considered the most important source of new knowledge, technological progress and ultimately economic growth. R&D expenditure of the business sector of an economy provides a measure of the international competitiveness of the local firms and thus attracts FDI (Kogut & Chang, 1991; Neven & Siotis, 1996). Hence, the extend to which the business enterprise sector[6] invests in research and development activities is likely to have a positive impact on the level of technological sophistication in the economy, which in turn is positively related to FDI inflows (see cases A2 and A3 in Appendix A). Technological Sophistication (**TS**) is captured by business enterprise R&D spending as a percentage of value added in industry and serves as part of the intellectual infrastructure of an economy.

*Hypothesis 6: **TS** is positively related to FDI inflows*

Inventiveness

Knowledge is recognized as a principal source of economic rent and the effective management of organizational knowledge has increasingly been linked to competitive advantage and thus considered critical to the success of the business firm (e.g., Grant, 1996; Spender, 1996).

these firms include Synthesis, which manufactures pharmaceutical intermediates, Navia Aviation, producing aviation navigational aids equipment and Dynal, a biotechnology firm (see Narula, 2000).

[6] The Business Enterprise Sector covers private and public enterprises and institutes serving such enterprises.

For multinational firms investing in the Nordic region access to technological knowledge, which can be transformed into innovative output for commercialization, is of primary concern. The patents of a country provide an output measure of the current knowledge generation capacity of an economy, since they capture both the will and efforts of firms to create scientific knowledge and the subsequent success of their science-oriented activities. Jaffe *et al.* (1993) suggest that patents and references in patent documents can be used to trace knowledge flows. Narula and Wakelin (1998) use patents granted per capita in each country relative to those of the country with the highest value as an indicator of a nation's technological capability. Criscuolo *et al.* (2002) use patent citation data in order to analyse the technological sourcing behavior of foreign affiliates in US and Europe. At an aggregate level, the number of resident patent applications in relation to employment shows the inventiveness (**INV**) of the economy and the efficiency of the labor force, thereby contributing to the intellectual infrastructure of the country. The four Nordic countries share an extremely highly skilled workforce, with virtually the same mean year of schooling (9.5) and endowment of skilled R&D personnel (Torstensson, 1996). For Scandinavia, where the majority of investments are within downstream, technologically advanced industries[7], one would expect the following relationship:

Hypothesis 7: ***INV*** *is positively related to FDI inflows*

[7] Alternatively, in regions where investors are focusing less on innovation potential, patents may be perceived as a block to market entry and hence one would expect the relationship to be reversed.

4. Model Specification

Since our objective is to shed light on the pull factors[8] of FDI flows into the Scandinavian region it seems appropriate to place emphasis on a macro-level analysis of the region's determinants.

Based on our discussion in the previous section, the tested model takes the following form:

$$\mathbf{FDI}_{i,t} = \mathbf{a}_0 + \mathbf{a}_1\mathbf{MS}_{i,t} + \mathbf{a}_2\,\mathbf{EO}_{i,t} + \mathbf{a}_3\,\mathbf{ULC}_{i,t} + \mathbf{a}_4\mathbf{CC}_{i,t} +$$

$$+ \mathbf{a}_5\mathbf{PHIN}_{i,t} + \mathbf{a}_6\mathbf{TS}_{i,t} + \mathbf{a}_7\mathbf{INV}_{i,t} + \mu_i + \varepsilon_{i,t}. \qquad (1)$$

where *i* denotes the host economy, i.e. Denmark, Finland, Norway, Sweden, *t* the time period, i.e. t = 1979-2000 and μ_i fixed effects. The dependent variable, **FDI**, represents the inward FDI flows normalized by the recipient economy's GDP. Consequently, the **EO** and **PHIN** variables are likewise normalized for consistency purposes. The dataset was compiled by various sources of OECD: International Direct Investment Statistics, Annual National Accounts, Economic Outlook and Science and Technology Indicators. Our basic model treats all four countries as parts of a particular region with identical characteristics. However, it is worth mentioning that Norway is the only country in the sample, which is not a member-state of the EU, and it is the most geographically isolated market in terms of adjacency to the mainland. In addition, Norwegian governments have followed an isolationistic policy[9] and it is only recently that they have actively

[8] The push factors (e.g. current account surplus of the investing country) would be captured in part by the constant term of our regressions.

[9] During the 1970s and 1980s foreign firms were required to seek permission from regulatory authorities before investing under the concession laws. According to Kvinge (1994) this may have had a negative impact on FDI flows into Norway. Although these laws were relaxed during the latter part of the 1990s, Norway continues to be isolationistic.

encouraged foreign investors. Thus, we also test the model excluding Norway to check for robustness of our results:

$$\mathbf{FDI}_{i,t} = \mathbf{a}_0 + \mathbf{a}_1\mathbf{MS}_{i,t} + \mathbf{a}_2\,\mathbf{EO}_{i,t} + \mathbf{a}_3\,\mathbf{ULC}_{i,t} + \mathbf{a}_4\mathbf{CC}_{i,t} + \\ + \mathbf{a}_5\mathbf{PHIN}_{i,t} + \mathbf{a}_6\mathbf{TS}_{i,t} + \mathbf{a}_7\mathbf{INV}_{i,t} + \mu_i + \varepsilon_{i,t}. \qquad \mathbf{(2)}$$

where i now denotes Denmark, Finland and Sweden. Furthermore, among the Scandinavian countries, Sweden is the most technologically advanced country, assumed to attract the most technology-oriented FDI. Hence, it seems worthwhile to investigate our hypotheses for the rest of the three countries to check whether agglomeration forces due to capital and knowledge abundance attract foreign investment in those economies as well or whether Sweden is driving our results.

$$\mathbf{FDI}_{i,t} = \mathbf{a}_0 + \mathbf{a}_1\mathbf{MS}_{i,t} + \mathbf{a}_2\,\mathbf{EO}_{i,t} + \mathbf{a}_3\,\mathbf{ULC}_{i,t} + \mathbf{a}_4\mathbf{CC}_{i,t} + \\ + \mathbf{a}_5\mathbf{PHIN}_{i,t} + \mathbf{a}_6\mathbf{TS}_{i,t} + \mathbf{a}_7\mathbf{INV}_{i,t} + \mu_i + \varepsilon_{i,t}. \qquad \mathbf{(3)}$$

where i = Denmark, Finland and Norway.

5. Methodology

The most appropriate method for our purposes seems to be the Least Squares Dummy Variables (LSDV) technique because although we consider the Nordic countries as a homogenous region, country-specific effects should also be taken into consideration. Datasets covering macroeconomic country variables often exhibit heteroscedasticity in

their residuals, leading to unbiased and consistent but not efficient estimates, causing a type II error. In order to account for this problem we use the robust standard errors technique, thus, we obtain estimates corrected for heteroscedasticity.

Another problem we faced was the existence of high correlations between **MS** and one of our factors related to intellectual infrastructure (**TS)** and in some cases high correlations between the two variables related to intellectual infrastructure (i.e. **TS** and **INV)**. From an economic point of view, an argument put forth for the first case would be that the process generation of the GDP (proxying the **MS** here) of a country is different than that behind R&D expenditure and innovation output. Hence, we don't expect the high correlations to be a sign of severe multicollinearity in the model, which may create problems due to biased estimators. Nevertheless, in order to detect whether multicollinearity was a problem to our model, we calculated the *variance-inflation factor* (VIF) and the *condition number*. VIF(β_i) is the ratio of the actual variance of β_i to what it would have been if x_i were uncorrelated with the remaining x's and it is the result of $\mathbf{1/(1-R_i^2)}$ where R_i^2 is the R^2 in the regression of x_i on all the other variables. VIF values less than 20 do not indicate severe multicollinearity. An overall measure suggested by Raduchel (1971) and Belsley, Kuh and Welsch (1980) is the *condition number*, which is defined as the square root of the ratio of the largest to the smallest eigenvalue of the matrix $\mathbf{X'X}$ of the explanatory variables and is assumed to measure the sensitivity of the regression estimates to small changes in the data (Greene, 2000, Maddala, 1977, 1992). Belsley, Kuh and Welch (1980) argue that *condition numbers* less than 20 are not indicative of a problem. Hence, our estimations provide true inferences of the variables used, as nowhere do we detect problems arising from multicollinearity. However, as a

further advanced econometric technique, we proceeded to the orthogonalization (using the 2SLS technique) of the relevant variables in samples where high correlations were obtained, by regressing **TS** onto **MS**, thus, partitioning **MS** into two parts, the fitted values and the residuals. That is, y = Xb + e, where y is the variable with which the vector of variables X is correlated. Then, we obtain the fitted values, $\hat{y}$ = Xb and the residuals e. By construction, these two parts are orthogonal (Greene, 2000), hence we used the residuals of **MS** in the original model in order to check the robustness of our results. Indeed, they are fairly stable as can be observed in Appendix B.

Table 1 provides the descriptive statistics for the full and the groups of countries' samples examined, while the corresponding correlation matrices and the eigenvalues of our variables are provided in Appendix C.

Insert Table 1 here

6. Results and Discussion

Table 2 provides the econometric results of LSDV estimations for our full sample and sub-samples in order to explore the relative strength of agglomeration factors in the Scandinavian region.

Insert Table 2 here

The hypotheses developed in the relevant section seem to be supported in our model specifications. In particular, new trade and new economic geography variables turn out to be highly significant in the full model. All three variables exhibit strong significance; especially the existence of physical infrastructure (**PHIN**) and the inventiveness

coefficient (**INV**) followed by the technological sophistication of the countries (**TS)**. Labor costs, even when accounting for productivity of the countries, do not appear to affect significantly FDI inflows, an indication which is consistent with our argument. Access to cheap labor costs are not believed to be a motive for investing in the Nordic countries (see case A3 in Appendix A), whilst the technological output of their efforts, as indicated by the number of patent applications they produce, is of particular importance. Observing the high significance of the host market size may seem peculiar in the first place, because the countries of interest are of small size and thus we wouldn't expect foreign investors to be interested in catering to the local markets. Nonetheless, and in accordance with our hypothesis of mainly export-oriented MNCs supported in estimations, we claim that absorption of production by the domestic markets is not irrelevant (see case A2 in Appendix A). On the contrary, it is reasonable to believe that combining the two elements, i.e. selling the output at the local market and exporting the rest, broadens the global market share of producers and raises their revenues. Culem's (1988) argumentation in regards to the role played by the lending rate is also supported, though it is not of much significance.

Not accounting for Norway, results are slightly modified, although intellectual infrastructure is again found to exhibit a strong impact on inward investment. However, the lending rate hypothesis looses significance and, even more importantly, the market size hypothesis looses its significance. We assert that access to the local market is of more relevance with regards to Norway compared to the other three countries, because, although the market is relatively small, the country has experienced a relatively high GDP growth, which in turn has resulted in an increase in domestic demand for

particularly construction equipment, consumer goods and services (Kvinge and Narula, 2001). Moreover, since Norway is located in the periphery without direct access to mainland Europe or Russia, and in addition Norway is not a member of the EU, we expect that producers, who establish affiliates in Norway, would be attracted primarily by the skilled workforce, the high buying power and local markets in general.

According to our theory development, it seems worthwhile to exclude Sweden when analyzing the drivers of FDI into Scandinavia. It is interesting to note that in this case, labor costs turn out to comprise an important element for foreign investors. This is in line with the negative, though not significant, sign of the **TS** variable and the highly significant one of the market size (**MS**). That is, MNCs, although they treat the Nordic countries as sharing common features, at the same time distinguish among factors that are country-specific. Technological forces are stronger with respect to Sweden (see case A3 in Appendix A), whilst other forces, such as market size and labor costs accounting for productivity, are more relevant for the rest of the Scandinavian countries.

7. Conclusions

The rapidly changing economic environment with increasing globalization and international competition is altering the driving forces of FDI. As competitive pressure grows, advanced economies find themselves in a comparatively advantageous situation due to the increased importance of efficiency considerations and innovativeness. What is needed in the new "knowledge economy" is the ability to adapt to rapid technological changes and the solution seems to be an advanced legal and institutional infrastructure, highly specialized skills and technological sophistication in the economy.

This paper analyzes the evolution of FDI trends spanning more than two decades, during which the world has changed dramatically as a result of globalizing effects like the emergence of the European Single Market, the end of the Cold War and the technological revolution. Our investigation explores some of the main drivers of FDI into the Scandinavian region with particular emphasis on the role of physical and intellectual infrastructure. Markets with a relatively high level of knowledge-based economic activities attract particularly knowledge intensive FDI. The Nordic countries constitute such a region since they possess the appropriate legal and institutional framework, the necessary entrepreneurship, technology-based sectors, and high levels of funding for R&D to support MNC direct investments. In other words, the Nordic region is attractive to FDI due to its global competitiveness. The empirical results of the present study demonstrate that, although traditional cost factors continue to affect investment locations, agglomeration forces at a country level as measured by the existence of physical and intellectual sophistication exercise an extremely significant role in undertaking production in the Scandinavian countries.

Table 1. Descriptive Statistics of Variables – Full Sample & Sub-Samples

	FDI	MS	EO	ULC	CC	PHIN	TS	INV
Full Sample								
Mean	194.045	113.611	32.5	87.37	11.42	20.87	1.99	16.83
St. Dev.	398.60	34.26	6.71	19.19	3.53	4.72	0.98	6.47
Obs.	88	88	88	84	88	88	84	88
N Excl.								
Mean	222.75	122.14	32.41	86.14	11.23	19.10	2.20	18.73
St. Dev.	451.32	34.35	7.16	19.18	3.61	3.30	1.04	6.41
Obs.	66	66	66	63	66	66	63	66
S Excl.								
Mean	155.08	96.85	31.94	88.54	11.05	22.20	1.54	14.34
St. Dev.	319.34	17.60	5.99	18.30	3.35	4.69	0.56	5.11
Obs.	66	66	66	63	66	66	63	66

Source: OECD on-line Statistics, and Authors' Calculations.

Table 2. Econometric Results for the Full Sample and Sub-Samples

Dependent Variable: FDI, LSDV estimations with robust standard errors

	Full	N Excl.	S Excl.
MS	15.90**	32.78	17.41***
	(2.48)	(1.44)	(2.84)
EO	60.27***	56.95**	65.48**
	(3.09)	(2.47)	(2.25)
ULC	-5.74	-5.99	-6.25*
	(-1.46)	(-1.32)	(-2.09)
CC	39.90*	39.27	51.81
	(1.88)	(1.34)	(1.77)
PHIN	60.42***	32.95	63.30**
	(2.95)	(0.80)	(2.26)
TS	388.78*	500.63*	-169.94
	(1.91)	(1.66)	(-0.99)
INV	43.21***	51.84**	58.51*
	(2.76)	(2.56)	(1.82)
DK			
FIN	-187.56	228.06	-260.92
	(-1.12)	(0.40)	(-0.97)
N	-240.16		-240.26
	(-1.10)		(-1.07)
S	-1190.48**	-1602.14**	
	(-2.61)	(-2.23)	
Intercept	-4075.65***	-3798.62**	-5477.48**
	(-3.04)	(-2.23)	(-2.41)
R-sqr	0.6583	0.6763	0.6519
F-stat.	4.71***	4.90***	3.99***
Mean VIF	3.80	5.75	5.83
C.N.	6.7654	8.1091	10.2545
N	84	63	63

t-statistics are in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

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Appendix A: Illustrative Cases[10] of FDI Flows into Scandinavia

A1: Microsoft's Acquisition of Navison

In 2002, Microsoft acquired Navision, a Danish provider of integrated business software solutions. The acquisition brought together the complementary geographic and product strengths of Navision with Microsoft, enhancing Microsoft's ability to deliver interconnected .NET business solutions for small and medium sized businesses. Because of its deep understanding of customer needs that is delivered through an extensive local partner network, Navision became the center of development and operations for Microsoft Business Solutions in Europe, the Middle East and Africa (EMEA). Given the small market size of Denmark and the fact that the investment totaled approximately $1.3 billion (U.S.) it is safe to assume that export to adjacent markets and the rest of the world was the main motivation behind the investment. A further testimony to this is the fact that two of the main competitors in Europe filed an antitrust complaint with the competition authorities of the European Commission following the acquisition[11].

A2: TechTeam Global establishes Swedish Subsidiary

US-based TechTeam Global provides IT and business support services. Building on an already significant presence in the US, TechTeam began its European expansion in 1996 with the opening of its Chelmsford support center in the UK. After then opening centers in Brussels, Belgium, and Cologne, Germany, TechTeam opened its center in Gothenburg, Sweden, in 2002. TechTeam's Swedish subsidiary, TechTeam Europe AB, was officially formed on 28 March 2002 to drive the company's expansion in Scandinavia. "Gothenburg is centrally located in Scandinavia, so it's easier for us to serve our Swedish and other Scandinavian customers," says TechTeam Europe's country manager for Sweden, Thomas Floback. "As a key part of our expansion, we're planning to build up our Gothenburg operations and expect to employ around 50 people here by the end of 2002." Christoph Neu, VP, TechTeam Europe states: "Our expansion into Sweden is an important step in the further development of TechTeam Europe. Sweden's strong automotive, telecoms and pharmaceutical industries have

[10] The cases are based on information acquired from several sources, including press releases, the Internet and interviews.

[11] The European Commission did not launch an investigation and the acquisition went ahead as planned.

been a driving force in our selection of Gothenburg as our base for the Scandinavian markets."

A3: Flextronics uses Sweden as Launch Site

Singapore-based Flextronics is the world's second-largest supplier of electronics manufacturing services for the communications, networking, computer, medical and consumer markets. It has design, engineering and manufacturing operations in 27 countries. One of Flextronics' largest customers is Ericsson, the Swedish communications giant. In 1997, Flextronics acquired Ericsson's plants at Karlskrona, in the southern part of Sweden. These facilities were used to form Flextronics International Sweden AB and Add the two paragraphs!ecame the headquarters for Flextronics' Western European operations. "The Nordic region, and Sweden in particular, is clearly focused on telecom and IT hardware. This gives Flextronics a good base of potential customers and a qualified workforce," says Flextronics' Senior Vice President, Corporate Marketing, Jim Sacherman. "Although our costs in Sweden are higher than in the lowest-cost locations, Swedish productivity is high and increasing rapidly," says Flextronics' Vice President, Business Development, Tommy Nilsson. "Our highly educated, skilled workforce and efficient infrastructure in Sweden help to keep our Swedish operations competitive. This is why we're concentrating more skills-intensive activities in Sweden while building up lower-cost operations in Eastern Europe. We're currently building an industrial park in Gdansk, Poland, just across the Baltic from our Karlskrona plant – our largest in Sweden - and Western European HQ. Still increasing, Gdansk employs people for labor intensive, mass production activities while our Swedish sites will act more like launch sites for new products and new customers."

Appendix B

Econometric Results for the Full sample and Sub-Samples without correcting for multicollinearity
Dependent Variable: FDI, LSDV estimations with robust standard errors

	Full	N Excl.	S♣ Excl.
MS	15.90**	32.78	17.41***
	(2.48)	(1.44)	(2.84)
EO	60.27***	56.95**	65.48**
	(3.09)	(2.47)	(2.25)
ULC	-5.75	-5.99	-6.25*
	(-1.46)	(-1.32)	(-2.09)
CC	39.90*	39.27	51.81
	(1.88)	(1.34)	(1.77)
PHIN	60.42***	32.95	63.30**
	(2.95)	(0.80)	(2.26)
TS	-107.73	-464.5	-169.94
	(-0.90)	(-1.08)	(-0.99)
INV	43.21***	51.84**	58.51*
	(2.76)	(2.56)	(1.82)
DK			
FIN	-187.6	228.06	-260.92
	(-1.12)	(0.40)	(-0.97)
N	-240.16		-240.26
	(-1.10)		(-1.07)
S	-1190.48**	-1602.14**	
	(-2.61)	(-2.23)	
Intercept	-4912.54***	-5707.74**	-5477.48**
	(-3.04)	(-2.69)	(-2.41)
R-sqr	0.6583	0.6763	0.6519
F-stat.	4.71***	4.90***	3.99***
Mean VIF	6.00	10.13	5.83
C.N.	9.6077	12.3340	10.2545
N	84	63	63

t-statistics are in parentheses
*** p < 0.01, ** p < 0.05, * p < 0.10
♣ The model excluding Sweden is identical to the model in table 2 since we have not corrected for multicollinearity in the original regression.

Appendix C

Correlation Matrix for the Full Sample

	MS	EO	ULC	CC	PHIN	TS	INV
MS	1.0000						
EO	-0.0433	1.0000					
ULC	-0.0898	0.7289	1.0000				
CC	0.2970	-0.6852	-0.5858	1.0000			
PHIN	-0.2998	-0.3714	-0.1543	0.0763	1.0000		
TS	-0.0000	0.5979	0.3761	-0.3092	-0.5471	0.6292	1.0000
INV	-0.2080	0.0090	-0.1720	-0.1182	-0.4033	1.0000	

Correlation Matrix for the sub-sample, Norway excluded

	MS	EO	ULC	CC	PHIN	TS	INV
MS	1.0000						
EO	-0.1288	1.0000					
ULC	-0.2387	0.7013	1.0000				
CC	0.5664	-0.6732	-0.6182	1.0000			
PHIN	-0.1701	-0.3941	-0.0899	-0.1961	1.0000		
TS	-0.0000	0.6816	0.4778	-0.3074	-0.4616	0.5458	1.0000
INV	-0.3284	0.0278	-0.1480	-0.0924	-0.1415	1.0000	

Correlation Matrix for the sub-sample, Sweden excluded

	MS	EO	ULC	CC	PHIN	TS	INV
MS	1.0000						
EO	0.7035	1.0000					
ULC	0.7035	0.7340	1.0000				
CC	-0.5088	-0.6235	-0.5155	1.0000			
PHIN	-0.5615	-0.4145	-0.2821	0.1944	1.0000		
TS	0.5891	0.7038	0.6649	-0.6899	-0.3560	0.4260	1.0000
INV	-0.1920	-0.1185	-0.0102	-0.4441	-0.0985	1.0000	

Eigenvalues of the incorporated variables in the relevant samples

	FULL	N excl.	S excl.
MS	2.9357	2.9754	3.8406
EO	1.6845	1.6477	1.4260
ULC	1.2820	1.3414	0.8494
CC	0.4117	0.5832	0.3699
PHIN	0.3862	0.3211	0.2756
TS	0.0641	0.0452	0.0365
INV	0.2357	0.0861	0.2020