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The economic integration process of the European Union

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Abstract

The ongoing processes of internationalization and globalization have led to a genuinely borderless world economy with a strong regional focus. This paper examines the European Union and to what extent this region is economically integrated over the years spanning from 1982-2006, by mapping the nature and development of Foreign Direct Investments within the EU15. In order to study the degree of European economic integration, this paper analyzes the *structural*, *institutional* and *functional* mode of integration. The empirical results show that the economic structures of EU countries converged over time and that the institutional environment breeds a positive impact on the European integration process. Furthermore, the longitudinal study of intra-regional FDI data is appropriate to analyze the evolving FDI network relations in a temporal dimension. This paper indicates that the dominancy of central European countries slightly decreases, while the periphery region emerges within the EU. In addition, the nature of the intra-European production network has developed into a highly complex network with increasing interdependency among all EU countries.

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Introduction

Today's world economy is genuinely borderless. Firms increasingly engage in international activity and the interdependence among countries has grown as a result of technological innovations, trade liberalization (by reducing political barriers/tariffs) and the increase in demand and consumer tastes (Dunning, 1988a). This process of cross-border movement of economic activity can be referred to as internationalization, with multinational enterprises (MNEs) as their main actors (Dicken, 1992). MNEs explore to obtain linkages outside the home market by foreign direct investments (FDI), international trade and non-equity arrangements (e.g. licensing).

The internationalization process is closely related to globalization, except this process emphasizes more on the functional integration of economic activity and not merely the quantitative increase in cross-border economic activity. There is a qualitative change evolving in the nature and development of the integration process in the world economy. Nowadays, the exchange between nations has transformed in a highly complex structure with firms that have created transnational production networks (Dicken 1986 and Dunning and Narula 2004). The increase in intra-firm and intra-industry trade changed the composition into geographically dispersed and functionally fragmented production processes. The changing nature and composition of the production networks are highly influenced by the institutions and socio-political practices in which they are territorially embedded, because it shapes the macro-structure of the world economy (Dicken, 2004).

Examining the globalization process it is not necessarily a '*global*' process, but can be seen in other geographical perspectives as well. Since the emerging number of Regional Integration Agreements (RIAs), the institutional focus seems to be more on a regional level (Venables, 2000). Recent research (Rugman, 2001) argues that a significant share of trade and FDI takes place among countries which are bounded by RIAs. MNEs predominantly pursue a regional strategy, focusing primarily on trade and production within their home region, whether it is North America, the European Union (EU) or Japan.[1]

[1] The structure of the global economy had changed, by the 1980s, to a triad of three major economic powers: the United States, Japan and the European Committee (Ohmae, 1985).

This study focuses on the European Union. In the 1980s, the relative economic performance of the EC[2] was lower than that of Japan and the United States (Ohmae, 1985). In part, this explains the European Committee's decision to set in train the Single market program in order to improve and function more as an economically integrated region and to retain internationally competitive. The regional integration program lowered the trade barriers and has given an impetus to the spatial interaction of international economic activity within the European Union (Molle, 1994). Given the fact that there is a significant timeline and international activity data available, this paper strives to examine the European economic integration process over time. However, aggregated data does not capture the qualitative changes in the EU. Therefore in order to examine the integration process, this paper's primary contribution is to analyze the nature and development of international activity within the EU in a time and spatial dimension.

This paper examines the following research question:

To what extent is the European Union economically integrated in the 1982-2006 period?

This study attempts to measure to what extent the EU15[3] is economically integrated over the years spanning from 1982 to 2006, by mapping the intensity of one of the most important indicator of international economic activity, namely FDI. The longitudinal intra-EU bilateral FDI data is appropriate to analyze the geographical distribution and economic relations within the EU region from a dynamic dimension and therewith the evolution of the European economic integration process.

In order to understand the dynamic pattern of FDI and international trade within the European Union, this paper studies the theories behind international activity. First, to understand the international economic activity, the motivations behind FDI and international trade will be discussed. Secondly, the theoretical background of FDI and international trade will be examined, which provide the implements for further analysis.

To assess to what extent the EU can be regarded as one economically integrated region, depends on the definition of integration. In order to answer the research question properly this study provides an in depth analysis of the European integration process considering the

[2] EC refers to the European Committee, which later on turned into EU.

[3] The first fifteen EU member countries that joined the EU (see also chapter 5).

economic structural, institutional and functional perspectives of the process. Resulting in the following three sub-questions:

1. *To what extent is the EU economic structurally integrated in the 1982-2006 period?*
2. *To what extent is the EU institutionally integrated in the 1982-2006 period?*
3. *To what extent is the EU functionally integrated in the 1982-2006 period?*

This way the European economic integration process will be analyzed from three different perspective levels. With respect to this in depth analysis this paper endeavours to determine the source and the extent of the economic integration process within the European Union.

This research study is structured in eight chapters. In chapter 2 the major trends of the global economy will be reviewed and described which position the European Union takes within the world economy. Chapter 3 investigates the importance of corporate network relations more closely. In addition, the dynamic character of corporate networks will be explained, in order to clarify the corporate developments and motives to undertake FDI and international trade over time. The fourth chapter reviews the theories of international trade (4.2) and foreign direct investment (4.3), which help to understand the conditions behind decisions for FDI and trade. In chapter 5 the three modes of integration will be discussed and it will be hypothesized what can be expected with respect to theory. Chapter 6 describes the used data (6.1) and the applied methodologies (6.2). Followed by chapter 7, the empirical part of this study, in which the theory and methodologies will be applied and the empirical results exposed. This empirical study examines to what extent the EU is economically integrated over time, divided into three sub-sections corresponding with the three sub-questions or modes of integration: economic structural (7.1), institutional (7.2) and functional (7.3).

The first section (7.1) of the empirical study, examines to what extent the EU countries are structurally integrated in the 1982-2006 period. It examines the nodes of the intra-EU FDI network, which refers to the EU member countries as being the origin and/or destination of international economic activity. This section will apply a hierarchical cluster analysis in order to cluster EU countries with similar economic structures. In addition, a Herfindahl-index will be employed to expose the differences in industrial structures between EU countries. These analyses indicate the homogeneity or heterogeneity among EU countries over time. This way it can be assessed to what extent the EU countries have converge over time, with respect to

their economic structure, and to what extent the EU countries become specialized, with respect to their industrial structures. These static analytical outcomes will be used as a basis for further empirical study in the following sections.

The next section of the empirical analysis (7.2), examines the institutional perspective or the environment in which the European integration process takes place. With the support of a gravity model, which combines the theories of international activity and economic geography, the main sources of the European integration process will be examined. It attempts to determine the potential declaring factors (motives) to undertake FDI over time and what effect some exogenous institutional steps have had on the integration process of the European Union. This might provide valuable information and implications for the EU policy makers.

The last section (7.3) of this empirical study handles the relational aspect of the integration process. In order to determine whether the EU is functionally integrated over the last 25 years, the FDI intensity and the factor mobility are taken into account. At first this section encounters an overview of the intra-EU FDI flows in geographical space and time. This FDI network in a temporal dimension provides the basis for analyses of the European integration process from a more dynamic perspective. Moreover, this section applied a centrality-, core-periphery- and network density analysis, in order to examine the network developments over time and to determine the main host and home countries undertaking FDI within the EU region. This offers an indication of the integration process within the EU. In addition, the spatial interaction pattern will be related to the economic structural and institutional developments, in order to determine the main actors or nature and development of the European integration process. Finally, this section applies the Grubel-Lloyd index as an indicator for intra-industry trade, which examines the structural intra-EU network developments and the interrelation between FDI and trade.

Eventually, in chapter 8 the conclusions are drawn with respect to the research question and some policy or research recommendations are provided in the discussion part.

2. Internationalization and Globalization

Although the focus of this study is on the European Union, this chapter will first give an overview of the macro economic pattern of internationalization. The aim of this chapter is to get an insight of the major economic developments and to assess the position of Europe within the world economy. The first section of this chapter explains sequentially the process of internationalization and globalization (2.1). An insight in the global patterns of international activities is provided by analyzing world FDI and trade flows. Besides the major upsurge of world trade and FDI, two other trends can be observed within today's world production flows, which will be described in section (2.2). First of all (2.2.1), by the 1980's the structure of the global economy had changed to a "triad" of three major economic powers, the United States, Japan and the European Committee (Ohmae, 1985). Secondly (2.2.2), a rising share of FDI and trade within services can be observed, which is also referred to as deindustrialization.

2.1 The process of internationalization and globalization

Recently, the world economy is characterized by a high amount of cross-border activity. National economies become vaguer and international economies have become an issue. This process of increasing involvement in international activity is referred to as the internationalization process (Buckley and Ghauri, 1993). Closely related to the internationalization process is the concept of globalization. Globalization is regarded as an advanced form of internationalization, which not merely emphasizes the increase in cross-border movement, but also takes into account the degree of functional integration of such internationally dispersed economic activities (Dicken, 2003). While the internationalization process only refers to the quantitative increase in cross-border economic activity, the globalization process also highlights the qualitative changes in the organization of international economic activity and the growing interdependence among countries. Multinational Enterprises (MNEs)[4] are the main actors that take part in these processes (Dicken, 1986). MNEs are, by definition, involved in international activities and try to take advantage of the different factor endowments in different countries (Prahalad and Doz, 1987).

[4] MNEs are firms that undertake productive activities outside the country of which they are incorporated (Buckley and Ghauri 1993). MNEs are firms that own a significant equity share of another company (affiliate or subsidiary) operating in a foreign country. According to the IMF and OECD recommendations, when the foreign firm controls more than 50% of the shareholder's voting power or the right to remove or appoint a majority of the members of the supervisory, management or administrative body, than the foreign firm can be defined as a subsidiary.

By means of the internationalization activities of MNEs, linkages outside the home market are created. Dunning (1981a) distinguishes between three alternative options to create linkages outside the home market: FDI, trade and non-equity arrangements[5]. The focus in this paper will predominantly be on FDI and to some extent on trade, which are being used as 'indicators' of the internationalization and globalization process within the EU.

The choice for a company of either FDI, export or a non- equity agreement has become a key issue in theory as in practice (surveyed in Dunning 1981a; Buckley and Casson 1981 and Caves 1982). An international trade relation between two companies is limited to the selling and buying of a product or service. The attractiveness of an international trade relation, as compared to FDI, is the relatively low responsibility between the company and the foreign entity. However, from a strategic perspective, the company may want to influence the operations of the foreign entity and in that case FDI is considered as a suitable option. FDI refers to an investment made to acquire a lasting interest in firms operating outside the economy of the investor.[6] Usually, FDI is used as a mean to create or acquire a foreign subsidiary in order to gain ownership or control over production facilities in other countries.

The emergence of the internationalization process accelerated after the Second World War. This post-war era is characterized by a rapid growth of some 'new' markets, based on new technological possibilities that emerged (Rothwell, 1982). Advances in communications, information and transportation technologies decreased the distance costs between countries, which had previously been seen as a major obstacle for international expansion of firms (Johanson and Vahlne 1977; World Bank 1995; Frankel 1997 and Hill 1997). Furthermore, three major institutions were brought into being which formed the international framework for the rebuilding process of the world economy. Two financial institutions were established in order to create monetary stability, the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (World Bank)[7]. The third

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5 A *non-equity agreement* is a way of going international, where the company has no (or limited) equity involvement with the foreign firm. The most commonly used types are licensing and franchising in which companies sell particular technical or managerial knowledge about economic activities to foreign companies. In essence, the non-equity agreement is similar to FDI. The main distinction is that with FDI the company has (some) *control* on the management of the company abroad. In this paper, this internationalization mode is excluded.

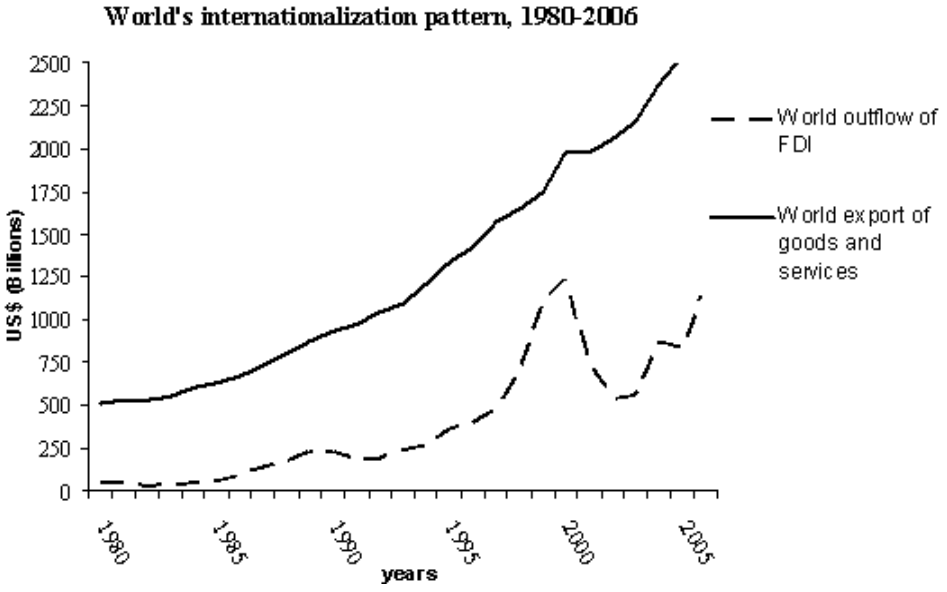
6 This definition is according to the Balance of Payments Manual: Fifth Edition (BPM5). The IMF/OECD definitions (IMF 1993; OECD 1996) include that FDI is an investment in a foreign company where the foreign investor owns at least 10% of the ordinary shares, with the objective of a long-term relationship and significant influence on the management of the firm. FDI flows include equity capital, reinvested earnings and other direct investment capital (e.g. intra-company loans).

7 The primary purpose for the IMF was to encourage international monetary cooperation among nations through a set of rules for world payments and currencies. The initial focus of the World Bank in the post-war period was to facilitate development through capital investment in Europe.

international institution that helped rebuilding the international economy is the General Agreement on Tariffs and Trade (GATT), the predecessor of the World Trade Organization (WTO). The purpose of the WTO is to ensure a stable trade and economic environment with reduced tariff barriers and a prohibition on other types of trade discrimination (Dicken 1986). This liberalization of cross-border movements (by lowering trade barriers) together with the wave of technological innovations and an increase in demand and consumer taste, opened new doors for firms and imposed new opportunities to compete on foreign markets (Dunning, 1988b).

A reflection of the process of internationalization within the past few decades is shown in figure 2.1, by the upward trend of FDI and trade for the period between 1980 and 2006. Data of the past few decades shows that firms more often use FDI as their primary entry mode. The growth rate of world FDI exceeded the growth rate of international trade, which in turn, has grown more than world's output (IMF 2001 and UNCTAD 2001).

Figure 2.1 The internationalization process



Source: UNCTAD FDI-statistics (WIR 2007) and OECD trade statistics (EIM)

From 1980 to 2000, world FDI and trade increased substantially and FDI outflows skyrocket in the late 1990s. However, in 2001, the world recession has set in as a consequence of the terrorist attack on 9/11 and the asset deflation (stock market declines, i.e. dotcom bubble). This breaking point is especially observable in the world's FDI outflows. The outward FDI declined until 2002 and recovered afterwards. In addition, world's exports showed a similar

trend, but with a less observable dip during the recession. This parallel increase in foreign trade and FDI gives the impression that these two phenomena are closely linked. Moreover, Nicoletti et al (2003) found a significant positive correlation between trade and FDI and suggest that factors related to economy size, location and distance affect both FDI and trade. The complex relation between trade and FDI will be further elaborated on, from a theoretical perspective, in chapter 4.

Besides the major upsurge of international trade and FDI, also the nature and development of international activity in the world economy seem to have changed over time. As markets were enlarged and competition had become global, companies were forced to create linkages outside the home market to stay ahead of competition. It is argued that businesses that do not adjust to decreasing distance costs and are not thinking and acting globally will be at a competitive disadvantage (Levitt 1983; Ohmae 1989 and UNCTAD 1993). As a result of the enlargement of markets and the emergence of global competition, companies have been forced to create linkages outside the home market to remain organised in the most efficient way. Therefore, it is likely that the observed expansion of world FDI and trade flows, as shown in figure 2.1, in fact reflects the consequences of worldwide integration policies which have persuaded firms to reorganize production in order to benefit from the advantages that a freer trading environment has created or to seek across borders for an expansion of their market. Furthermore, the rapid increase in international exchange has altered the world economy (Dent, 1996). Nowadays, the exchange between nations is transformed in a highly complex structure, involving geographically dispersed and functionally fragmented production processes on a global scale with MNEs as the coordinators of this transnational production network of value-adding activities (Dicken, 1986).

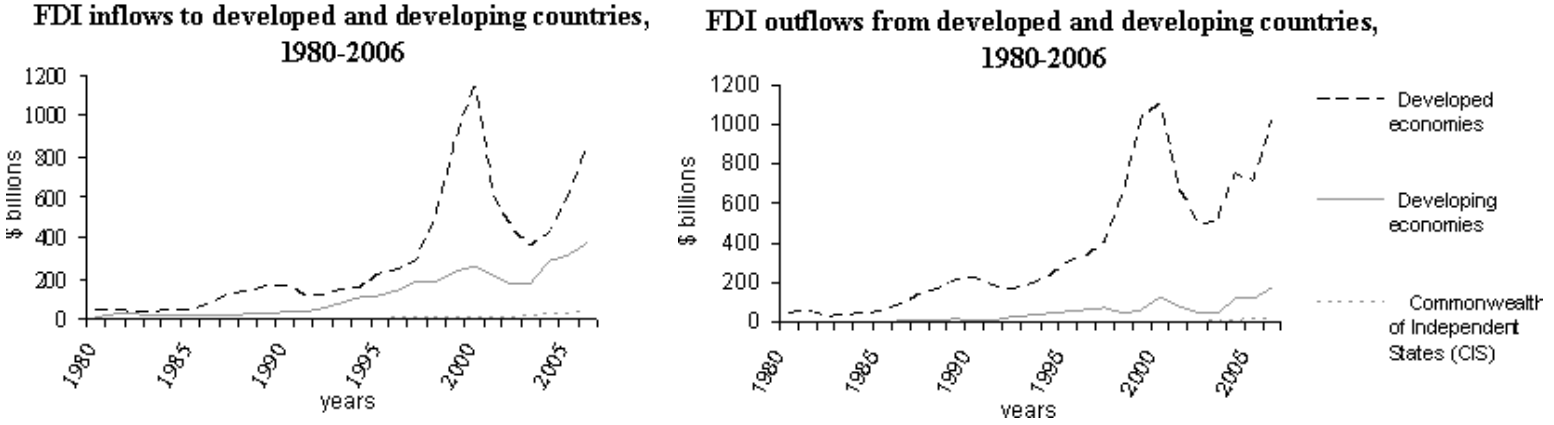
2.2 Regionalization and deindustrialization

The major upsurge in world trade and FDI is not the only phenomenon which has made the world economy qualitatively different from the past. The emergence of a triad of three major powers (2.2.1) and the process of deindustrialization (2.2.2) are two other important developments within the global economy and will be described successively in the following sections.

2.2.1 A triad of economic powers

Transnational networks of production create an economic space which appears to be borderless. However, the nature and composition of these production networks are highly influenced by the institutions and socio-political practices in which they are territorially embedded (Dicken, 2004). The overall increase in FDI and trade holds both for developing as well as for developed countries. However, the vast majority of FDI and international trade takes place between developed countries, see figure 2.2.

Figure 2.2 World in- and outward FDI flows



Source: UNCTAD

The share of FDI flowing from and into the developed economies particularly rose in the 1995-2000 period relatively to the developing nations. In this period, the developed countries accounted for an annual average of over 80% of all FDI inflow and outflow. In 2006, the developed economies still accounted for over 84% of all FDI outflows and approximately three fourths of all FDI inflows (UNCTAD, 2006), making the developed economies important as both *home* and *host* to direct investment. Thus, the global pattern of production is predominantly an activity of the core economies. A possible explanation could be that developed countries have larger markets, these countries contain more beneficial takeover targets and political risks and financial instabilities are more likely to be lower in developed countries. Furthermore, within the global economy a "triad" of three major (developed) economic powers can be found; the United States, Japan and the European Union (Ohmae, 1985). Remarkable is that for all three major economies FDI has become more of an intra-regional nature. The fact that most of the trade and FDI flows stay within each economic power of the triad, is suggested to be the result of integration policies with a regional rather

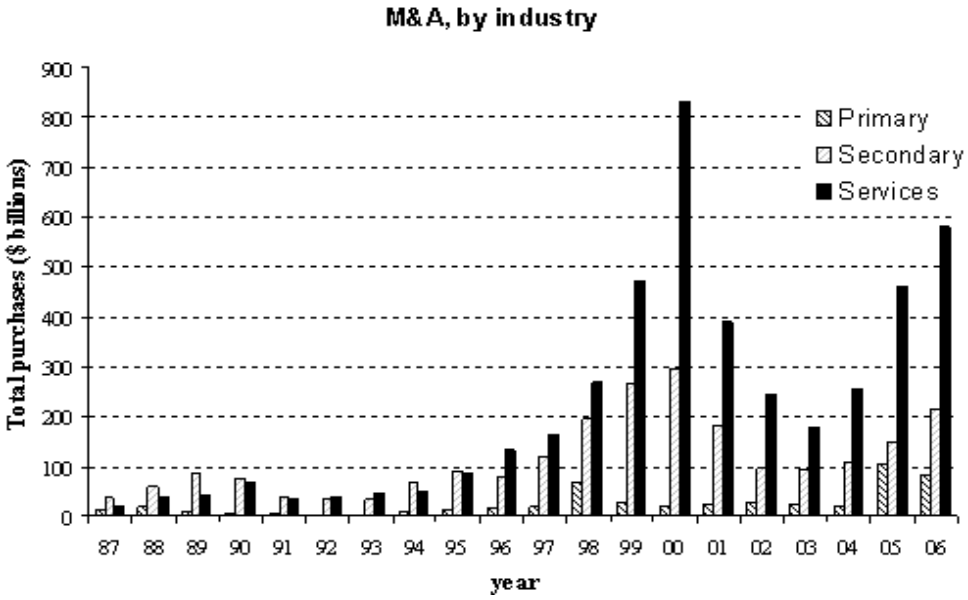
than a global focus. Within recent years a rise in the number of Regional Integration Agreements (RIAs) has been evident (Venables, 2000). RIAs establish a preferential trading area defined by a geographic region, which eliminate economic barriers to trade among the countries involving the agreement (Phisalaphong, 2004). This suggests that globalization is not necessarily a global process, but can better be considered from a more disaggregated geographical perspective. In addition, Rugman (2000 and 2001) revealed that very few MNEs that dominate international business activity actually have a truly global presence and that a significant share of bilateral trade and FDI takes place among geographically close countries and countries which are bounded by RIAs.

2.2.2 The process of deindustrialization

Another major trend in the world economy is the process of deindustrialization. Since the beginning of the 1970s, the deindustrialization process has changed the pattern of world economic activity (Batchelor et al., 1980). The world economy entered a new phase in which manufacturing, the engine prosperity, has declined continuously in most advanced economies (Rowthorn and Ramaswamy, 1997). Currently all developed countries have experienced a structural shift in employment, which is referred to as deindustrialization. This phenomenon shows an increase in the relative importance of employment in the tertiary or service sector and a decline in the share of manufacturing employment.

This pattern of deindustrialization is also evident in mergers and acquisitions (M&A), which account for the largest share of FDI, see figure 2.3. Figure 2.3 shows the M&A purchases in the primary, secondary and tertiary sector. Since 1995, the tertiary (service) sector has become the most dominant sector in which purchases take place. This shift towards services accompanied by a decline in the relative share of FDI in manufacturing, has been the most important change in the industrial pattern of FDI over the past quarter century.

Figure 2.3 The share of M&A per industry



Source: UNCTAD, FDI database (http://stats.unctad.org)

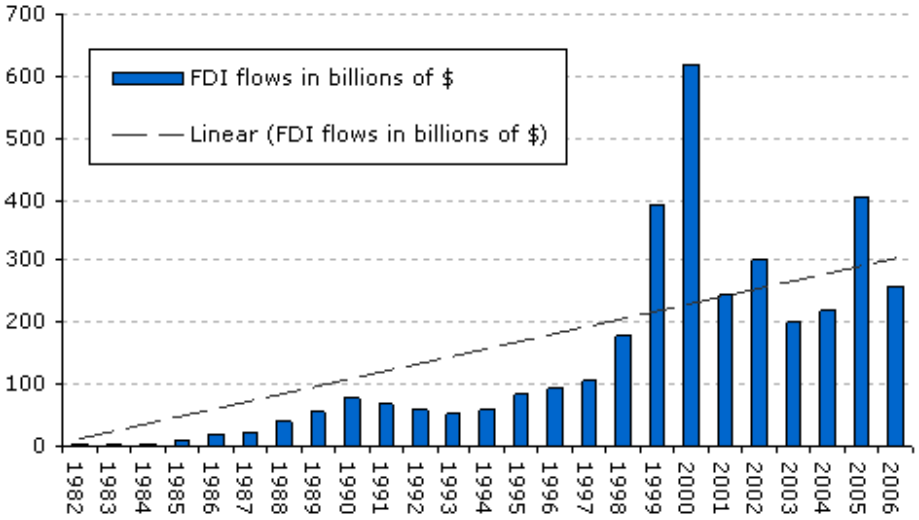
2.3 Summary and discussion

The growing internationalization of economic activity is one of the major trends in the global economy of the past few decades. Looking at the world pattern of economic activity an enormous increase in FDI and international trade is observed, which enlarges the interdependence among countries in the world economy. Furthermore, it has been revealed that MNEs as the main actors of international activity predominantly pursue a regional strategy, focusing primarily on trade and production within their home region. This regional focus is mostly formalised through RIAs in which they are territorially embedded. The present findings indicate the relevance to analyze the process of globalization -which refers to the economic integration of national economies into a global economy- from a lower scale of geography, which is on the EU level. Although the European integration is often seen as a process of integrating the economies of West and East (transition countries), this paper's emphasize is on the EU15. This paper attempts to analyze to what extent, this region of relatively developed and similar economies, changes towards a more integrated economy over the years spanning from 1982-2006. What drives MNEs to trade or invest in other 'similar' developed countries? Did European countries become more integrated over time? In order to understand the qualitative difference and dynamic complexity of economic activity, the next chapter will first examine the importance of the complex networks in which MNEs are embedded. In addition, chapter 4 will contribute to understand the patterns of international activity, by analyzing trade and FDI theories.

3. Corporate networks

By analyzing intra-EU FDI flows, see figure 3.1, a similar pattern can be observed as for world FDI flows (as was shown in chapter 2).

Figure 3.1 Total intra-EU15 FDI flows, 1982-2006



Source: OECD statistical database

Note: a. Average annual growth rate of 11,56 (billion US$)

Intra-EU FDI rapidly increased throughout the 1980's and 1990's and showed a temporary stagnation after the peaking year in 2000 as a consequence of, amongst others, the dot.com bubble. However, taking into account the entire examined period, intra-EU FDI flows show an increasing trend, with an average annual growth rate of 11.56 billion US$. The high growth level of intra-EU FDI indicates that the economic activities of countries bound by RIAs have become more interwoven. To understand what is really going on in the process of the European integration, it is not merely relevant to examine the intensity of trade and FDI flows, but moreover the changing behaviour of their key players. The patterns of trade and FDI depend upon the internal decisions of firms regarding their production locations and the organization of their production chains. In order to make hypotheses with regard to the spatial organization of production within a fully integrated European Union, Gereffi's concept of the Global Commodity Chain (GCC) and Dicken's work on Global Production Networks (GPN) are a good starting point and will be discussed in section (3.1). In addition, the dynamic character of the firm itself will be explained in section (3.2). Finally, within section (3.3) Krugman's model will be discussed with the aim to clarify the impact of economic integration programmes on the geographical location of production.

3.1 Global commodity chains and production networks

This section will primarily provide a general outline of Gereffi's concept of the global commodity chain (3.1.1) and Dicken's work on global production networks (3.1.2).

3.1.1 The global commodity chain

A commodity chain is defined as the whole range of activities involved in the production process of a commodity, from the conception till the final end-product (Gereffi and Korzeniewicz, 1994). Each stage of production (e.g. design, actual production or marketing) may be organised separately and dispersed across different locations. When production stages cross the national boundaries, it is usually referred to as a *global* commodity chain (GCC). Depending upon who is the main coordinator of such a commodity chain, a distinction can be made between producer driven and buyer driven commodity chains. However, in both cases the production of final goods is broken up and intermediate inputs are exchanged between the different nodes in the commodity chain. These intermediate inputs can comprise parts or components of the final product as well as supporting services. Furthermore, firms with a fragmented production structure can decide to slice up the commodity chain within the boundaries of the firm (through FDI and intra-firm trade) or decide not to (through arm's length contracts and inter-firm trade). The observed increase in trade and FDI flows across the members countries of the EU (as shown in figure 3.1) thus may reflect, in part, the shift from production taking place in one location to geographically and organizationally dispersed organization structures.

3.1.2 The global production network

The GCC concept identifies the relationships that exist among different actors involved in the production process of a specific commodity. This 'chain' concept implies linearity in the process of activities that eventually result in a final good or service (Bair, 2005). Although Gereffi noticed the existence of networks around the different nodes of the commodity chain, this multi-dimensionality is further conceptualized by Dicken et al. (2001) in the concept of global production networks (GPN). GPNs are defined as "the nexus of interconnected functions and operations through which goods and services are produced and distributed" (Dicken et al. 2001 and Henderson et al. 2002). GPNs incorporate both the linear and non-linear relationships in which each node of the commodity chain is embedded.

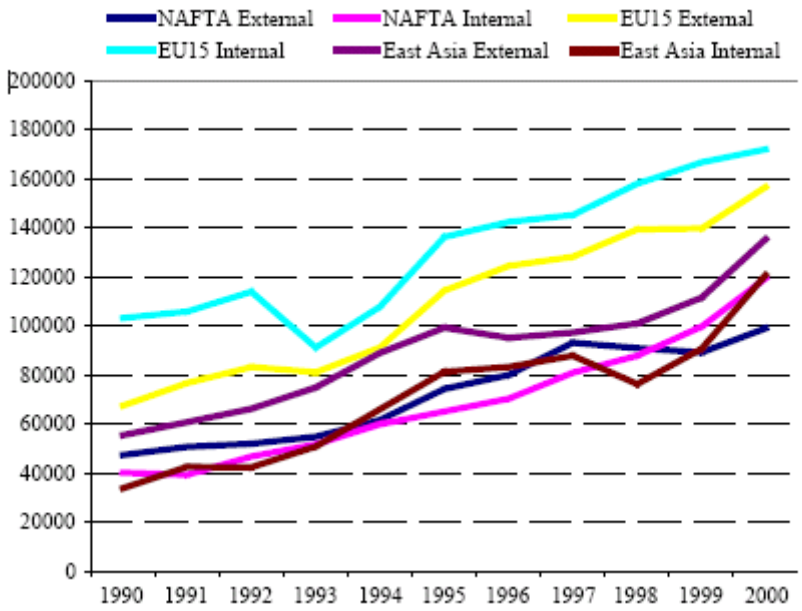
The GPN framework stresses the complex sets of intra-, inter- and extra-firm networks related to each stage of production and distribution of a good or service. Such networks integrate firms (inter-firm networks) and parts of firms (intra-firm networks) through a range of non-equity and equity relationships between the different (parts of) firms. In contrast to the concept of global commodity chains, GPN also take extra-firm networks into account. The extra-firm networks refer to the relationships among firms and other institutions, such as nation states, non-profit organizations or research institutes. The GPN framework emphasizes on how these complex sets of intra-, inter- and extra-firm relationships are organizationally and geographically structured and governed. The purpose to use GPN analyses here is not to understand how production networks are coordinated through various power and control mechanisms, but to reflect *how* the process of European integration works through the complex web of interrelationships among the networks' members. Intermediate inputs are traded between firms (inter-firm trade) or between different parts of a firm (intra-firm trade) located in different countries. When nodes of the network are interconnected (through a trade or FDI relation) across different countries, global production networks do not only integrate firms across borders, but thereby also integrate (parts of) national economies (Dicken, 2005). The technological revolution together with the removal of trade barriers resulted in a trade cost reduction, which is suggested to have given an impetus to such a spatial interaction of international economic activities within the EU.

Empirical data of trade in parts and components is only recently become available, since countries started to use the SITC[8] classification system in order to collect country statistics. Before this, it was impossible to distinguish between trade in finished products and in trade of intermediate inputs. By looking at the available data on trade in parts and components it is shown that this type of trade rapidly increased within the last few decades. In a study of Yeats (2001) it has been estimated that world trade of this type did increase from $355 billion to $846 in the 1990-2000 period, with an average increase of 9.1% per year. By contrast, growth in respectively world GDP and total world trade did on average only increase with 3.7% and 6.5% per year, within the same time period, what highlights the importance of this new phenomenon in the current global economy. Also from a more disaggregated geographical level, this trend of increased trade in parts and components holds for both intra as well as

[8] The UN's 'Standard International Trade Classification system' (SITC) in order to classify commodities.

extra regional (whether it is NAFTA, East Asia or the European Union) trade flows, see figure 3.2.

Figure 3.2: Trade in parts and components by regions (in million US$)



Source: Ng and Yeats (2003)

EU15 member countries are responsible for the highest share of trade in parts and components. On average, intra-EU trade of this type increased annually with 5.2%, which suggests that trade and production operations did become more interdependent over time.

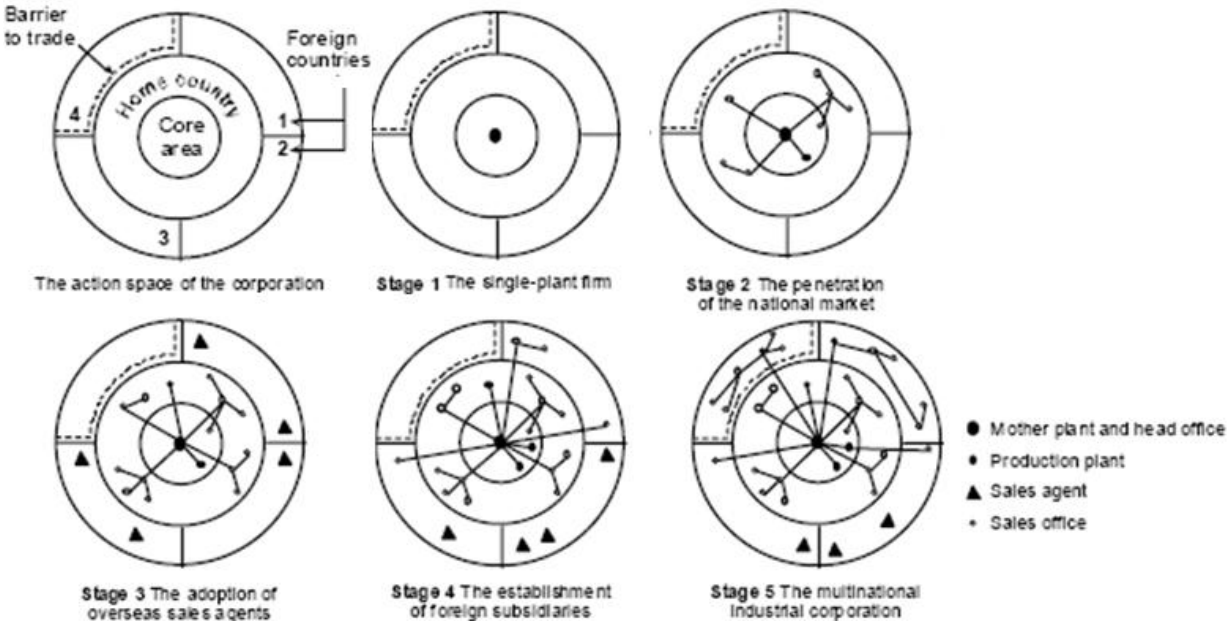
3.2 Corporate development

Through intra-, inter- and extra- relationships nodes in the networks become integrated, but the firm itself, as well as the context in which networks are shaped and embedded, have a dynamic character. As a result, commodity chains and production networks evolve and change over time. In addition, integration policies may also change the context in which these networks are shaped and may impact the strategic decisions of firms how to organize and where to locate production. Therefore, section (3.2.1) will describe the dynamic character of the firm. In addition, within section (3.2.2) Krugman's model (1991) will be discussed in order to clarify the impact of integration policies on the location and the organization of production.

3.2.1 The dynamic character of the firm

There are great varieties in the geographical scope and size of firms. Some firms exist of just one plant, while others control more than hundred plants which are dispersed across many countries. A single plant operation may once become a MNE which controls operation all over the world. When a firm wants to grow, it can undertake several growth strategies. Firms may enlarge market shares in their current market, they may develop new products or they may enter new markets with existing or new products (Ansoff, 1957). In this light, the internationalization process can be regarded as a firm that undertakes the growth strategy of entering a new (international) market in order to grow. By identifying geographical stages of growth, several models have strived to generalize long-run spatial expansion paths of firms (Håkanson 1979 and Taylor 1975). According to Håkanson, in the start-up phase, most firms try to establish a local basis first. After the establishment of a strong local base, a firm may decide to grow regional, national, or eventually worldwide. The growth path that firms usually follow is shown in figure 3.3.

Figure 3.3 Corporate expansion path



Source: Håkanson 1979: 131-135

The establishment of a local base and the regional and national expanding are reflected in the first two stages in the model (stage 1 & 2). Within the first phase of the internationalization process (stage 3), it is usually exported to foreign countries. In general, sales agents who are

situated abroad are used and look after the interests of the firm. However, when exports expand, locational restraints may come to existence as it is impossible to expand production capacity indefinitely. Furthermore, when exports expand, it becomes more important to react promptly and accurately to the needs and desires of the foreign customers. Therefore, firms may decide to establish a sales office abroad (stage 4). Within this phase foreign sales offices can be seen as an extension of national sales offices and do not yet have level of independency. Subsequently (stage 5), foreign production plants will be enabled to operate more independent of the mother company and production plants and/or other supporting activities may also be moved abroad. Thus, in line with the general expansion path of a firm, international fragmented production and global production networks emerge.

3.2.2 Concentration of production

To understand which role GPNs might play in the process of European integration it is important not to overlook the fact that production networks are shaped in and influenced by the socio-political and institutional context within which the networks are embedded. Changes in the macro-economic context in which networks are formed, may impact the spatial organization of MNEs. According to the model of Krugman (1991) the impact of economic integration policies on economic geography can best be clarified by taking a two step approach. This two-step approach has become the main concept to model economic geography in literature (see Fujita, Krugman and Venables 1999; Brakman, Garretsen and Van Marrewijk 2001 and Phisalaphong 2004). The model reveals, in a simple way, the relation between production costs, trade costs and market size. First, when international trade is restrained by high barriers to trade, production will be located close to the market. Then, in the first stage, some trade barriers are reduced, and changes can be expected in the location of production. The firm's production will concentrate closely to the largest domestic market, and products will be exported to other regions. As such, economies of scale can be achieved. The second stage refers to the total elimination of trade barriers. In this stage, again a relocation of production is expected to occur. Since the EU now can be considered as a genuinely borderless economic area, production will probably locate there where it can be undertaken in the most efficient way and from where it can easily been exported to foreign customers. Some types of production can better be undertaken in a specific area than others. For example, high skilled labor production can best be undertaken in a region where high educated personnel is widely available, while low skilled labor production can be best undertaken where wages are relatively low. Therefore, an increase in industrial concentration is the expected outcome of

European integration policies. Empirical research on the geographical concentration of industries is still scarce, but for some types of production evidence of concentration has been found (Brülhart and Torstensson 1996; Brülhart 1998; Amiti 1999 and Midelfart-Knarvik et al. 2000). For example, a close concentration of furniture activities can be found in the "furniture districts" in Northern Italy. In addition, Brülhart (1998) found evidence for a high concentration of industrial activities which are subject to economies of scale (such as motor vehicles and chemicals) in the centre of the European Union. Furthermore, Midelfart-Knarvik et al. (2000) argue that the concentration of industries in low wage countries is characterized by slow-growing and unskilled labor-intensive industries.

Krugman (1991) distinguishes three alternative motives for the regional concentration of firms from the same industry. At first, concentration in one region will provide a market pool of specialised skilled labor, which benefits both firms and workers. Secondly, an industrial district offers a variety of inputs by specialized suppliers. Finally, physical proximity enhances greater knowledge or technological spillovers between firms. Empirical studies (Jaffe 1986 and Feldman 1994) argue that industrial districts in developed economies give support to knowledge spillovers and positively affect the innovation process. Especially tacit knowledge[9], which is considered to be an important input factor in the innovation process (Nooteboom, 1992), is more likely to spill over in close proximity to others.

3.3 Summary and discussion

In order to get a better understanding of intra-EU15 FDI decisions and in the process of how different countries become integrated into a web of functional linkages, the concept of Global production chains and networks are described within this chapter. Throughout the 1982-2006 period a rapid increase of intra-EU FDI is observed and it can be concluded that EU firms have become fundamental direct investors in the EU region. MNEs are responsible for the biggest shares of trade and FDI flows and therefore considered to be important players in creating linkages among geographically dispersed economies. European integration policies aimed at free trade of goods and financial flows are expected to have reinforced the internationalization decision of European firms as it has brought changes to the business environment. According to Krugman (1991) the reduction of some economic barriers will

[9] Tacit knowledge is implicit or uncodified knowledge, which is based on practical experience with certain technologies.

first coincide with a concentration of production activities towards the largest markets of the EU. As such, economies of scale can be achieved while it can easily (through low trade costs) be exported to all other EU markets. However by further European integration, when all goods, financial flows or factors of production can move freely and also other non-trade restrictions are further eliminated, again a relocation of production is expected to occur. European integration policies enable firms to take advantage of locational conditions (e.g. lower wages, taxes, skilled labor and resources) more easily. The total elimination of barriers allows firms to locate each stage of production there where production can be undertaken most efficiently. Therefore, an adjustment to this new business environment is the expected outcome. It is hypothesized that fragmentation and changes in the spatial organization of production can be expected because firms need to remain organized in the most efficient way in order to stay competitive. Statistics of European FDI and trade give support for this hypothesis. Evidence of increased intra-EU15 FDI and trade in parts and components confirms that firms more and more organize their production and supporting business activities across national borders.

However, although recent findings indicate an increase in international production, the nature and development of the European integration is less clear. Did all EU countries become more functionally integrated through FDI and trade linkages or are some countries left behind? And is the outcome of European integration policies the same for all industries? Within the next chapter trade and FDI theory is described in order to assess the determinants of intra-regional FDI and trade and its effects. Moreover, in chapter 7, it is tried to get insight in the nature and development of integration through an empirical analysis of the changing nature of the EU15 economies themselves and the patterns of intra-EU FDI and trade linkages between the EU15 member countries.

4. International production and trade theories

In chapter two it is already argued that FDI and trade are important factors in the recent wave of internationalization and globalization. The focus in this paper is not on 'how' to internationalize, but the FDI and international trade modes are applicable as 'indicators' for internationalization. The trade and FDI intensity will be considered as an indication of the level of economic integration between the EU countries. In order to understand the conditions behind intra-EU economic activity, the existing theories of international trade and FDI will be discussed. The underlying theories of trade and investment gives an insight in the *why*, *how* and *where* organizations engage in international business. The theories which will be highlighted are the theories of international trade where the analysis focuses on the country, and the theories of international investment where the analysis focuses on the organization. This way the patterns of economic activity that have emerged can be explained. The first section of this chapter (4.1) will discuss the different types of FDI and the complex relation of FDI and trade. In the following sections (4.2) and (4.3), an overview is given of the most important theoretical considerations with respect to trade and FDI.

4.1 Internationalization modes

The number and importance of world-wide foreign establishments has increased considerably and this development coincides with an upsurge in FDI by MNEs (Levitt 1983, Ohmae 1985, Bartlett and Ghoshal 1989 and UNCTAD 2000). According to Dunning (1993a), FDI has become a key channel for the transfer of resources and capabilities between countries and as a means of controlling the use of these complementary local assets. It can be a channel to technology, access to foreign markets and international production networks, as well as additional employment, all with possibilities of multiplication and spillovers. Many countries attempt to attract FDI inflows (Dunning 1994, Narula and Dunning 2000), because it is generally believed that foreign firms contribute to the economic performance and competitiveness of host countries. However, the impact of FDI on host economies depends on country-, industry- and firm-specific characteristics and the type of FDI (Dunning 1993a).

4.1.1 Types of FDI

A distinction is made between four types of FDI. Mergers and Acquisitions (M&As) and Greenfield investments on the one hand and horizontal and vertical FDI on the other hand, which will briefly be described below.

- *Mergers and acquisitions* are the result of a legal joining of two firms under a single ownership, while with *Greenfield investments* a parent firm invests in new production facilities in a foreign country.

- Furthermore, FDI can be of a horizontal or a vertical nature. *Horizontal FDI* refers to multinationals that undertake the same production activities in multiple countries. *Vertical FDI* on the other hand is understood as the process by which the multinational acquires a share in a foreign firm that either uses its output (forward vertical FDI) or provides its input (backward vertical FDI).

M&A account for the dominant share of FDI-flows and predominantly take place between developed countries, as revealed in chapter 2 (UNCTAD 2001). This might be explained by the fact that the start-up in a foreign target market is usually much faster when a firm chooses for M&A rather than Greenfield investments. Another advantage of M&A is that the acquired firm, with a ready product and market, can help the investor entering new business fields (Root, 1994). Furthermore, the acquisition offers some specific resources or capabilities, which are difficult to obtain in the open market of the target country. However, Greenfield investments on the other hand might be advantageous in some cases, as it enables firms to shape the subsidiary in its own way without the need to take over the organizational culture and labor of the acquiring firm (Jemison and Sitkin, 1986).

4.1.2 The relation between trade and FDI

The relation between trade and FDI is a complex one. The model of Håkanson, which has been described in chapter 3.4, suggests that the FDI mode will be chosen only when a certain level of trade is achieved (see also Buckley and Casson 1981). The switching point is based on the intensity of trade. From this perspective it is thought that trade comes before FDI and that it takes some time before the FDI takes place. However, companies that undertake FDI are also likely to be involved in international trade relations. Trade and FDI theory presents two opposing views with regard to relationship between FDI and trade. On the one hand, a *substituting* effect is expected between horizontal FDI and trade. In this case, the company

sets up a subsidiary in the foreign country, and will trade off between lower trade costs next to higher fixed costs (Horstmann and Markusen 1992). This cost induced effect refers to the tariff-jumping effect, which states that a company has an incentive to 'jump' over the tariff wall, by setting up similar production plants in that country. Regarding horizontal FDI, it is traded of between close proximity to the market and the exploitation of economies to scale (Markusen, 2002; Markusen and Venables, 1998 and 2000). However, within the EU the trade costs are largely reduced, which suggests that the incentive for intra-EU horizontal FDI or "tariff jumping" has decreased.

On the other hand FDI and trade can be complements (Markusen 1983). When a company invests in vertical FDI, the production process becomes fragmented over different countries. The production process will be divided into different segments, with each segment located in the country where it can be undertaken most efficiently. Since each plant has to export its intermediate goods or supporting services to other plants, it is suggested that vertical FDI and trade are complements.

Although, the EU is often seen as one entity, differences in culture, consumer taste and language still force companies to locate in proximity to the market. For industries in which branding is of main importance it seems especially important to locate close to the market in order to respond quickly to the needs and desires of local customers. Furthermore, keeping the existing deindustrialization process in mind (as described in chapter 2), operating in close proximity to the market may be advantageous or even required. Through computer-communication links some services and service components have become tradable, but a large amount of services is non-tradable and for them proximity to the market is a prerequisite (UNCTAD, 2004). Additionally, service industries are mainly knowledge intensive industries, and therefore also for tradable services FDI might be advantageous, motivated by knowledge or strategic asset seeking.

4.2 International trade theories

This section elaborates on the international trade theories, which may help to explain the international trade patterns which can be observed in the world economy. First, traditional trade theory is explained in section (4.2.1). Secondly within section (4.2.2) new trade theory is discussed.

4.2.1 Traditional trade theory

Traditionally, economic theory explained trade on the basis of comparative advantages. At the first half of the 20th century Heckscher and Ohlin proposed a new model (Heckscher-Ohlin theorem), which stated that trade patterns are determined by factor endowment differences between countries. Factors that are abundant in a country give the sectors, which intensively use these particular production factors, a comparative advantage. Subsequently, countries will export the goods in which they have a comparative advantage. Conversely, goods which production requires an intensive use of factors that are relatively scarce in a country will be imported (Heckscher 1919 and Ohlin 1933). Classical trade theory emphasizes on the complementarities of countries. Assuming that trade costs do not exist at all, countries will specialize in the type of production in which they have a comparative advantage and will export surplus to other countries. Products in which they do not have a comparative advantage will be imported. Krugman and Obstfeld (2000) refer to this type of trade as inter-industry trade. However, the largest share of trade flows are between developed countries which have similar factor endowments, productivity levels and country characteristics. To theoretically explain the observed trade flows between similar countries, new trade theories evolved.

4.2.2 New trade theory

New Trade theory is developed by researchers as e.g. Krugman (1979), Lancaster (1980), Helpman (1981) and Ethier (1982) to explain post World War II trade patterns. One important difference with traditional trade theory is that the foundation of New trade theory relies on the concept of scale economies and imperfect competition. Furthermore, this post-war period is characterized by an increase in trade between similar countries in terms of their development and by a growing importance of intra-industry trade. Parjanne (1989) and Hansson (1989) define intra-industry trade as 'the simultaneous export and import of differentiated products'. Thus, instead of specialization in line with a country's comparative advantage, within new trade theory it is presumed that countries trade in similar, but differentiated products (Krugman and Obstfeld, 2000). Due to intra-industry trade more varieties of a product are made available to consumers and therefore demand of consumers with different preferences can be satisfied. A distinction can be made between horizontal and vertical intra-industry trade. Horizontal intra-industry trade refers to the simultaneous export and import patterns of goods from the same sector, at the same stage of processing. Countries with similar factor endowments will specialize in a limited variety of 'niche' products. These countries gain from

trade, as they are able to reap the fruits from scale economy advantages, while the variety of goods available for consumers is not reduced (Krugman, 2000). Vertical intra-industry trade can be defined as "the simultaneous exports and imports of goods classified in the same sector but at different stages of processing" (Krugman, 2000). Vertical intra-industry trade is likely to be based on the increasing ability to fragment production processes into different stages, each performed at different locations by taking advantage of the local conditions. Vertical specialization of production may for example be driven by comparative advantages in factor endowments, particular skills of the workforce or high fixed research and development costs.

4.3 International production theories

Within this section it is elaborated on theories that try to explain the FDI patterns which can be observed in the world economy or within the EU. According to Dicken (1986), the MNE is one of the major institutions, which plays a key role in shaping the pattern of world production. In order to participate in the emerging global marketplace, MNEs can undertake FDI as an entry mode. It relates to the question if it is more profitable for firms to establish a subsidiary in a foreign country instead of making use of arm's length contracts or to export to a particular country. Perhaps the most common used theory of international production is the eclectic paradigm opposed by Dunning (1977), which is widely used to explain the international activity behaviour of MNEs.

4.3.1 OLI paradigm

The eclectic paradigm provides the major elements for any satisfactory explanation of foreign value added activity. The paradigm is an integration of partial theories on international production. Dunning continuously developed and refined his eclectic paradigm (e.g. Dunning, 1988a). However, the *core* of the paradigm remains unaltered and is composed out of three advantages. The theory states that whether firms undertake FDI is determined by three sets of advantages: Ownership, Locational and Internalization (OLI) advantages, the why, where and how of MNE activities. Therefore the eclectic paradigm became also known as the OLI-paradigm.

- Ownership advantage

The ownership condition (O) answered the 'why to go abroad' question. Ownership advantages refer to the firm's (intangible) assets to which other (foreign) firms can not easily get access or rights, e.g. a strong brand name, management skills or a patent. These assets give the MNEs a competitive advantage over others, which enables them to overcome establishment costs in foreign countries (UNCTAD, 2000). Moreover, ownership advantages can be categorized in three types:

Type 1: advantages that do not occur due to multinationality, but advantages that any firm may have over another that produces in the same location. For example better resource capability and usage, monopoly power or size advantages. These advantages offer the firm more market power or cost efficiency over other firms.

Type 2: advantages that come into being, when being part of a multi-plant enterprise. This way firms can create economies of scale or have access to internal resources at lower cost.

Type 3: advantages that particularly arise from multinationality. Advantages like the ability to exploit different markets and factor endowments across countries in which the MNE has operations (Dunning 1981b).

- Locational advantage

The Location condition (L) provides a possible explanation of the 'where to produce' question and relates to the endowments and attractiveness of the market which influences the locational choice. Factors influencing the companies' investing location are for example trade policy, labor costs, transport costs, factor costs and market size. L advantages arise when it is more beneficial to exploit the O advantages outside the home country. The concept of Location advantages is related to the principle of comparative advantages which is considered in the theory of trade.

- Internalization advantage

Finally the Internalization condition (I) answers the 'how' question. Internalization advantage refers to advantages which make it more profitable for firms to establish a foreign subsidiary instead of carrying out ownership and location advantages through arm's length contracts by working together with partners already familiar with the local market. Companies will only undertake FDI when all three advantages are met, where the ownership and locational advantages represent the opportunities to economically integrate in geographical space and

the internalization advantages correspond to the primary strategic impulse for foreign investments (Morsink, 1998).

This paper particularly stresses the ownership and locational advantages. The following section will emphasize more on the ownership advantages or the strategic motives for EU firms to engage in foreign investment. Furthermore, in section 4.3.3 the ESP-paradigm underlines the locational advantages more thoroughly. This theory is applicable for further analyzes, in which EU countries' specific locational advantages need to be obtained.

4.3.2 Motivations for international production

Dunning (1988c), in his restatement of the OLI paradigm, recognized that the link between OLI and strategy could be made through firm-level motivations for international production. Different motives or strategic objective encourage companies to undertake foreign direct investments. In this paper the motivations behind international activity will be determined, in order to analyze the motives for EU firms to undertake FDI within the EU and whether the motivations for international production changes over time.

Initially, Dunning (1989) classified three motivations for international production: market seeking (import substituting), resource seeking (supply-oriented) and efficiency seeking (rationalized investment). A fourth category – strategic-asset seeking – was soon added, reflecting the increased use of knowledge-based strategic alliances within OECD countries (Dunning 1991). In Dunning's eclectic paradigm, the motivations to undertake FDI is more focused on the *exploitation* of the firm's O advantage, instead of strategic management theories that focuses more on the *creation* of advantages. By 1993, Dunning (1993a) had identified four basic types and the purpose of the actual investment was now defined as *seeking* or *acquiring* either products (market seeking FDI) or factors (resource, efficiency and strategic-asset seeking FDI).[10]

- Resource seeking motives

The *resource-seeking* motivation refers to the incentive to invest abroad in order to acquire specific resources that are more efficient than those obtainable in the home country. Dunning (1993a) distinguishes three kinds of resource-seeking: (a) physical resources (raw materials

[10] Based on these four motives, Robock and Simmonds (1989) added two other motives: low risk seeking and competitive counterattack. These motives are not added in this paper.

and agricultural products); (b) cheap (well motivated) unskilled or semi-skilled labor; and (c) technological capacity, management or marketing expertise and organizational skills.

- Market seeking motives

The *market seeking* motivation refers to the incentive to invest in a particular country or region in order to serve the foreign market. Besides, the expansion of market size and expected market growth, Dunning (1993a) exploited four main reasons for market-seeking firm's to undertake FDI. (a) When the firm's main customers or suppliers have expanded abroad, the company may want to follow them in order to retain its business; (b) when market presence is needed for a firm's product to adapt to local tastes and specific market conditions, FDI could be a requirement; (c) A foreign investment can reduce the production and transportation compared to supplying that market from a distance; (d) from a firm's (defensive) strategic consideration, to be physically present in the leading markets served by its competitors.

- Efficiency seeking motives

From efficiency *seeking* perspective, firm's incentive to invest is to increase their efficiency by exploiting the advantages of different costs of factor endowments between countries and the benefits of economies of scale and scope. It is suggested this motivation comes after resource or market seeking FDI has been realized and that it increases the firm's profit. Typically, this type of FDI is expected between developed countries, especially those within integrated markets, like the EU (Dunning, 1993a).

- Strategic-asset seeking motives

Finally, the *strategic-asset seeking* motive. The firm's incentive to engage in FDI is to promote their strategic goals. Usually, it is a tactical investment to sustain or enhance their international competitiveness and prevent competitors from gaining resources. Knowledge can be seen as one of the most important strategic assets. In the presence of the deindustrialization process knowledge is expected to play an increasing important role. It establishes ownership advantage and contributes to creating new network opportunities, which could create additional ownership advantages.

In addition, the international expansion and changing business environment stretched the ownership specific advantages, decided by non asset-exploiting motivations, in many ways.

Firms even engage in FDI without having any competitive advantage, but orientate more on long term motives. Motives like risk diversification, circumventing or dumping and network creation (Phisalaphong, 2004).

This paper initially focuses on the four motives described by Dunning (1993a) in order to analyze the motivations behind intra-EU investments and to see which motive is dominant in which period. Dunning (1998) argued that market and resource seeking motives characterized initial FDI, where market seeking (efficiency and strategic asset seeking) is often characterized as sequential FDI. Furthermore, he argues that strategic asset acquiring investments have become more important and that the locational needs for corporations has shifted from access to markets or natural resources to access to knowledge-intensive assets, which could increase the O specific advantages of a firm (Dunning, 1998).

Nevertheless, the seeking motive for a specific company to undertake FDI is subject to its corporate process stage, described in chapter three (3.2.1).

4.3.3 ESP-Paradigm

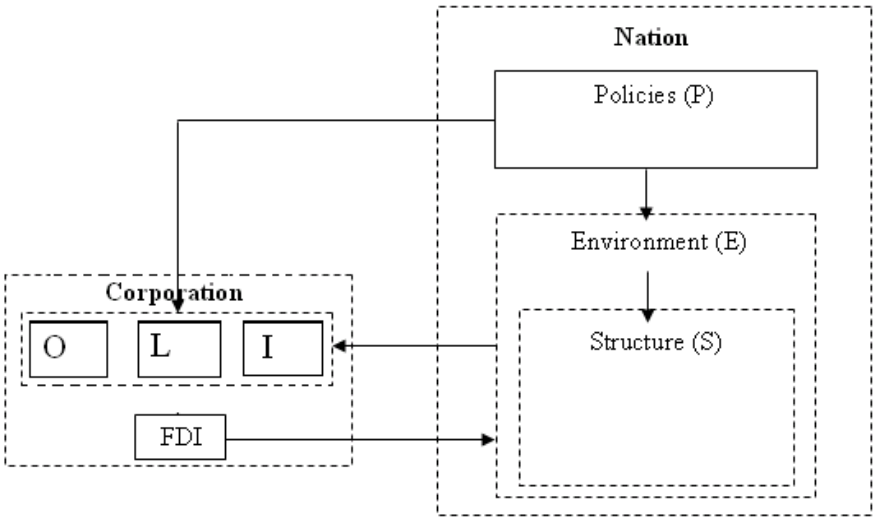
As stated before, firms will only engage in foreign value adding activities when the three OLI conditions will be satisfied. Suggesting that the ownership and internalization conditions of the firm are satisfied, the attractiveness of the location is of importance. Therefore, the specific-characteristics of the EU member countries need to be taken into account. Compared to Dunning's original locational advantages (Dunning 1979), Dunning extended and grouped the country specific items into the ESP paradigm (Dunning 1988c and 1993a). The ESP paradigm, suggests that economic activity of a country depends on its economic or environmental developments (E), the structure of its economy (S) and the role of the government pursuing the economic and social policies (P). The E stands for the environment typified by, for example, the level of economic development, the cultural, legal, educational and technological infrastructure of the foreign nation where the firm may want to operate. The S is characterized by the economic structure or institutional framework of the country and the P emphasizes the role of the governments in establishing policies which also might affect the attractiveness of international economic activity in that particular country. The ESP paradigm identifies ways in which EU country specific variables might affect production decisions of EU firms.

4.3.4 Corporation nation matrix

EU countries can be at different stages over time, depending on the relationship between the nation's corporations and country specific characteristics. The corporation nation matrix links the two paradigms of OLI and ESP together. The OLI paradigm presented the strategies from a firm perspective, which is dependent upon political and economic features of the involving countries. Within the ESP-paradigm, the coordination between the specific country elements and MNEs are linked and affects the spatial geography of the firm's international activity.

The OLI advantages are subject to major dynamic forces, which influence or modify the three advantages and create opportunities for economic interaction in geographical space. There are both endogenous as well as exogenous variables which shaped the dynamics of international economic activity over the past decades. Technological advance, economic development and the role of the government can be seen as exogenous factors, which influence the role of MNEs (Dunning 1993a).

Figure 4.1: Corporation-nation model



Source: Slide of a 'Regional economics and business' lecture by Prof. G.A. Van der Knaap

According to Dicken (1986), the actions and interactions of the nation states and the MNEs are the two major institutions that shape the international production pattern. Therefore, essential in this paper is to examine the changes of both the EU country specific elements and EU firm specific elements over time, in order to analyze the spatial interaction pattern of intra-EU FDI over time.

4.4 Summary and discussion

In previous chapters the evolving economic processes and the dynamic character of the firm are described, which illustrated the regional focus of MNEs and its emerging dispersed production processes. These elements are insufficient in explaining *why* firms choose to operate across national boundaries. In this chapter it is explained why international trade and production occurs. Traditional trade theories specifically focus on comparative advantages and complementarities between countries. This theory of different factor endowments is specifically applicable for manufacturing industries, but less applicable for the emerging service industry. In the service industry knowledge is the most important input and firms in this industry will probably seek for more similar developed countries to trade with.

With respect to the international production theories, Dunning argues that firms will only engage in international production when the three conditions of OLI are satisfied. This paper emphasizes on the ownership and locational advantages, which encourage EU firms to invest within the EU. The ownership advantages refer to the motives to undertake FDI and how these strategic motives develop within the EU over time. These motives will be proxied and analyzed in section 7.2 of the empirical results.

On the other hand, the locational advantages refer to EU country specific elements. This chapter underlined that a firm's strategy depends on political and economic features of the involving EU countries. Country specific characteristics are determined by endogenous aspects, which refer to the environmental (E) and structural (S) country differences and exogenous aspects, which in this case refer to the governmental policies. The different endogenous characteristics (E and S) of each EU country will be explored in section 7.1 of the empirical results, in order to determine the similarities and differences in EU countries and to what extent EU countries converge over time.

Although, specific EU countries' government policies are not examined, the exogenous institutional environment (P) shaped by the EU integration policies will be taken into account in section 7.2 of this study. In addition, it is examined to what extent these exogenous factors affect the European integration process.

The next chapter emphasizes on the European integration process. What is this paper's interpretation of economic integration? This study determines three different modes of the integration process, which help to understand the underlying nature and development of the European economic integration process. Furthermore, chapter 5 elucidates what can be expected of the EU region, with regard to theory?

5. European economic integration

According to Molle (1994), integration refers to the harmonization of different nations into one entity. So in the context of the European Union, integration would imply that the EU15 member countries can be regarded as one "entity". However, integration or one entity depends on the analyzing perspective, which could enclose a social, legal, political and/or economic notion. For example, a group of countries regarded as one entity from a legal viewpoint does not necessarily function as a single entity from a social or an economic perspective. Although, in this paper the primary emphasize will be on the *economic* notion and analyzing whether the European integration policies has actually led to one economic integrated region, integration remains a broad concept. The purpose of this chapter is to shed light on three different modes of the economic notion, in order to acquire a comprehensive analyzes of the European economic integration process. Section (5.1) will first discuss the institutional aspect of the EU integration, which refers to the environmental context of the EU. In the subsequent section the economic structural aspect of the European integration will be analyzed (5.2), which refers to EU countries or in other words the nodes of the intra-EU interaction network. Finally, in section (5.3) the relational or functional aspect of European integration will be described.

In sum, this chapter describes the institutional, structural and functional aspects of the European integration process and what can be expected with regard to theory.

5.1 The institutional aspect of integration

The European integration process is subject to the environmental EU policy. To end up as one economic entity, institutional steps need to be taken accordingly. This section describes the process of institutional integration within the EU15. It is aimed to get a better understanding of the history and the development of the EU15 and to determine to what extent the EU15 can be seen as an institutionally integrated entity. In line with the definition used by the European Central Bank (ECB), institutional integration is defined as;

"The policy decisions taken by two or more governments of countries belonging to the same geographic area in order to promote economic co-operation in terms of positive and negative integration under the terms of an agreed pact." (Mongelli et al., 2005)

Negative integration refers to the elimination of barriers to trade (Tinbergen, 1954). With positive integration the creation of common institutions and the joint exercise of powers are meant (Tinbergen, 1954). The aim of positive institutional integration is to create a common policy framework that leads to equal conditions for the functioning of all parts of the economy. Furthermore, as a result of the harmonization of national regulations, compliance costs for internationally active companies will decrease.

Besides positive and negative integration in the EU, a distinction can be made between the widening and the deepening of the integration process. While some integration policies are aimed to foster the widening (accession of new member countries) of the EU, the purpose of other integration policies are generated to increase the depth of the European integration process. In order to determine the depth of EU15 institutional integration, the integration stages as developed by Balassa (1961) are used. Balassa classifies the process of regional integration into five stages: free trade area (FTA); custom union (CU); common market (CM); economic union (EUN); and Total economic integration (TEI). At each consecutive stage a deeper level of integration is reached, see table 5.1.

Table 5.1 Balassa's stages of economic integration

	No tariff or quota	*Common external tariffs*	*Free flow of production factors*	*Harmonized economic policies*	*Unification of policies & political institutions*
FTA	√				
CU	√	√			
CM	√	√	√		
EUN	√	√	√	√	
TEI	√	√	√	√	√

Source: Balassa, 1961

At the first integration stage, tariffs between member states are abolished but each member country can make their own decision to impose tariffs or quantity restrictions for third countries. At the second stage, a common external tariff is set. Then, at the third stage a common market comes to existence. Within a common market trade the mobility of production factors and financial assets can take place freely. Up to this point all integration stages are examples of negative integration. They are all aimed at the elimination of all kind of barriers to trade. The fourth integration stage, an Economic Union, on the other hand is the first stage were aspects of positive integration start to play a role as it refers to some degree of harmonization of fiscal, economic, sectoral, social or monetary policies. The final stage of

Balassa's integration index is total economic integration. To be considered as a total economic integrated region, the establishment of a supra-national authority as well as the unification of fiscal, economic, legal, sectoral, social and monetary policies is required.

Within the EU there is free movement of goods and factors of production, and some common institutions and economic policies have been developed. Furthermore, eleven of the EU15 member countries have adopted the same currency, the Euro. Therefore, the EU15 in its present form can be regarded as a highly institutionally integrated region and can be classified somewhere between the fourth and the fifth stage of the Balassa index. However, the path towards the EU15 in its present form was not the same for all member countries. In the next section the process of European institutional integration for each EU15 member country is described. However, a fully detailed analysis of the process of institutional European integration is behind the scope of this paper. It is only used to determine the major milestones in this process. In addition, chapter 7.3 tries to assess whether these milestones or institutional policy steps breed the intended positive impact on the functional integration of the member countries.

5.1.1 Institutional integration process of the EU15

The European process of institutional integration already started at the midst of the twentieth century. After World War II, Regional Economic Integrations (REIs) became increasingly popular. In 1950, the Foreign Minister of French Robert Schuman proposed for Western Europe to cooperate and integrate the coal and steel industries. The aim was to unite European countries economically and politically in order to secure lasting peace. In 1951 the Treaty of Paris led to the creation of the European Coal and Steel Community (ECSC) with six members: France, West Germany, Italy, Belgium, Luxembourg and the Netherlands (Welford and Prescott 1996). Efforts towards greater efficiency and further unification resulted in the Treaties of Rome in 1957. The Treaties of Rome created the European Economic Community (EEC) to establish a free trade area and the European Atomic Energy Community (EURATOM) for cooperation in developing nuclear energy (Griffin and Pustay 1999).

The establishment of Balassa's Stage 1: Free Trade Area

In 1968, the three European communities (ECSC, EEC and EURATOM) merged to form a single set of institutions: the European Commission, European Council and European

Parliament. The merged communities are collectively referred to as the European Communities, also referred to as the European Committee (EC). At that time, all internal tariffs were eliminated and a common external tariff was imposed, which moved the EEC from a free trade agreement to a customs union.

The establishment of Balassa's Stage 2: Custom Union

The benefits of economic integration were acknowledged by other European countries. As an alternative for European states, which chose not to or were unable to join the EEC, the European Free Trade Association (EFTA) was established to provide liberalization of trade among the member states. In 1960 the EFTA convention, was signed by seven states (Denmark, Austria, Sweden, Norway, Portugal, Switzerland and the United Kingdom). In the following decades most of these countries joined the EEC. Ireland, Denmark and the United Kingdom joined the EC in 1973, followed by Greece in 1980.

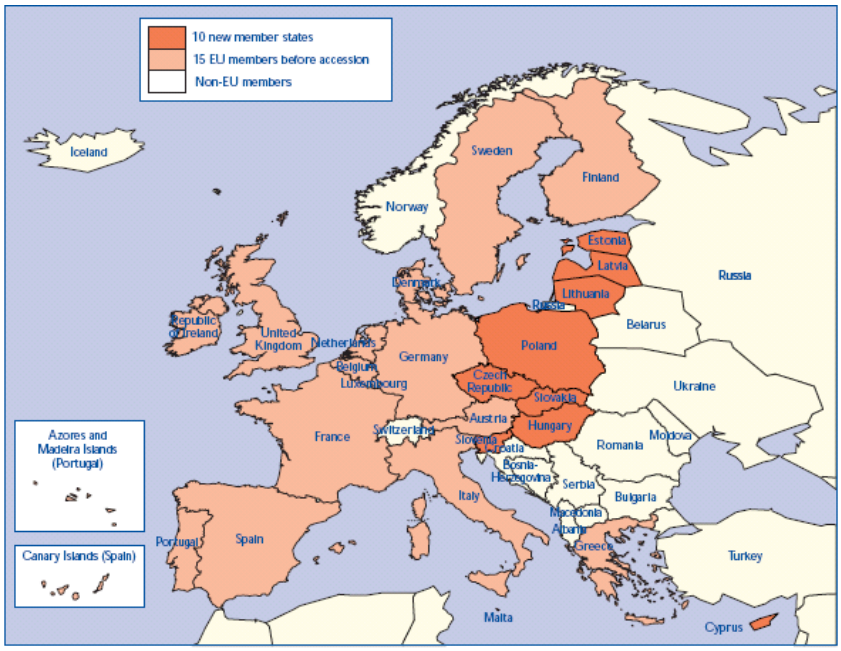
Then in 1986, Portugal and Spain joined the EC and in that year the Single European Act is signed by government leaders. This act aimed at European political cooperation and a further reduction of trade barriers to create a single/common market in which people, goods, capital and services can move freely around the EC. The aim was to remove all remaining physical, fiscal and technical barriers to create a continuous growth for the EC, its member states and individual firms (Dicken 1992).

The establishment of Balassa's Stage 3: Common Market

In 1992 the Maastricht Treaty came into force, which established a revised structure and the term European Union (EU) replaced the term EC in November 1993. The EU introduced new forms of cooperation between member state governments, which included co-operation in matters of foreign policy and home affairs. The initial core objective of the leaders of the treaty is to create a political, monetary and economic Union, subsequently renamed as the Single Market Programme. This programme aims at the liberalization of the European market, by eliminating the remaining barriers to trade among EU countries. It is expected that this institutional step taken by the EU, deepens the integration and as a consequences the industrial restructuring and reallocation of economic activities will increase. The impact of this institutional stage on the European integration process will be explored in the empirical part of this study (7.2).

In 1995 Finland, Austria and Sweden also joined the EU (Welford and Prescott 1996). With these three additional member states, the EU accounts for fifteen countries that made up the world's biggest market in 1996, with a GDP of US$8.4 trillion, a fifth more than the GDP in the US (Carr 1996). These first fifteen countries that joined the EU refer to the EU15, see figure 5.1.

Figure 5.1 Map of the EU15 and EU10



Source: Office for national statistics

The EU15, which will be examined in this paper, consists of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Table 5.2 The widening process towards the EU15

Year	*Accession Countries*
1951	Belgium, The Netherlands, Luxembourg, Italy, France, Germany
1973	Ireland, Denmark, UK
1980	Greece
1986	Spain, Portugal
1995	Finland, Sweden, Austria

Within table 5.2 the widening process towards the EU15 is shown. This implies that this paper does not include the expansion of 2004 and 2007. A legitimate explanation for these countries to be excluded is that no strong empirical conclusion of these countries' degree of integration is possible, because the time to analyze is not long enough.

In 1999 the economic and monetary union of the European Union launched a single European currency, the EURO. Eleven of the then fifteen member states were prepared to use the EURO as an accounting currency. The EURO became a physical reality in 2002, with twelve countries (Greece joined in 2001) introducing the EURO coins and notes. The impact of this institutional step on the European integration process will be explored in the empirical part of this study (7.2).

Eventually, in 2004 the EU had its biggest enlargement when ten countries, mostly Eastern European, entered the Union. Three years later, two more joined. Nowadays the EU, formerly known as EEC or EC, is a union of twenty-seven independent member states between which trade barriers are largely removed and in which a high degree of policy harmonization can be found.

5.2 The structural aspect of integration

The structural aspect of integration emphasizes on the economic structural development of EU countries over time, which are the nodes of the intra-EU international activity network. One of the European Union's fundamental aims is the reduction of disparities, which is also referred to as economic convergence, between member countries. The European Commission stated:

"The Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favored regions" (European Commission, 1996)

Therefore, as a result of further institutional integration, the narrowing of international differences in the development of economic variables of EU members is expected. Chapter 7.1 will analyze whether economic structural country convergence occurs. Real economic convergence can be defined as the increasing alignment of certain economic variables between the member countries, caused by a more rapid growth in less favoured countries

compared to the average of the grouping. In order to examine the real economic convergence the EU countries will first be proxied by GDP per capita and by a combination of main macro economic indicators (E and S of the ESP-paradigm). It is expected that the EU countries' economic structures will converge over time. Eventually, with this notification it is feasible to examine the geographical distribution of inter-regional FDI activity within the EU and to what extent these distributed regions function as one economically integrated region (see chapter 7.3.2).

It is generally assumed that more similarities in the economic structure of countries will make further integration easier. First of all, adjustment cost will be low when countries are relatively alike. When differences between countries are smaller, it is more likely that they will be exposed to symmetric shocks (Brülhart, 2000) and experience more correlated business cycles (Clark and Van Wincoop, 2000). If economic structures of the EU member countries become more homogeneous, sector-specific shocks will affect more EU15 countries in a similar way. In addition, if there are asymmetric disturbances, European wide policy responses may not be credible for all individual EU member countries. Especially with respect to monetary policy matters, the synchronization of business cycles and symmetric shocks are important as national monetary policy responses are impossible within a Monetary Union.

Besides the analysis of country similarities in economic characteristics, it will be analyzed in chapter 7.1.2 whether industrial structures of EU countries have changed over time. In the following of this section it is theorized on the impact of institutional European integration and the spatial distribution of industries. It is suggested that European integration programs will lead to a restructuring of productive activity and a changing industrial geography within Europe. Integration programs such as the completion of the Single Market or the introduction of a common currency have led to a strong reduction in cross border trade and investment costs. It is expected that these reduced transaction costs will result in an industrial restructuring within the EU, as it enables firms to exploit locational advantages with greater efficiency. For instance, firms may decide to locate close to transportation hubs, in proximity to R&D labs or within regions where factors of production are available in abundance (such as a pool of high-skilled labor, low-cost labor, or natural resources).

Thus, based on the Neo-Classical theory of comparative advantages, it is predicted that countries will specialize in line with their comparative advantage which result from differences in factor endowments or technology. For example, countries with a relatively large amount of low skilled labor will further specialize in low skilled labor intensive production. In this way, specialization will increase differences in industrial structures as opposed to autarky.

As countries exploit comparative advantages, EU15 member countries will become more specialized and countries with similar endowments will specialize in similar forms of industrial production. For example, labor intensive industries will concentrate in countries with relatively low costs of labor, while knowledge intensive industries will concentrate in countries that are characterized by a high educated labor force or in countries with relatively high expenditures on R&D. In addition, for high technology and other knowledge intensive industries it is theorized that some profitability might accrue to firms by locating in close proximity to similar firms as it allows for better knowledge spillovers. As such, further European integration might furthermore result in industrial agglomeration.

In sum, on the one hand integration policies are aimed at convergence of economic development levels of the member countries what suggest greater homogeneity among these countries. On the other hand, as barriers to trade and investments decrease it is expected that, based on initial comparative advantages, high growth industrial activity will concentrate in core countries while the more traditional industries will concentrate in the periphery. So, the impact of the EU integration policies on the converging process is ambiguous.

5.3 Functional aspect of integration

Both institutional integration and changes in the economic structures of EU15 members are expected to have altered functional integration in the region. The functional aspect of integration stresses the relational aspects of the economic activity network and is defined as; *"The degree of interpenetration of economic activity among two or more countries belonging to the same geographic area as measured at a given point in time. The "economic activity" includes both real aspects of an economy (such as trade) and financial/monetary aspects (such as financial flows)." (Mongelli et al., 2005)*

In order to determine to what extent the EU is functionally integrated over the past 25 years, this paper studies the bilateral FDI network relations within the EU. This study endeavors to combine the three (institutional, structural and functional) modes of integration in order to reveal the nature and extent of the European economic integration process. When the changing nodes and environment of the intra-EU economic activity network are being explored, the basic context of the EU is elucidated and provides the fundamental notice for further dynamic analyzes. The outcome of the relational intra-EU FDI pattern of FDI is subject to the changing EU countries (nodes) and changes in the network environment compiled by the European's RIA. These changes might provide the declaring factors for particular FDI relations between EU countries. The deeper the institutional environment is integrated and the stronger the locational advantages of a country are the more FDI inflows are expected from other EU members. Therefore, the strength of the FDI relation between two countries will depend on the competitiveness and the complementarity of the particular EU country.

In order to provide a comprehensive evaluation of the functional integration process within the EU over the past 25 years, this paper studies the modifying EU network relations with the support of a centrality-, density- and core periphery analysis. These analyses of the distribution of FDI activity among EU countries over time are appropriate to study the effects of locational advantages and institutional developments, on individual EU countries' positions and on the entire EU region.

With regard to the centrality analysis (see 7.3.2) it is expected that the centrality of the intra-EU FDI network decreases over time, assuming that EU countries converged and with the notification that the EU region's environment is liberalized. All EU countries are likely to participate more evenly in the bilateral intra-EU FDI activity and the dominancy of FDI generating or receiving EU-countries is expected to decrease. When this evolves it might suggest that the EU moved towards a more economically integrated region. Moreover, it is to be expected that, with elimination of barriers, certain industries will concentrate in certain EU regions based on locational advantages of that particular area.

Furthermore, the core-periphery analysis explores the inter-regional distribution of FDI activity more closely (see 7.3.3). It is to be expected that the FDI activity *from* and *to* the periphery region will relatively increase over time, compared to the core region. When this

condition is met and FDI activity among core and periphery regions within the EU has become more evenly distributed, it can be concluded that the EU functions as one economically integrated region.

In addition, a network density analysis will be performed in order to obtain a comprehensive examination of the structural evolution of the EU production network over time (see 7.3.4). This is meaningful because the emerging GPNs emphasize the complexity of firm networks and the interdependency among EU countries' firms. Therefore it is to be expected that the bilateral relations will increase over time. When it is evident that the network density increases over time it can be said that EU countries are more interdependent with respect to their production and that the EU has become a more economically integrated region over time.

Finally, the European integration process will be reflected through the complex web of interrelations among the network's nodes. As economic integration in the EU progresses, trade patterns within the region are displaying a greater complexity, with intermediate goods traded between firms (inter-firm) or within one company (intra-firm) located in different EU countries. Therefore, international fragmented production most likely leads to an increase in trade and FDI between EU countries. When EU countries are interconnected through a FDI or trade relation, GPNs not only integrate cross border firms, but in that way also integrate the EU national economies (Dicken, 2005). In this study the intra-industry trade (IIT) pattern will be used as an indicator of economic integration (see 7.3.5). By examining the sectoral patterns of trade, it shifts the emphasis from country-specific determinants or comparative advantages of trade, towards industry-specific trade determinants such as economies of scope and external markets. Based on the assumption that IIT is closely related to offshore production by MNEs and intra-firm trade, this paper measures the extent of IIT in order to gain more explanatory power to determine the structure of the FDI interaction pattern within the EU. It is to be expected that the IIT increases over time, which represents an increase of intra-firm trade among different EU countries. When this is evident in the empirical study, it might suggest that the interdependency among firms located in different countries increased as well as the economic integration of the EU region.

With these analyses this study endeavors to provide a robust and comprehensive examination of the EU functional aspect of the integration process spanning over the years from 1982 to 2006.

5.4 Summary and discussion

This chapter splits up the European integration process into three modes; *Structural, Institutional* and *Functional* integration. The structural aspect of integration explores the changing nodes of the economic activity network. It examines the convergence of EU countries over time and to what extent the EU becomes a specialized region. The institutional aspect of integration focuses on the environment of the network. It examines the dominant motives to undertake FDI over time and the effect of some European institutional development on the economic activity within the EU. Finally, the functional aspect of integration explores the changing network relations. It examines the modifying network relations within the EU and endeavours to understand the relation between the economic structural and institutional developments and the transforming intra- EU FDI network.

These three aspects of integration also represent the structure of the empirical part of this study, as opposed in table 5.3. However, the next chapter (6) will first describe the used data and applied methodologies which are interwoven in the empirical study.

Table 5.3 The structure of the empirical study

Dynamic in depth analyzes of the European integration process
To what extent is the EU economic structurally integrated in the 1982-2006 period? Changing Nodes of the Network
▪ Similarity among EU countries ▪ Differences between EU countries
To what extent is the EU institutionally integrated in the 1982-2006 period? Changing environment of the Network
▪ The motives to undertake FDI over time ▪ Effect of the institutional events on international activity
To what extent is the EU functionally integrated in the 1982-2006 period? Changing network relations
▪ Geographical interaction pattern in the EU over time→ ▪ Centrality analysis ▪ Core-Periphery analysis ▪ Network density analysis ▪ Intra-Industry trade → Intra-firm trade ▪ Comparisons of the changing nodes and environment on the total Network, in order to examine the relations and the functional structure of the European integration process.

6. Data and Methodology

In this chapter the data used and the methodology applied will be described. Driven by technological change and the ongoing liberalization of the European market, FDI and trade play a key role in the process of the European economic integration. The enormous growth of FDI and trade within the EU, together with considerable variation across two-sided FDI and trade flows, offers a potentially valuable source to examine the research question in a more comprehensive approach. In particular, the panel approach over the comparably long period of 1982-2006 allows us to investigate the integration process more precisely. Besides more observations and potentially more precise estimates, the results will be controlled for country-specific and time-specific effects. Furthermore it enables to conduct a more robustness analysis, including the extension to a dynamic specification and the consideration of potential endogenous concerns.

6.1 Data

Reliable statistics are essential for meaningful interpretations. Internationally comparable FDI and trade data makes it possible to measure the degree of economic integration. Other studies (Morsink 1997 and Pelkmans 1983) already showed that a comprehensive and consistent dataset on intra-EU FDI is hard to generate and encounters many problems. There is a curious lack of comparable data on intra-EU direct investments in the earlier years, due to differences in FDI measurement standards. Furthermore, the Balance of Payments of countries in the EU predominantly shows total outflows and inflows, but not always FDI's country destinations or origin.

Although EUROSTAT and OECD have undertaken the initiative to harmonize the statistical information on FDI the data is still not fully consistent.[11] The collected data are based on the Balance of Payment (BoP) statistics published by the Central banks of each member country. Although the FDI statistics are standardized for all member countries, the differences in countries' measurements and definitions account for limitations in data comparability. Nevertheless, the most complete and consistent dataset of intra-EU foreign direct investments is from EUROSTAT and OECD and will be used in this paper. For the early years (1982-1984), the statistical direct investments yearbooks are used and for the most recent years the

[11] The OECD and Eurostat helped to improve the comparability of the FDI data, by harmonizing the FDI data based on the recommendations of the IMF's *Balance of Payments Manual: Fifth Edition* (BPM5) and the *OECD Benchmark Definition of Foreign Direct Investment*, Third Edition. The IMF/OECD definitions (IMF 1993; OECD 1996) include that FDI is an investment in a foreign company where the foreign investor owns at least 10% of the ordinary shares, with the objective of a long-term relationship and significant influence on the management of the firm. FDI flows include equity capital, reinvested earnings and intra-company loans.

FDI data is acquired from the OECD statistical database.[12] The available FDI data is on a net basis, which implies the credits less debits (of capital transactions) between the investors and the foreign affiliates. FDI comprises not only the initial transaction, but also the subsequent capital transactions between the direct investor and the foreign company. A positive outward flow represents a net decrease in assets and a positive inward flow represents a net increase in liabilities, both recorded as credits in the BoP. The BoP records debits or a negative sign, when there is a net increase in assets or a net decrease in liabilities. So, a negative FDI flow indicates that at least one FDI component (reinvested earnings, equity capital and/or intra-company loans) accounts for a negative amount and outnumbers the remaining positive components of FDI. In these cases a disinvestment or reverse investment takes place. That some countries do include reverse investment, which implies negative signs, in their FDI definition causes considerable practical problems.[13] Each individual EU country has its own determination of what FDI actually is and what should be included or excluded. For instance, the inclusion or exclusion of reinvested profits can also have a major impact on the FDI-flows (EUROSTAT 1992).

Although the OECD and EUROSTAT harmonized the definition of FDI, based on the recommendations of the IMF's *Balance of Payments Manual (5th edition*) and the *OECD Benchmark Definition of Foreign Direct Investment* (3th edition), countries still use different measurement methodologies. This could cause large asymmetries between EU countries and affect the comparability among them, which implies that the FDI statistics needs careful interpretation. However, when the countries FDI data is collected consistently over the years, then the data can still be meaningful to identify major patterns and relationships, which is useful for this paper's purpose.

6.2 Research design and methodology

In order to create a reasonable consistent dataset of bilateral FDI flows between EU member countries, a simple methodology is followed.[14] At first the panel data from intra EU15[15] FDI-flows from 1982 to 2006 is conducted from two sources, namely EUROSTAT and OECD.

12 The data is available on www.SourceOECD.org in the OECD database.

13 Negative signs are excluded in the empirical methods and labelled as missing value.

14 Large parts of this methodology are also used in Morsink's study (1997).

15 Initially, this study refers to the related membership situation of fifteen countries in the EU before the expansion of 2004. The participating countries are; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. However, in order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE) in this study.

The data for the first three years (1982-1984) is collected from the International Direct Investment Statistics Yearbook (EUROSTAT 1991). The data for the following years are conducted from the SourceOECD database. After the data is collected the following steps are undertaken:

1. An origin-destination matrix, based on the FDI net inflows as collected by the host EU member country, is created per year;
2. An origin-destination matrix, based on the FDI net outflows as collected by the home EU member country, is created per year;
3. Data, which is only provided in national currencies, will be transformed into US-Dollars.[16]
4. These two matrices are then judged on their quality;
5. Finally a new melted origin-destination matrix is created.

The first two steps drafts two matrices with information on inflows and outflows among EU member countries. The first three years (1982-1984) of the panel is acquired from the OECD statistical yearbooks. The FDI statistical yearbook of the OECD, which data is obtained from countries' BOP statistics, only publishes in national currencies. In order to properly compare all the results the national currencies are transformed into one currency, the US-dollar.
In step four, the two matrices will be closely assessed, because of the incomplete data and the difference in measurement used as reporting country. The comparison of the two datasets reveals asymmetries for inflows and outflows of two reporting countries, due to measurement inequalities and differences in definitions. This comparison also indicates the incompleteness of the available information in the two matrices. In case there is no information for both datasets it will be indicated as missing value. When only one dataset provides the information, that one value will be transferred to the new matrix. In case both datasets provide a value, the values will be averaged by adding the two values and divide it by two, unless one of the two values is considered insufficient[17] only the qualitative better value will be transferred to the new matrix. In the end a new origin-destination matrix of FDI flows among EU15 member countries will be drafted for the 1982-2006 period, with the best available information on intra-EU flows possible. Furthermore, the annual data is calculated in five year totals in order

[16] In the years 1982-1984 the FDI-flows, collected from statistical yearbooks (national currencies), are transformed to Dollars according to the yearly exchange-rates (source: www.stats.oecd.org/WBOS).
[17] Insufficient is when the FDI flow shows an outlier, based on the records of the previous and subsequent years. However this remains subjective.

to create a robust dataset and avoid statistical problems. The five-year origin-destination matrices of intra-EU15 FDI, within the 1982-2006 period, are drafted in appendix I (see tables I.2-I.6).

6.2.1 Other methodologies

Now that a consistent dataset of intra-EU FDI flows is prepared, other methodologies that are applied in order to answer the research-question will be discussed in this section. Each methodology requires different data conduction, implication precautions and serves a different purpose. The following methods will be sequentially discussed; Hierarchical cluster analysis, Herfindahl-index, Gravity model including an Ordinary Least Square Regression (OLS) and the Grubel-Lloyd-index.

Hierarchical cluster analysis

In order to examine to what extent the fifteen European countries become more similar with respect to their economic structure in the 1982-2006 period, this paper applies a hierarchical cluster analysis. This way the member countries can be clustered into heterogeneous and homogeneous countries based on their economic structure and with the aspect of time it is interesting to see whether these countries converge over time.

Before countries can be clustered, it is essential to elucidate which variables are used to capture the economic structures of countries in order to compare similarities. The used variables to cluster countries are extracted from theory of the ESP paradigm. Only the endogenous E (Environment) and S (Structure) characteristics are taken into account, in order to determine the similarities in economic structure of the EU countries.

The initial sixteen variables (see appendix II, table II.1.2) of each country will be reduced to five components with a principal component analysis (PCA). This is an appropriate tool to reduce the initial variables to a few principal components with a meaningful interpretation and without losing substantial information. This analysis reveals the underlying structure or pattern of the data by expressing the dataset in a few principal components that reflects (sequentially) the highest eigenvalues. These components are the most significant relationships between the data dimensions.

The PCA could either be done on raw data as on standardized, which could result in different outcomes. This implication depends on the extent of variances and therefore in this analysis the collected data is standardized because of the high variances of variables and the measurement dimensions differ much as well.

The PCA is an intermediate step of the Hierarchical cluster analysis and indicates the variation of correlated multivariate data into principal components, a set of uncorrelated variables. The sixteen original variables are brought back to five principal components, according to the following three generally used approaches. One way is to exclude all components with eigenvalues lower than 1. Another approach is to retain all the components that cumulatively explain for at least 80 percent of the total variance. Third, one can perform the scree plot, in which the components (with eigenvalues) before the breaking point will be retained, based on subjective judgment. According to these approaches the number of components will be reduced to five principal components. The first components account for the bigger part of the variation in the data. This way a smaller set of variables, without losing a lot of information will be used for the hierarchical cluster analysis. The five variables together still explain 84.6% of the variance (see appendix II, table II.1.1).

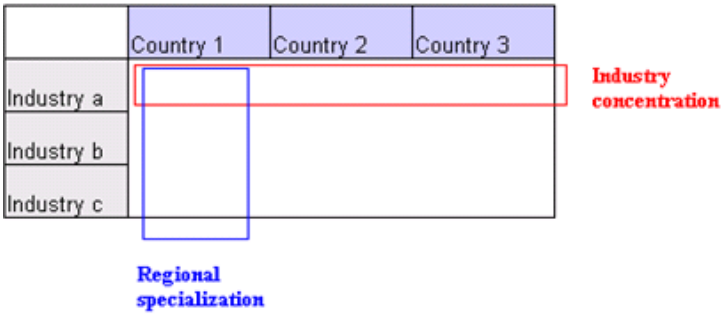
The Hierarchical cluster analysis is derived from the principal components and is used to determine relatively homogeneous clusters, based on the measured characteristics described above. This statistical method tries to group the data collection per country into clusters, such that those countries within a cluster are more closely related than countries assigned to another cluster. The two basic methods for this analysis are agglomerative methods and divisive methods. This paper applies the agglomerative method which starts with each country being considered as a separate cluster and then sequentially proceeds to combine the countries according to their cluster-to-cluster distance until one single cluster is left. The Euclidean distance, which implies the geometric distance in the multidimensional space, is the chosen type of distance and is commonly used. Furthermore, this paper uses the average group linkages as a method to calculate the distance between clusters. This method computes the distance between the average values (mean vectors) of two clusters, such that the inter-group distance of the newly formed cluster is minimum. Finally, each step of the clustering process is illustrated in a dendogram, representing the outcome of the cluster analysis (see appendix II.2, figure II.2.1-II.2.5).

Central to this cluster analysis is the degree of similarity (or dissimilarity) between the countries being clustered, based on economic characteristics. In other words the cluster analysis is applied as an exploratory tool, which aims at sorting (maximal) associating EU countries into clusters. Given this, the cluster analysis discovers structures in the economic country characteristics without providing an interpretation.

Herfindahl-index

In order to get more insight in the development of the EU countries, this paper attempts to examine the differences in EU countries, with respect to their industrial structures. The Herfindahl-index is the applied method to measure the concentration of industries, which is calculated as the sum of the squares of market shares of each industry. In this paper the specialization in specific industries per EU country will be measured, as well as the concentration of industries in the EU. The EU is considered specialized in a specific sector, when a majority of employees work in a particular sector relatively to other sectors in the manufacturing *or* service industry. In addition, an industry is considered concentrated when the majority of the industrial activity takes place in a small number of countries.

Figure 6.1 Matrix of concentration and specialization



This method examines to what extent the industrial structures become more concentrated or specialized in the EU countries and within stable clusters. It analyzes the structural divergence in the manufacturing and service industry (on an aggregated level) in the EU over time. The industries are aggregated in two digit SIC-codes according to the European NACE (rev. 1) classification, which is almost similar to the International Standard Industrial Classification (ISIC, rev.3). On the basis of this paper's research purpose the manufacturing and service industry are both aggregated into seven industries. The manufacturing industry includes following industries; Food industry (15-16), Textile industry (17-19), Wood and Paper (20-22), Chemical industry (23-26), Metal industry (27-28), Machinery (29), Equipment (30-35). The Service industry on the other hand is aggregated into the following industries; Wholesale

and retail (50), Other wholesale and retail (51-52), Hotels and Restaurants (53-55), Transport and Storage (60-63), Communication industry (64), Financial intermediation (65-67), Real estate & Business (70-74) (see also appendix II.3, table II.3.1).

The Herfindahl-index (H) is defined as follows:

$$H = \sum_{i=1}^{n} \left(\frac{s_1}{S} \right)^2,$$

Where $1 \geq H \geq 1/n$. The H index is the sum of squared sizes of all industries in the manufacturing or service industry, where industries are expressed as a proportion of the total manufacturing or service industry. The industry sizes are scaled in terms of employment, collected from the KLEMS DATABASE.[18] A higher H-index implies a higher concentration or a high degree of specialization.

An implication of this method is that the level of industrial aggregation affects the H-index. Although the aggregation problem is known, it is unavoidable and the comparability of the data remains as long as the data will be carefully interpreted. For example, a company that is involved in aerospace engineering is attached to another SIC code (electronic components) as compared to a company that only makes jet engines (mechanical components). This may affect the interpretation

Gravity model

The origin-destination matrices give an impression on the spatial interaction pattern of FDI flows within the EU since 1982 onward. In order to analyze the spatial interaction between fifteen EU member countries over time, this paper applies a gravity model. This model combines the theories of international activity and economic geography. The theory showed that the destination of FDI is determined by locational or country differences in available endowments and ownership advantages. With this model the motives for the bilateral FDI flows within the EU over time will be determined. In addition, this model examines the effect of the (exogenous) institutional interferences on the bilateral FDI flow pattern within the EU.

18 Macro data of 14 EU member states (EU 15 without Luxembourg), covering the observation period of 1970-2004/2005., which provides data collected from the EU countries' national accounts and additionally from the EUROSTAT database.

Gravity modelling has its origin in physical science (Newton 1687), but seems appropriate for analyzing geographical patterns in FDI-flows as well, as it is successfully applied in more studies (Pelkmans 1983 and Morsink 1997) and in other internationalization flow studies like trade and migration. With the lowering of economic borders within the EU, one would expect higher interaction between member countries and lower proximity importance. This so-called gravity model assumes that the interaction intensity between EU countries is depending on the countries' mass and the physical distance between them. It is expected that this interaction intensity is positively related to the masses of the countries and negatively related to the distance between the two.

The formula has the following expression:

$$I_{ij} = K \frac{M_i^{\beta_1} M_j^{\beta_2}}{d_{ij}^{\beta_3}}$$

This equation specifies that a FDI flow from origin country i to destination country j can be explained by economic forces at the flow's origin, economic forces at the flow's destination, and economic forces either supporting or resisting the flow's movement from origin to destination. In this equation I_{ij} is the interaction intensity or the amount of FDI flows between country *i* and *j*, *K* a proportionality constant, M_i the mass of the country of origin, M_j the mass of the destination country, d_{ij} the physical distance between the two countries and b an impedance factor reflecting the rate of increase of the friction of physical distance. The physical distance refers to the distance between the capitals of each EU member country. The model controls for the economic mass of sending and receiving localities and the physical distance between them, in order to properly analyze the degree of spatial integration between these EU member countries.

As the objective is to analyze the spatial pattern of FDI flows, the origin mass and destination mass is specified conform the theory. Having developed a theoretical framework for FDI in the previous chapters, the gravity model can be further developed. Tinbergen, Pöyhönen and Linnemann were among the first to use the gravity model for analyzing internationalization processes. Although the application of the initial gravity model is lacking a formal derivation, Bergstrand (1985) made an effort to derive a gravity equation for world trade. In this paper an attempt is made to build upon his thought and develop a specified gravity model on FDI as an internationalization process. The gravity model will be adjusted to the theory discussed in previous chapters.

The mass coefficients of the origin and destination in the initial gravity model will be specified according to the basic motives to undertake FDI (see chapter 4.3.2). As was described in theory there are four basic motives for FDI. These four motives are the independent variables being the ”locational advantage” factors at a country level. At first proxies will be made of these motives, which are the specification of the origin and destination mass and classify the determinants of FDI.

- *Market seeking*

The mass of an origin or destination country of FDI is affected by the market attractiveness or market and demand potential. In this analysis the population size will be used as an indicator of market size and the GDP per capita will be used as an indicator of demand potential. The GDP per capita and population capture the relative strength of market demand of a country or market seeking motives. Both these variables will be used for origin and destination mass. Resulting in the following specified proxies for market seeking motives:

- GDP per capita
- Population

- *Efficiency seeking*

The attractiveness of a country can also be influenced by the efficiency possibilities that the country can offer. In this analysis the labor productivity and labor costs are the indicators applied for efficiency potential. Both these variables will be used for origin and destination mass. Resulting in the following specified proxies for efficiency seeking motives:

- Labor productivity
- Labor costs

- *Resource seeking*

The attractiveness of a country can also be influenced by the available resources that a country contains. The inflation rate and the rate of high education are proxies for the resource seeking motives. Both these variables will be used for origin and destination mass. Resulting in the following specified proxies for resource seeking motives:

- High education
- Inflation

- *Strategic asset seeking*

Finally, a firm can undertake FDI to promote their strategic goals, which depend on the strategic possibilities in a host country. The number of patents and R&D expenditure per country is used as strategic asset seeking motives. Both these variables will be used for origin and destination mass. Resulting in the following specified proxies for strategic asset seeking motives:

- Patents
- R&D expenditure

All models control for the economic mass of origin and destination, but also the physical distance between them in order to properly analyze the degree of spatial interaction between the EU countries.

- *Distance*

In economic geography the distance can be related to the transportation costs, as an important component of the transaction costs. In case of trade between two countries, the transportation of goods affects the price of the product. However, in case of FDI the physically distance seems to be of less importance. But FDI can be seen as a transaction and even more important, in most cases, it leads to a long term trade relation, which implies that the transportation costs or distance is a relevant determinant.[19] It is to be expected that a negative relation between distance and FDI-intensity is envisaged.[20] Although, the importance of distance could incline, due to the Single market program and a decrease in transportation costs.

- *Institutional stages*

Additionally, this model assesses the impact of two institutional factors in the EU integration process on bilateral European FDI relations; the Single Market Program and the introduction of the EURO as one single currency (EMU). So, the gravity model not only controls for the economic mass of origin and destination and the physical distance between them, but also the institutional events. Therefore, dummies are made of these institutional events resulting in the following control dummies:

- DummySM

[19] Respectively the transactional and locational approach, according to Caves (1982).

[20] For practical reasons, the straight line distance in kilometres between two countries' capital are used in this study.

- DummyEURO

The DummySM exists of the pre-Single Market period 1982–1991 (0) and the period since the introduction of the Single market, 1992-2006 (1). Additionally, the DummyEURO consists of the pre-EURO period 1982-2001 (0) and the post-EURO period 2002-2006 (1). It is to be expected that the institutional events impede an increase in the FDI-intensity.

In the previous section the theoretical background has been translated into specific mass specifications. The proxies of the motives, the independent variables, are the determinants of the dependent variable. The dependent variable is the FDI intensity from the home to the host country. The above can be summarized in the following gravity-type models:

Market-seeking model:

Efficiency-seeking model:

Resource-seeking model:

Strategic asset-seeking model:

Where:

FDI =FDI intensity

GDP =Gross domestic product

POP =Population

LABPRO =Labor productivity

LABCOSTS =Labor costs

HIGHEDU =High education

INFLAT =Inflation rate

PATENTS =Patents

RDEXP =R&D expenditure

K =Constant

D =Physical distance between two countries

SM =Introduction of the Single Market

EURO =Introduction of the EURO

i =Home country

j =Host country

These equations show that the FDI intensity between a pair of countries i and j depends on a set of determinants, defined as motives.

Ordinary Least Square Regression

The gravity model is a goodness of fit, however not a structural explanation. That will be examined regarding the specification of the interaction term of the four models. In this paper, the gravity model has been estimated by an Ordinary Least Squares regression (OLS). The regression gives an equation of a straight line, which specifies the linear relation between the dependent variable and the independent variables. This technique examines the relationship between the FDI intensity (dependent variable) and the explanatory variables (independent variables) for bilateral FDI flows between EU countries over time. The equation minimizes the difference between the individual observations of the dependent variable and the straight line. OLS is employed to model numerical data obtained from observations by adjusting the parameters of a model so to get the optimal fit of the data. In this analysis the variables are transformed into natural logarithms, because OLS requires a linear model, whereas the equation is of a multiplicative nature. This way the non-normal statistical distribution of the dependent and independent variables will be adjusted.

Furthermore, large network data often consists of zero flows between nodes (countries), which could denote that OLS estimation is not the preferred specification. Instead, the Poisson model would then be more appropriate to handle zero flows. However, in this dataset the zero flows are negligible and OLS is still an appropriate tool to estimate the Gravity model. Nevertheless, the results of the OLS estimation are only valuable and unbiased, when five different assumptions are met. These assumptions are normality, homoskedasticity, linearity, no autocorrelation and no co linearity. These assumptions are all satisfied.

Grubel-Lloyd index

In theory it is addressed that the relationship between FDI and trade is a complex one, but it is also relevant to consider this relationship as FDI and trade are both indicators of the economic integration process within the EU.

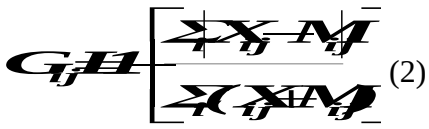
FDI and trade are both internationalization modes, but they can have a correlated relationship. FDI can lead to international vertical integration in trade which reduces costs of production and increases economies of scale. Intra-industry trade (IIT) arises when a country imports and exports goods or services in the same "sector". Intra-industry trade distinguishes two different types; vertical IIT and horizontal IIT. Vertical IIT refers to the imports and exports of goods and services in the same sector but at *different stages of processing*. It may encourage FDI as it assures them of ownership advantages, based on the fragmentation of the production process. Different stages of the production process can be established at different EU countries by taking advantage of the local conditions and the market of a country. Horizontal IIT refers to the imports and exports of goods and services in the same sector but at the *same stage of processing*. It may discourage FDI as the product trade substitutes FDI. However, based on the desires of different type of consumers, product differentiation is an answer to this variety of consumer needs.

Analyzing the intra-industry trade (IIT) pattern within the EU, could provide more explanatory power to the FDI interaction pattern. Based on the assumption that vertical trade is considered the norm and MNEs offshore their production, intra industry trade is closely related to intra firm trade. This paper uses the Grubel-Lloyd index to measure the extent of IIT and in order to gain more explanatory power to determine the structure of the FDI interaction pattern within the EU. A high Grubel-Lloyd index then represents a high integration of intra firm trade.

In order to analyze the impact of intra-industry trade on FDI the constructed index of Grubel-Lloyd (1975) is the most widely preferred index to determine the extent of IIT. Since the GL-index is calculated as IIT divided by total trade, the GL-index should be interpreted as IIT's share or percentages of a country's total trade. Once a country's export and import value for a particular sector and period are known, it is calculated as:

$$GL_{ij} = \left[\frac{(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \right] \quad (1)$$

Or

 (2)

where subscript *i* refers to sector ('product') group and index *j* refers to a EU country, in this case trading with the EU15 as a region. So, Xi is an EU country's exports of product *i*, to the EU15, and Mi is an EU country's imports of product *i* from the EU15. Absolute values are indicated by ‖.[21] The second equation is a modification on the first equation to obtain the average level of IIT for a country j. The sigma (Σ) means that all the GLij are calculated by a weighted mean, using the relative size of imports and exports of a particular product group as weights.

When a country only exports or imports goods or services within the same sector, there is no intra-industry trade and the right-hand side of equation (2) equals one, such that the GLij reduces to zero. Similarly, when imports equal exactly the export value, than the right-hand side of equation (2) equals zero and the GLij reduces to one. The Grubel–Lloyd index therefore varies between zero (pure inter-industry trade), when there is complete specialization (Krugman 2000) and one (pure *intra*-industry trade), when trade is in balance.

All the statistical data is collected from SourceOECD. The data used in this paper is classified according to the Harmonised System (HS).[22] The reason for using the HS is that it offers more disaggregated data. The sectors used are classified at a 3 digit level of SITC Revision 2.
The data covers the import and export of manufactures (thousand US$) between an EU country and the total EU15 in the years 1982 - 2006. Furthermore, the yearly data are aggregated in five year periods.

The Grubel-Lloyd index is a criticized tool for measuring IIT, but still the most frequently used measure and there is no alternative index that is widely recognized as superior to the Grubel-Lloyd index. The main problem with the Grubel-Lloyd index is the categorical aggregation level of the data.[23] When the statistical data is highly disaggregated, products can be excluded from the industry where they should be included and the opposite for aggregated data is true, where different products are included in the same industry although they should

21 The absolute value is a number without regard to its (negative) sign.
22 The trade data is from SourceOECD
23 See e.g. Markusen et al. (1995)

be excluded. The fact that the aggregation level affects the value of IIT has caused economists to argue which SITC level is the most appropriate one. The more aggregation levels, the lower the value of the index (Hansson 1989 and Parjanne 1989). However, the commonly used three digit level is suitable enough and applicable for accurate approximations (Parjanne, 1989). Although the intra-industry trade statistics depend on the chosen disaggregation level, this analyzes still meaningful for changes in IIT over time and compared across EU countries.

Furthermore, the data covers only the imports and exports of manufactures, which makes it impossible to examine the IIT for service industries and limits the possibility to compare the level of IIT within the two industries. Additionally, this way of aggregating industries is somewhat different than the aggregation based on the SIC-codes, as is done in the Herfindahl-index. This makes it difficult to combine or compare the industries on concentration and IIT. Other criticism that the Grubel-Lloyd index releases is the consequence of using multilateral or bilateral trade flows or the effect of unadjusted trade imbalances. However, these complications are not relevant for this paper and therefore not discussed further.

7. Empirical results

Having developed a comprehensive theoretical framework which combines the theory of international production with the theory of economic integration, it is now time to empirically analyze the research question(s). This chapter provides an empirical exploration to determine the actual degree of economic integration within the EU15 over the past 25 years. The primary contribution of this empirical study is to examine the nature and development of the European integration process. In order to understand the dynamic pattern of FDI within the EU and to what extent the EU can be regarded as one economically integrated region this paper analyzes three modes of integration: *economic structural*, *institutional* and *functional*.

The first section (7.1) of this empirical study handles the *economic structural* perspective of the integration process. It takes into account the changing nodes of the FDI network, which are the EU countries. To what extent do these EU countries, which are the origin and destination of international activity, become more similar or dissimilar in the 1982-2006 period, with respect to their economic structures?

The second section (7.2) examines the *institutional* perspective (7.2) or the environment in which the European integration process takes place. This section examines the potential declaring factors (motives) to undertake FDI over time and what effect the exogenous institutional events have had on the integration process of the European Union?

Another important pillar of the integration process is the *functional* perspective (7.3) and to what extent the network of international activity changes over time. This section handles the relational aspect of the integration process, in order to determine whether the EU is functionally integrated in the 1982-2006 period. This will be an extension of the previous sections, in which the empirical results will be compared with the FDI interaction network within the EU.

7.1 Economic Structural integration

Before, the functional interaction network of bilateral FDI flows between EU countries in the 1982-2006 period will be shown, this section attempts to analyze the *nodes* of this interaction network. The nodes being the EU countries as origin and destination of international activity. The applied Hierarchical cluster analysis, determines the economic structures of the fifteen European countries and groups the (most) homogeneous countries together. This analysis

examines to what extent these EU countries become more similar or dissimilar in the 1982-2006 period. With the aspect of time it is interesting to see whether EU countries converge over time and whether the EU becomes a more homogeneous or integrated region, with respect to their economic structure. In addition, the Herfindahl index (7.1.3) is applied to get more insight of the EU countries' industrial structures. This might help to understand were the differences or similarities found in the cluster analysis stem from. Furthermore, it can be seen whether the EU countries have some concentrated industries or whether the EU becomes more specialized as a region.

7.1.1 Similarities among EU countries

The Hierarchical cluster analysis is derived from the PCA (see appendix II.1). The applied agglomerative method starts with each country being considered as a separate cluster and sequentially combines the EU countries according to the cluster-to-cluster distance until one single cluster is left. This method clusters the EU countries such that those countries within a cluster are more closely related than countries assigned to another cluster. In figure 7.1 and 7.2 the outcomes of the cluster analysis of the first and last examined time period are graphically represented in a dendogram.

Figure 7.1 Dendogram of the EU15, 1982-1986

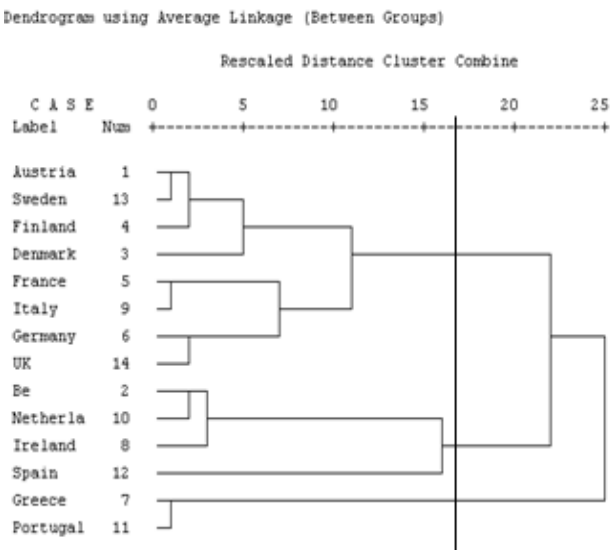
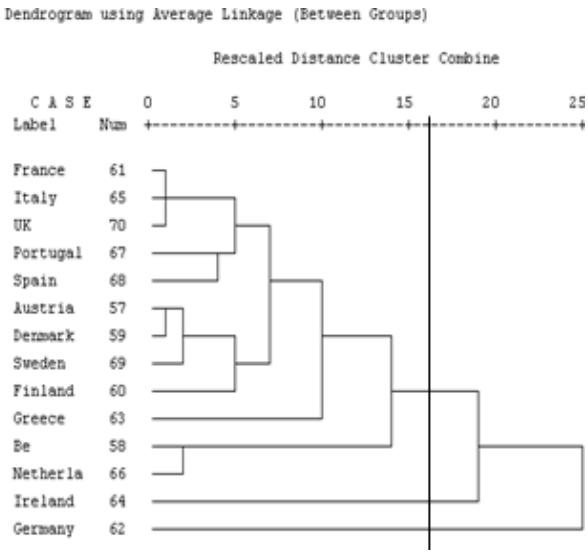


Figure 7.2 Dendogram of the EU15, 2002-2006



Source: Appendix II.2 Hierarchical cluster analysis

Notes: a. Luxembourg is excluded from this analysis

b. Clustering of the five principal components derived from the PCA (see appendix II.1)

c. This analysis applies the Euclidean distance between average group linkages.

These dendograms can be interpreted by analyzing which countries are attached the closest to zero on the rescaled distance cluster axis. The countries that are clustered together first (closest to zero on the rescaled distance cluster axis), are characterized by the highest degree of homogeneity within their economic structures. Thus, in figure 7.1, "Austria" and "Sweden", "France" and "Italy", and "Greece" and "Portugal" form the strongest clusters in the 1982-1986 period. In figure 7.2 it is shown that the "United Kingdom" joined the cluster with "France" and "Italy", and that "Austria" and "Sweden" again form a strong cluster together with Denmark in the 2002-2006 period. Furthermore, "Belgium" and "The Netherlands" are quite homogeneous in both periods. The total examined period showed some more rather stable clusters over time, which will be discussed later on in this section.

Another valuable piece displayed by the dendograms is the inter-cluster linkages. In the first period the dendogram shows two main groups and "Greece" and "Portugal" merging at a much later stage with these two groups. Twenty years later the situation is significantly different. When drawing a vertical line at the same rescale distance in the last period, the dendogram shows one main group which includes 12 economies and "Ireland" and "Germany" with a considerable distance between this main group. So, when comparing the first (1982-1986) and last period (2002-2006) covered in this analysis, the inter-cluster distance did decrease over time which indicates that the EU countries did become more homogeneous with respect to their economic structure. However there are some exceptions. Ireland and Germany became more diverged compared to the other EU countries. Additionally, the intermediate examined periods show some fluctuations in inter-cluster distances (appendix II.2). Furthermore, the cluster analysis has revealed that the intra-cluster variance of the sub-level clusters is decreasing over time. By analyzing the results of the cluster analysis from all five time periods, some stable clusters can be derived, see table 7.1.

Table 7.1 Clusters over time

	Clusters									
Period	1982-1986	Be, NL, Ire	Fr, It, UK, Ger	Au, Swe, Fin, Den	Sp	Por	Gr			
	1987-1991	Be, NL	Fr, It, UK	Au, Fin, Por	Ger	Ire	Gr	Sp	Swe	Den
	1992-1996	Be, NL	Fr, It, UK	Au, Swe, Den	Ger	Ire	Gr, Por	Sp	Fin	
	1997-2001	Be, NL	Fr, It, UK	Au, Swe, Den, Por	Ger	Ire	Gr, Fin, Sp			
	2002-2006	Be, NL	Fr, It, UK	Au, Swe, Fin, Den	Ger	Ire	Gr			

Source: Appendix II.2 Hierarchical cluster analysis

Note: a. derived from the Hierarchical cluster analysis.

The first two obvious stable clusters are the country combinations; (a) “Belgium” and “The Netherlands” and (b) “Italy”, “France” and the “United Kingdom”. The whole examined time period (1982-2006) these economies were clustered in one group bases on the lowest levels of intra-cluster variance, which indicates that these groups form homogeneous countries. It reveals that the Netherlands and Belgium on the one hand, and Italy, the United Kingdom and France on the other hand show large similarities with respect to their economic country specific elements.

In the first period Ireland had only a small distance from the Netherlands-Belgium cluster, but over time Ireland started to diverge from this cluster as well as from all the other EU countries. Also for Germany a diverging trend can be observed. From 1992 onwards, Ireland and Germany both formed a stable cluster on their own. These two countries can be seen as two heterogeneous countries compared to all the other EU member countries as well as to each other.

In addition, Austria together with the Scandinavian countries (Finland, Sweden and Denmark) can be considered as a stable cluster, although the intra-cluster variance is greater than for the clusters which were mentioned before. For the 1982-1986 and the 2002-2006 period these countries show large similarities in their economic structures. However, in the intermediate time periods these countries show some more dissimilarity to each other. This might indicate a restructuring of the economies of these countries which did not happen in parallel.

The countries, Greece, Portugal and Spain keep changing patterns over time. In the first period these countries had the largest distance to all other EU countries. However, in the overall period these countries did become more closely related towards the other EU member countries. At the same time, all Euclidean distances between EU countries became shorter, which indicates that the EU countries, except for “Germany” and “Ireland”, converged over time with respect to their economic structures.

Core and Periphery countries

In addition to the cluster analysis, the EU countries will be classified into core and periphery, based upon their GDP per capita. Countries with a GDP per capita below average are grouped as peripheral countries and above average as core countries (see appendix figure II.2.6). Examining the development of the regions within the EU over time provides insight into the degree of convergence of EU countries.

Figure 7.13 Core and periphery countries, 1982-1986

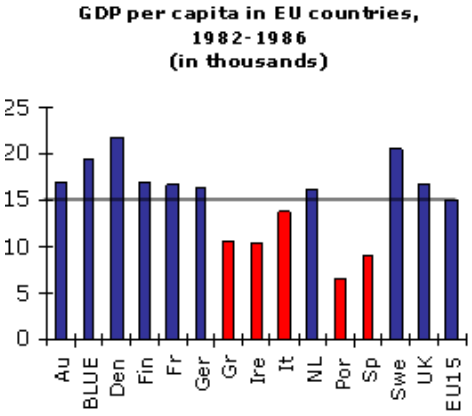
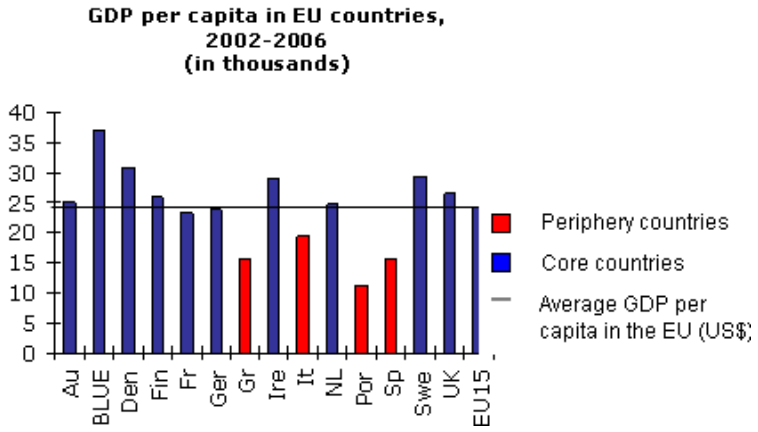


Figure 7.14 Core and periphery countries, 2002-2006



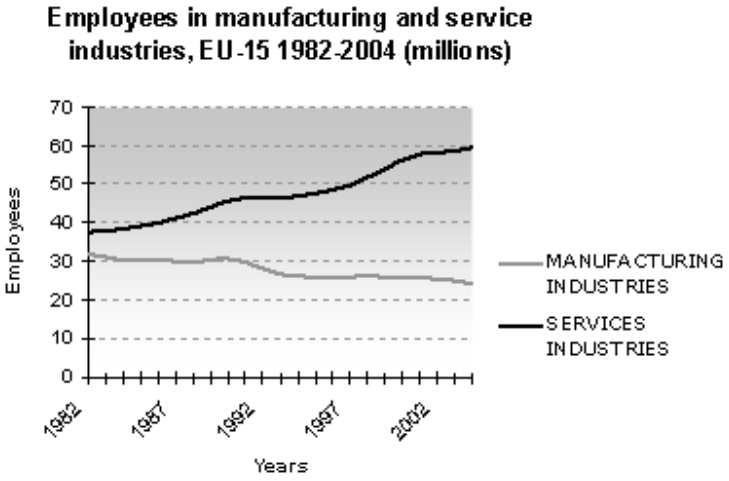
Source: WDI

Figure 7.13 and 7.14 (intermediate tables are presented in appendix II.2.6) reveal that over time none of the EU countries switches from core to periphery country. Moreover, the other way around no major switch from periphery to core is evident, except for Ireland. In the 1997-2001 period, Ireland's GDP per capita increases above the average EU15 GDP per capita and based on this criteria Ireland can therefore be regarded as a core country from that point forward. Furthermore, the GDP per capita increases for all the EU countries, even for the peripheral countries, which lead to an increasing average GDP per capita in the EU. However, GDP per capita among EU countries is still very unstable or variable over time.

7.1.2 Differences between EU countries

The previous section studied to what extent the European countries have become more similar, based on their country specific elements. In this part it will be examined to what extent the industry structures differ in the EU. The following of this section will focus on detecting the geographical relocation of industries within the EU and the level of specialization per EU country. With the support of the Herfindahl-index, evidence is provided about the changing patterns in the distribution of industrial activities among EU member countries. In order to acquire a general impression of the industry development within the EU, the proportion of total employees working in *manufacturing* and *service* industries in the EU over time will be shown in figure 7.5. It reflects the deindustrialization process and implies a relatively high concentration of services, as compared to manufacturing industries, in the EU15 during the 1982-2006 period.

Figure 7.5 Development of industries in the EU, 1982-2004



Source: KLEMS DATABASE

Notes: a. The manufacturing industries consist of the two-digit SIC-codes 15 -35 and the service industries consist of the two-digit SIC-codes 50-74.

b. Luxembourg is excluded from the EU15.

c. Only data available from 1982 to 2004

The absolute number of employees working in the manufacturing industries is decreasing while the absolute number of employees in the service industries is increasing over time, which is in line with the world economy as described in chapter 2. The decrease in the manufacturing industry is not as strong as the growth in services, what indicates that the shift towards services can not entirely be explained by deindustrialization, but also by the shift from agriculture employment towards services. However, by analyzing the service/manufacturing specialization indices of the individual countries a clear distinction is observable between core and periphery outcomes. Besides Ireland, all periphery economies are characterized by a relative high degree of specialization in the manufacturing sector as compared to the EU average, see figure 7.6 and 7.7. Moreover, with respect to the core economies also Finland and Germany form an exception, as they have remained a relatively high specialization in manufacturing.

Overall, it can be concluded that the relative share of service has gained importance in all EU15 economies, but that the southern Mediterranean peripheral countries together with Germany and Finland can be considered as the most manufacturing orientated countries of the EU15 as they account for the highest share of manufacturing in its economies. On the other hand, the Netherlands, the United Kingdom, France and Denmark can be considered as the most service orientated countries of the EU15.

Figure 7.6 Specialisation index, Manufacturing

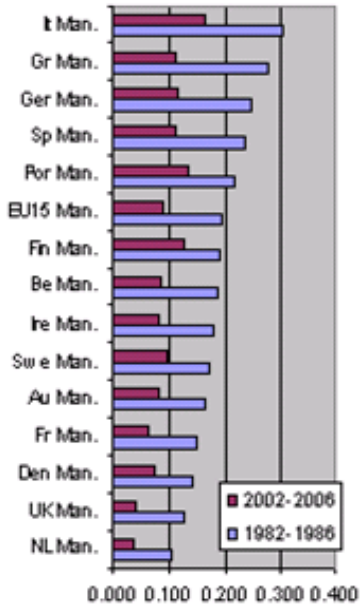
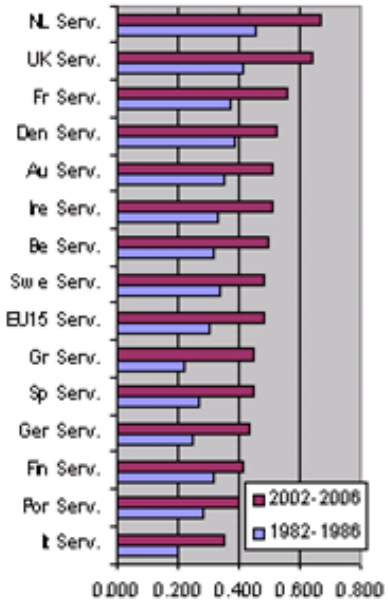


Figure 7.7 Specialisation index, Services



Source: Own calculations, extracted from the KLEMS database

Note: a. Total industry employment per country is aggregated into manufacturing and service industries

Furthermore, this section employs a more aggregated dataset (see appendix table II.3.2), which illustrates in which manufacturing and in which service industries the EU is most specialized. With respect to the manufacturing sector an absolute decline in the number of employees is visible for all industries. However, no big changes occurred in the dominance of specific sectors. Only for the "Textile" industry a significant decline relative to the other industries is observed. The other manufacturing industry shares remain rather stable. Furthermore, appendix table II.3.2 illustrates that the EU15 manufacturing industry is most specialized in "*chemical*" and "*Equipment*" which are both categorized as technology intensive sectors[24]. In contrast to the manufacturing industry, all service industries did grow over time, as measured by the number of employees per industry.

In the remainder of this section the observed specialization patterns of the individual EU countries will be analyzed. Did all EU countries become more specialized over time? Did all EU countries specialize in the same sectors? And is specialization in line with the comparative advantages of countries?

[24] Twenty industries are classified in to four subgroups; Resource intensive, Labor intensive, Capital intensive and Technology intensive. For full classification see appendix table II.3.24

Specialization and regional concentration

An insight is provided to what extent the economic characteristics of European countries converged towards each other. Countries characterized by similar economic characteristics were clustered together and the hypothesis was made that countries with homogeneous economic structures would specialize in the same type of industry. In appendix tables II.3.18 – II.3.23 the concentration and specialization indices of industries per stable cluster are presented. However, by analyzing the industrial structures of individual countries it is pointed out that countries which were clustered together on the basis of homogeneity in their economic characteristics, do not all show similar industrial structures.

With the following two graphs (figure 7.8 and 7.9) the specialization index of each EU country in the service and manufacturing industries will be shown. This picture illustrates that all EU countries have quite low indices (all below 0.3), which indicates that their economic activities in both the manufacturing and the service industry are diversified.

Figure 7.8 Specialization in Manufacturing industries

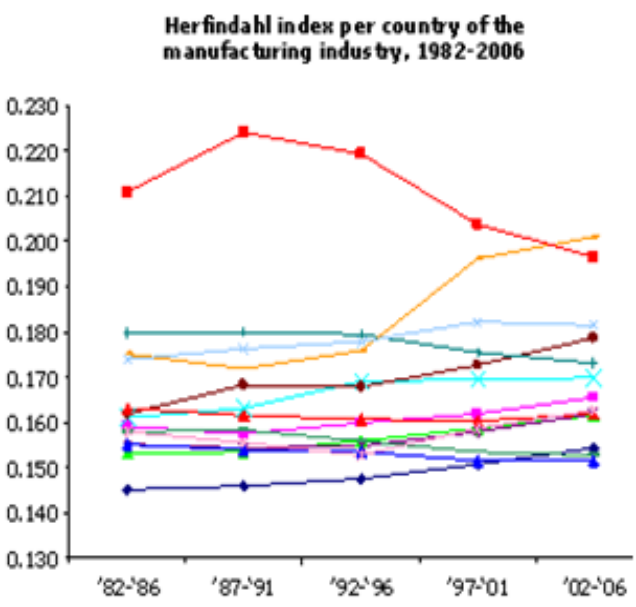
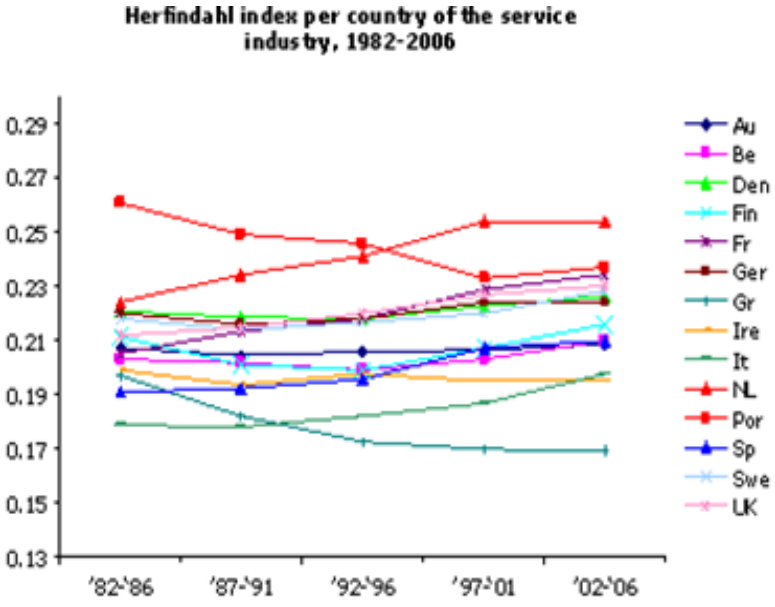


Figure 7.9 Specialization in Services industries



Source: extracted from table II.3.4 – table II.3.17 in appendix II

Notes: a. The manufacturing industry and the service industry are both aggregated into seven industries (see appendix II, table II.3.1).

b. Average HHI of five year-periods per country

Overall, in line with theoretical predictions, most countries obtained a more specialized industrial structure. Remarkable is that Portugal and Ireland have attained a more specialized

manufacturing industry as compared to the other EU members. This might be explained by their initial high shares in rural activities which have been decreasing in all EU countries over time. Portugal has become more specialized in the "*Textile*" sector and for Ireland industrial specialization is the effect of an increasing specialization of the "*Equipment*" and "*Chemical*" sector and partially the "*Food*" sector, although this one declines over time. However, Portugal is also the only country that shows a significant decrease in specialization after the establishment of the Single Market in 1992.

Also with respect to the service industry, most EU countries show slightly increasing specialization indices. Portugal and the Netherlands show relatively high levels of specialization within the service industry, while Greece has the most diversified service industry. Furthermore, all EU countries show highest specialization indices in two service sectors; the "*Other Wholesale and retail trade*" and the "*Real estate and Business activities*". In addition, due to the stronger increase of the "Real estate and Business" as compared to the other service sectors the EU15 service industry as a whole has become more specialized during the past twenty-five years.

Concentration indices furthermore point out that the service industry is more geographically dispersed than the average manufacturing industry. This may be explained by the nature of services. Not all services are tradable and therefore close proximity to the market is a prerequisite for some services. Furthermore, the income elasticity of demand for services is considered high (Midelfart-Knarvik, 2000), and therefore it can be expected that through the convergence of peripheral countries towards the core (section 7.1.1) demand for services in the periphery increased, what may have reinforced the geographical dispersion of the service industry across the EU15. Beside the increased demand for services by consumers, Midelfart-Knarvik (2000) observed an increase in the use of services as intermediate inputs for production. Especially the Office & Computing, Electrical apparatus, Non-metallic minerals, printing & publishing and the Equipment industries reported high amounts of services as intermediate inputs in their production process.

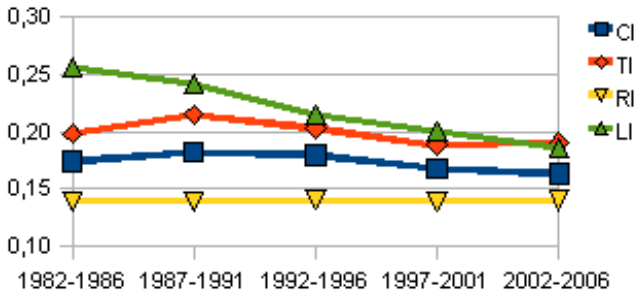
When considering the specialization of individual countries in specific manufacturing industry sectors, a distinction is made between countries that are specialized in labor-, resource-, capital- and technology-intensive sectors. In order to do so, the manufacturing industry was first further aggregated into twenty manufacturing sectors. Secondly, all twenty sectors were classified in one of the four categories, see appendix II.3.24. The classification of

sectors in these four categories is done in line with OECD[25] (1987, p. 272). It is distinguished between four industry categories:

- *Resource-intensive* (RI) industries: for which easy access to natural resources is important
- *Labor-intensive* (LI) industries: for which labor costs is a competitive factor
- *Capital-intensive* (CI) industries[26]: which are characterized by high physical capital investments (Peneder, 2002)
- *Technology-intensive* (TI) industries: which are characterised by "rapid application of scientific advance" and "tailoring products to highly varied demand characteristics" (OECD, 1987) and for which R&D motives are likely to play a major role in FDI decisions.

In addition, the classification of Pratten (1988), see appendix II.3.25, which ranked industries according to scale economies is used in order to distinguish industries in which high economies to scale can be achieved. Figure 7.10 shows the geographical concentration indices of the four industry categories. Subsequently, the industrial concentration and the level of specialization of the EU15 countries in each of the four classified manufacturing industries will be further elaborated on in the following of this section.

Figure 7.10 Geographical concentrations by industry characteristics



Source: Own calculations, extracted from the KLEMS database

Labor intensive industries

The Southern Mediterranean economies (Por, Sp, Gr and It) share the specialization in the "traditional" labor intensive production sectors, like "*Textile*" and "*Leather"*. Additionally,

[25] OECD (1987) has made a categorization of industries based on the primary factors affecting the competitiveness of each activity.

[26] Within the OECD (1987) study scale intensive industries rather than capital intensive industries were used in order to classify all industries. It is decided not to use the scale intensive classification because scale economies are also advantageous for many technology intensive industries.

the highest increase in concentration can be observed for the textile and leather industries. While in the 1982-1991 period these industries were predominantly located in the largest markets (Ger, UK, Fr and It), from 1992 onwards the industry becomes highly concentrated in the Southern periphery countries, see table 7.2.

Table 7.2 Concentration index for the leather and textile industry, 1982-2006

TEXTILES, LEATHER AND FOOTWEAR						
	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006	change
GER	0,034	0,031	0,018	0,012	0,009	-
UK	0,019	0,018	0,017	0,015	0,007	-
FR	0,018	0,014	0,013	0,011	0,009	-
IT	0,057	0,065	0,082	0,089	0,108	+
POR	0,009	0,011	0,014	0,016	0,020	+
SP	0,007	0,009	0,009	0,017	0,022	+
GR	0,001	0,001	0,001	0,001	0,002	+
HHI index	**0,147**	**0,149**	**0,157**	**0,162**	**0,178**	+

Source: Own calculations, extracted from the KLEMS database
Notes: a. The manufacturing industry was aggregated into seven industries (see appendix II.4.1).
b. Average HHI of five year-periods per country

This relocation seems to be in line with the theory of comparative advantages, as the geographical concentration of these labor intensive industries coincides with relatively high amounts of low cost labor in southern peripheral economies (Midelfart-Knarvik et al., 2000). Furthermore, labor intensive industries are lowest in Pratten's (1988) ranking of sectors according to economies of scales, what makes it unlikely that the concentration patterns are resulting from achieving greater efficiency through scale economies. However, in absolute numbers, the labor intensive industries loose importance over time, what can be explained by the comparative advantages of Chinese and South-East Asian countries in these industries (Rollet, 1988). These Asian countries developed an expertise in textile technologies and often charge lower labor costs than the EU15 countries.

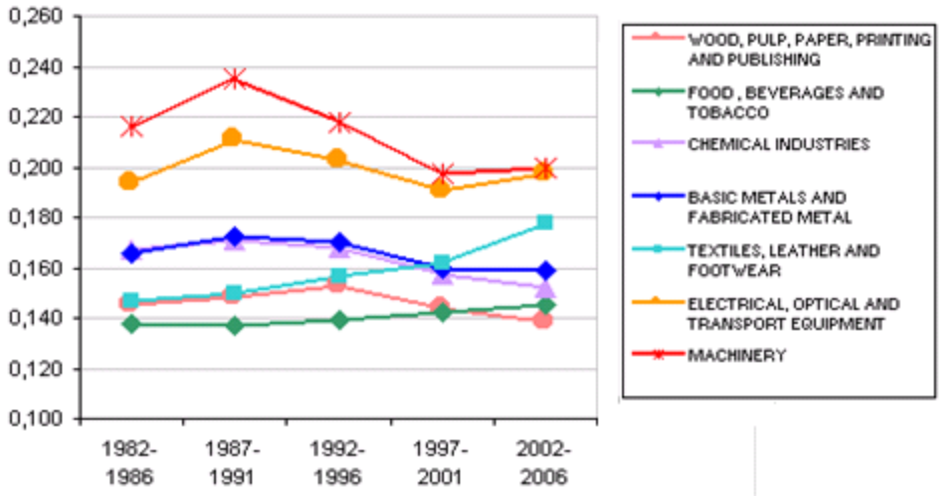
Resource intensive industry

The resource intensive industry is further aggregated into the paper, wood, non-metallic minerals, food & beverage and tobacco. Overall, the resource intensive industry seems to be dispersed across the EU15 countries as it reports the lowest concentration index, see figure 7.10. However, the Nordic Scandinavian countries (Den, Swe and Fin) all report high, though slightly decreasing specialization indices for the sectors; "*Wood and Paper*". In addition, also

Austria reports a high specialization in these industries. With respect to the largest countries (FR, Ger, UK, Sp, It) no high specialization indices can be observed for both the Wood and Paper industries. Nevertheless, the concentration index points out that the majority of employment in these industries is located in the largest countries and even an upward trend towards Spain and the UK can be observed. Thus, although "Wood and Paper" are important industries in the Nordic economies of the EU15, no industrial concentration of both industries can be observed in the Scandinavian countries.

Specialization indices for the food industry are quite high for all EU member countries and furthermore it turned out to be the one of the least concentrated industries, see figure 7.11. A possible explanation for the geographical dispersion of the food industry is that close proximity to the market might be advantageous as national cultures and tastes need to be served (Krugman, 2000).

Figure 7.11 Indices of industry concentration



Source: Own calculations, extracted from the KLEMS database

Notes: a. The manufacturing industry was aggregated into seven industries (see appendix II.4.1).

b. Average HHI of five year-periods per country

Capital intensive industries

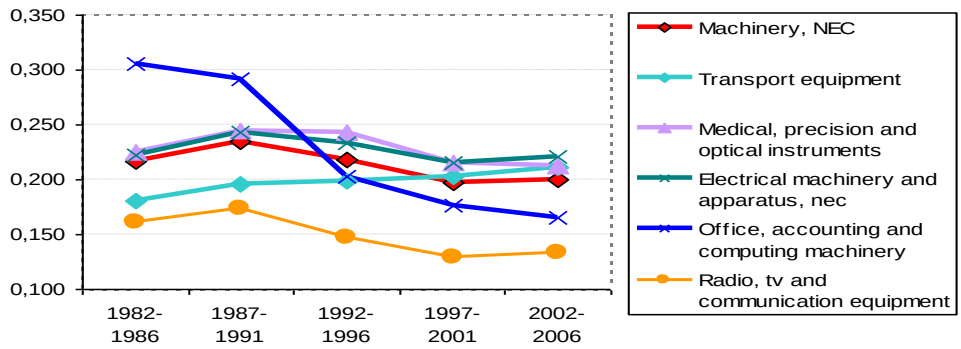
The capital intensive industries are characterized by high rates of physical capital investments (e.g. in buildings, equipment or machinery used in the production). With respect to the capital intensive industries the high specialization of the UK is remarkable, which reflects the strong increase in UK's printing, publishing and reproduction sector. Furthermore, all periphery countries share low specialization indices for the capital intensive industries, especially

Portugal and Italy. Although Gr, Sp and Ire show low specialization indices for capital intensive industries as well, over time they move more towards the EU15 average. All other EU15 (core) countries show similar specialization indices, somewhere in between that of the UK and the Periphery countries. Thus, the estimated findings reveal that capital intensive industrial activities are geographically dispersed across the (richer) EU core economies.

Technology intensive industries

Figure 7.11 pointed out that "Machinery" and "Electrical, optical and transport equipment" industries are most concentrated during the estimated period. However after the establishment of the Single Market these industries became more dispersed across the EU15 countries. Especially in the 1991-1997 a decline in geographical concentration can be observed. Also by further aggregation of the "Electrical, optical and transport equipment" industry, this pattern holds for four out of five industries, see figure 7.12.

Figure 7.12 Concentration patterns of technology intensive industries



Source: Own calculations, extracted from KLEMS database

The increased dispersion of technology intensive industries is mainly driven by the reduced dominance of Germany, the UK and France. The smaller EU core countries and even the periphery countries strengthened their positions in these industries. Most pronounced is the increased specialization of Ireland in these high technology intensive sectors. This industrial restructuring toward high skilled labor and technology intensive industries is in line with the findings in section 7.1.1 in which it already has been revealed that Ireland also catched up with the EU core countries based on the EU average GDP per capita criteria.

Only the "Transport equipment" industry shows a different pattern as opposed to the other technology intensive industries. As a result of the increased concentration of these industries

in Germany and Spain, the transport equipment industry shows a constant upward trend in regional concentration which may be explained by the large car industry in these countries.

7.2 Institutional integration

In order to enhance a comprehensive view of the intra EU international activity pattern and a starting point for further comparative analysis, this section examines dependency of the European integration process on its environment. A gravity model is applied in order to determine the main actors or the source of the European integration process. The theory showed that the destination of FDI is determined by locational advantages or the differences in country's available endowments. On the other hand the ownership advantages are responsible for the origin of FDI. These two advantages create the opportunities for FDI to take place in the EU. The gravity aims to examine the motives to undertake FDI in the EU over time. Furthermore, the focus on intra-EU FDI allows us to assess the role of the European integration program on the European integration process.

Table 7.3 Elasticity of FDI motives in the EU, 1982-2006

Motives	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006	
	β	Sig	β	Sig	β	Sig	β	Sig	β	Sig
Market seeking										
Population (Home)	.847	√	.873	√	.785	√	.807	√	.804	√
GDP per capita (Home)	2.503	√	2.882	√	2.549	√	3.008	√	2.030	√
Population (Host)	.914	√	.894	√	.588	√	.579	√	.722	√
GDP per capita (Host)	-.270	X	-.543	X	.130	X	1.596	√	1.200	√
Distance	-1.38	√	-1.34	√	-1.39	√	-1.38	√	-1.23	√
DummySM	1.214 (√)									
DummyEURO	.219 (X)									
Resource seeking										
High education (Home)	.805	X	1.063	X	.033	X	.443	X	-1.86	√
Inflation (Home)	-.844	√	-.562	√	-.960	√	-1.02	√	-.175	X
High education (Host)	-.289	X	-.761	X	-1.32	X	-.039	X	-2.38	√
Inflation (Host)	-.377	X	.018	X	-.226	X	-.302	X	-.205	X
Distance	-1.24	√	-1.59	√	-1.81	√	-1.93	√	-1.87	√
DummySM	.263 (X)									
DummyEURO	.526 (√)									
Efficiency seeking										
Labor costs (Home)	1.445	√	.539	X	-.062	X	6.538	√	5.385	√
Labor productivity (Home)	-.414	X	1.827	√	1.875	√	2.960	√	2.464	√
Labor costs (Host)	.320	X	-.429	X	1.315	X	-1.52	X	4.447	√
Labor productivity (Host)	-.636	X	-.012	X	.098	X	1.184	√	1.597	√
Distance	-1.44	√	-1.6	√	-1.63	√	-1.52	√	-1.38	√
DummySM	.156 (X)									
DummyEURO	-.068 (X)									
Strategic asset seeking										
R&D expenditure (Home)	.545	√	.656	√	.559	√	.552	√	.490	√
R&D expenditure (Host)	.198	√	.223	√	.192	√	.300	√	.300	√
Distance	-1.2	√	-1.24	√	-1.59	√	-1.66	√	-1.65	√
DummySM	1.161 (√)									
DummyEURO	.836 (√)									

Source: Appendix III.1

Notes: a. for variables see appendix x
b. bilateral FDI intensity (ln) as a dependent variable
c. significant level at .05. In this table √ refers to a significant level and X to an insignificant level.

Table (7.3) shows the proxied motives to undertake FDI within the EU and the dummied institutional events as independent variables, which are subject to the FDI intensity as a dependent variable and presented over time. Recall that the dependent variable is the bilateral FDI intensity from home country (i) to host country (j). So, a positive sign on independent variables means favorable to the bilateral FDI flow between two EU countries. A first note that can be made is that the coefficient on physical distance shows the expected negative sign and is significant at the 5% level for all the motives seeking strategies over time. This result suggests that as the physical distance between two economies increases, that a home country's bilateral FDI decreases regardless its motive. Though, the strength of impact of the distance differs per motive and over time. Furthermore, it can be seen that not all independent variables seem to hold a significant 5% level.

With respect to the ***market seeking*** variables it appears to be that market seeking is a dominant motive to undertake FDI in the EU over time. Four out of the five slope coefficients are significant at the 5% level in the first three periods and even five out of five in the last two examined periods. The coefficients on both GDP per capita (Home) and population (Home) have a positive sign and are significant. This implies that the bilateral FDI intensity is positively affected by the home country's GDP per capita and population. Especially high elasticity can be found for GDP per capita (Home). However, the GDP per capita of the host country just shows a positive sign since the 1992-1996 and a significant level after this period. The interpretation here is that GDP per capita of the host country is only after this period likely an indicator of potential market size. The distance variable has a significant negative impact on the level of FDI, but the elasticity slightly decreased in the last ten years. This implies that a higher physical distance between two EU countries generates a lower bilateral FDI intensity between the two economies. However, the importance of proximity decreases over the last examined periods. The results suggest that the market seeking hypothesis can be accepted. Thus, the larger the size of both the home and host economies the higher the FDI intensity between the two EU countries, when controlled for distance.

When examining the ***resource seeking*** motive and the ***efficiency seeking*** motive, they both provide mixed results with many insignificant outcomes. For the resource seeking strategy, only the inflation (Home) variable is significantly influential on FDI, except for the last period examined. The home country's inflation shows a negative impact, which indicates that the higher the home country's inflation rate will be the lower the bilateral FDI intensity

between two economies. This may be due to the fact that it attracts companies to stay on the home market and increase the turn over with higher product prices. As for the efficiency seeking strategy, only the last two examined periods may show some more explanatory power. In these periods all the independent variables display a (high) positive impact on the FDI intensity, except for the distance control variable which remains negative. Predominantly the coefficients on labor cost (home and host) have a highly positive sign, which would suggest that there will be more bilateral FDI when the home and/or host country's labor cost is high. This seems contradicted to the traditional comparative advantage theory, where it is argued that companies seek for countries' comparative advantages (e.g. lower labor costs). Perhaps companies seek more for different factor endowments like skill or knowledge intensive labor, which requires higher labor costs. Nevertheless, the resource seeking and efficiency seeking motive do not appear to be dominant motives to undertake FDI within the EU over time.

Finally, the ***strategic-asset seeking*** motive is examined and seems to be an important motive due to the significant results. The proxy for this motive is the research and development expenditure. The home as well as the host country's R&D expenditure generates a positive impact on the bilateral FDI between two EU countries. The home country's R&D influence increased in the 1987-1991 period and decreased afterwards. However, the impact remains significantly higher than the host country's R&D, which influence increased over time. This suggests that the strategic-asset seeking has proved to be a dominant motive to undertake FDI within the EU over time.

In short, the gravity model results have shown that the market seeking and strategic-asset seeking motives are of significant importance to the bilateral FDI intensity between two countries in the EU over time. In addition, the inflation (home) shows a dominant negative relation with the bilateral intra-EU FDI over time. As for the distance control variable, the proximity of EU countries seem still of great importance for all motives to undertake FDI over time. However, after the negative impact of distance increased in the first three examined periods, the last period shows a decline of the distance's impact for all motives. So, this might indicate that proximity of EU countries becomes of less importance.

Furthermore, the gravity model results presented in table 7.3 also assessed the ***institutional effects*** on bilateral intra-EU FDI over time. So, the gravity model also controlled for two

institutional events concerning the EU. It is examined whether they played a role in the European integration process. The first institutional factor, which might have an impact on the bilateral FDI within the EU, is the introduction of the Single market Program. All coefficients of the Single market dummy show a positive sign, though not all are significant. For the market seeking and strategic assets seeking motives the introduction of the Single market show a positive and significant influence on the bilateral FDI in the EU. This indicates that since the introduction of the Single market in 1992, the bilateral FDI between EU economies positively increased for these two motives. In addition, the introduction of the EURO as one single currency is used as a control variable as well. Although the impact is not as positive as the Single Market, it proves significant results for the resource seeking and strategic asset seeking motives.[27] The interpretation here is that after the EURO was introduced in 2001, that the bilateral FDI flow between EU member countries became significantly higher than before the introduction. This suggests that the institutional steps taken by the EU has led to an increase in intra-EU economic activity and played an important role in the interdependency among EU countries. This suggests that the EU is more integrated and that the institutional environment in the EU contributed to the intensification of economic relations among EU countries.

7.3 Functional integration

The previous sections of this empirical study already examined the context of the EU, with its changing nodes (7.1) and environment (7.2) in which the integration process takes place. Now that the nodes and conditions of the EU interaction network are explored, this empirical part considers the relational aspect of the integration process. In order to evaluate to what extent the EU is functionally integrated over the past 25 years, with respect to FDI relations, this paper studies the modifying network relations within the EU. It endeavours to understand the relation between the economic structural and institutional developments and the transforming intra- EU FDI network.

The first section (7.3.1) studies the spatial interaction pattern of intra-EU FDI in a temporal dimension, which provide the possibility to analyze the network relations from a dynamic

[27] A strong empirical conclusion of this marginal single currency effect is not possible, because the post-spanning time is not long enough.

perspective. The temporal dimension considers the development of FDI within the EU15 over time and the spatial dimension considers the allocation of production in space. This paper employs a centrality analysis to deduct which EU countries are the key actors in the intra-EU FDI network over time. This centrality analysis, together with the network density over time provides an indication of the network development and the European economic integration process.

7.3.1 The spatial interaction pattern of intra EU15 FDI flows

In order to investigate the pattern of intra-EU FDI, matrices of the origin and destination of FDI have been created (appendix I., table I.2-I.6) to examine the FDI flows between every pair of EU countries. These matrices represent the size of FDI flows, and therewith the strength of ties between the EU15 countries over the 1982-2006 period. In addition, these flows are used to visualize the EU15 as a network of countries and to identify the position of countries within the network and to analyze how these positions change over time. Figures 7.13-7.17 show the patterns of the intra EU15 FDI flows, whereby the size of the lines correspond with the tie strength relative to the other ties between EU15 member countries. Furthermore, the size of the arrowheads represent whether inward or outward FDI flows are of bigger importance for the strength of the relation between two countries. For example, in the 1982-1986 period outward flows from the Netherland to the UK were bigger than the outward flows from the UK to the Netherlands, visualized by the bigger arrowhead pointing towards the UK.

Figure 7.13 intra-EU 1982-1986 FDI flows

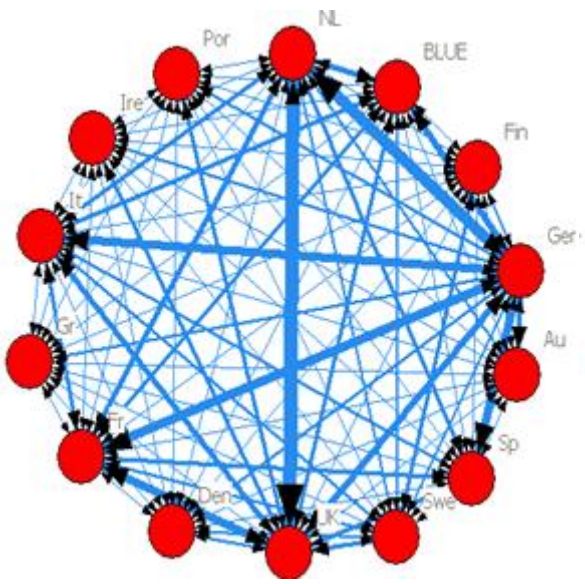


Figure 7.14 intra-EU 1987-1991 FDI flows

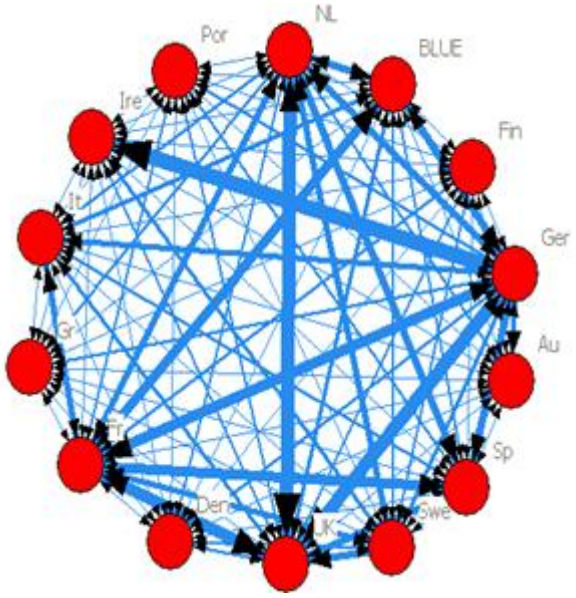


Figure 7.15 intra-EU 1992-1996 FDI flows

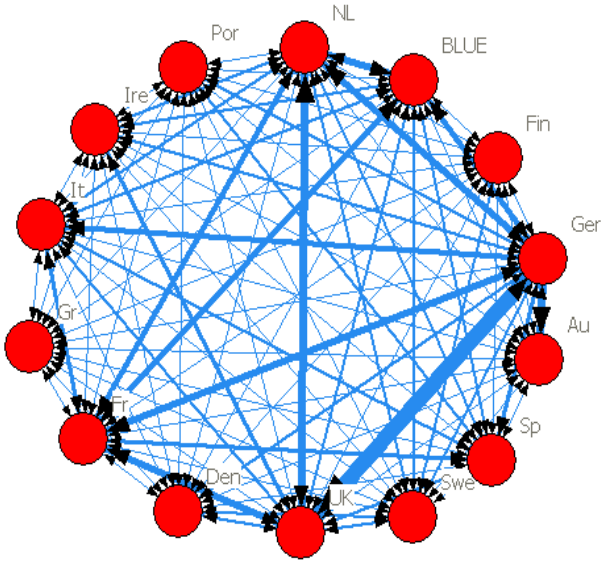


Figure 7.16 intra-EU 1997-2001 FDI flows

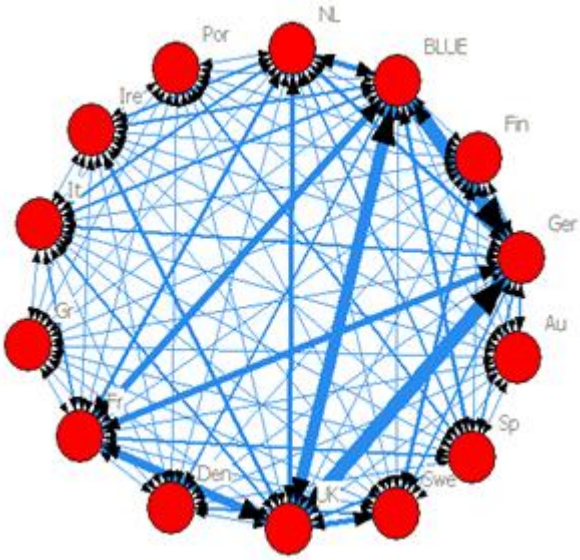
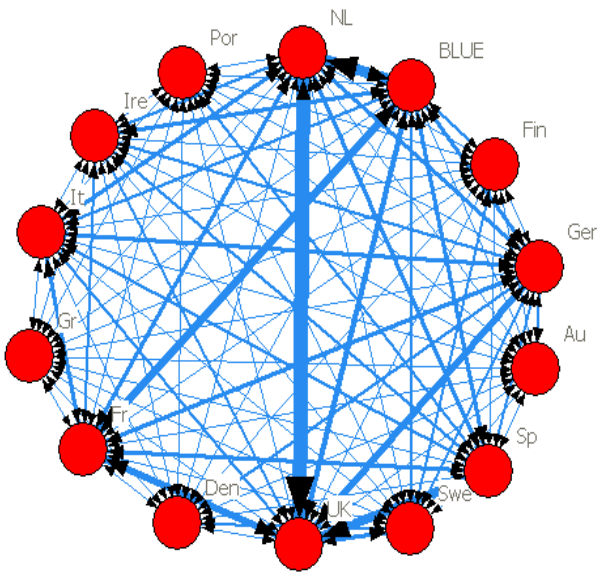
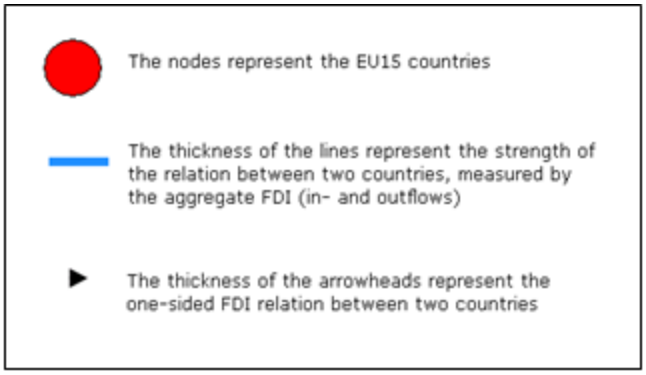


Figure 7.17 intra-EU 2002-2006 FDI flows





Source: Appendix I tables I.2 - I.6
Notes: a. UCINET is the applied computerprogram
b. Belgium & Luxembourg (BLUE)

These figures point out an obvious wave of intra-EU FDI intensity during 1987 and 1991. This observable expansion of FDI activity, reflects a greater globalization within the EU and more outward strategic focus or thrust by EU firms in that period. Furthermore, the pattern of FDI activity over the years spanning from 1982-2006, shows that the relative intra-EU FDI activity becomes more evenly spread across EU countries since 1992. This equalizing effect of FDI activity within the EU since 1992 corresponds with the introduction of the European Single market programme in 1992. This suggests that the economic institutional initiative taken by the Union has led to further integration of the intra-EU FDI network. In sections 7.3.2 and 7.3.3 a more closer look will be taken at respectively the centrality and density of the intra-EU FDI network.

In addition, figures 7.13-7.17 show that most EU countries have a FDI relation with all other EU countries. However, as reflected by some lines being thicker than others, the strength of the relations between EU member countries significantly differ. Strong ties are varying over the examined periods. An explanation for the fluctuating thick lines in the figures, could be that large M&A between MNEs of those EU countries have taken place in the representing period. Nevertheless, the same central EU countries remain responsible for the stronger FDI relationships. When looking at the distribution of FDI activity among EU countries, these figures suggest that physical distance and to a smaller extent cultural links (e.g. common language) still play a major role, as strong ties predominantly exist between nearby countries. The tight links between France and the Netherlands, BLUE, UK or Germany, and UK with Ireland, The Netherlands and Germany are not surprising. The geographical factor also emerges in the case of Germany, which has stronger links with nearby countries (The Netherlands, BLUE, France, Ireland and the UK, BLUE and France). Conversely, no obvious strong ties can be identified between the Scandinavian or Mediterranean countries. The Central European countries account for the strongest FDI relations in the EU and predominantly among each other. The most prominent tight links have its origin or destination in the UK, Germany, the Netherlands, France, BLUE or Ireland, of which some will be highlighted.

A strong FDI relation can be observed between Germany and Ireland in the 1987-1991 period. According to the thickness of the arrow its FDI relation is mainly based on the large investments done by German companies in Ireland. Throughout the rest of the examined periods the relation between Germany and Ireland seems to be of a much weaker extent. The

bilateral FDI relation between Germany and France also shows a strong relation which decreases over time.

Another relatively strong tie is observable between Germany and UK and vice versa over time. In the period between 1987 and 1996, FDI was mainly originated from Germany. As for the later period between 1997 and 2001, FDI predominantly came from UK companies that invested in Germany. A possible explanation for this changing pattern can be the mega hostile takeover of Mannesmann by Vodafone in 1999.

In fact, Germany and the UK seem to be the major players in the intra-EU FDI network. In other research studies (UNCTAD, 2000) it is already shown that the UK possesses a dominant position in acquiring M&As, keeping in mind that M&As account for the largest share of FDI activity. A feasible argument is that the UK obtains favorable conditions (e.g. liberal rules and shareholders protection) to establish holding companies (UNCTAD, 2000).

This is also evident in the relation between the Netherlands and the UK, which illustrate a quite remarkable strong tie (figure 7.13 - 7.17). In the 1980's and again from 2002-2006 a strong relation between the Netherlands and the UK can be found. However, for a big part the importance of investments from the Netherlands into the UK, and vice versa, probably can be explained by the investment decisions of just a few big conglomerates (Shell, Unilever and Reed-Elsevier) which have a joint Dutch/British ownership. Furthermore, it is remarkable that from 1997 onwards, the degree of centrality decreases for Germany, while Belgium/ Luxembourg becomes one of the most central players in the FDI network. From the midst of the 20th century the share of Belgium and Luxembourg's intra-EU FDI flows started to increase rapidly. Especially Luxembourg became an interesting FDI country for FDI in- and outflows around the year 2000. A possible explanation can be the favorable conditions to establish holding companies in Luxembourg (UNCTAD 2003). These holding companies, which had an affiliate in Luxembourg, were again responsible for the outflow from there to other EU countries. On the contrary, the share of German's intra-EU FDI flows slightly decreased since the late 1990's.

7.3.2 Centrality analysis

The previous section points out that the distribution of FDI activity among EU countries is not taking place evenly, but predominantly among a few countries in Central Europe. In order to

determine the main countries of origin and destination of FDI over time, this section analyzes the centrality of the network. The centrality analysis together with the network density over time will provide a comprehensive perspective of the intra-EU FDI network development.

Over time the difference in tie strengths seem to decrease (reflected by the tie strengths in figures 7.13-7.17 which become of a more equal size). While in the 1980's and the early 1990's some countries had a central position in the network, over time EU countries' positions in the network seem to equalize or integrate. However, Central EU countries seem to remain its central position in the network over time, but at a lesser extent.

The degree of network centrality refers to the position of a specific country in a network. The more direct links with other countries in the network, the higher the degree of centrality (Alba 1973; Bonacich 1987; Freeman 1979, Irwin and Hughes 1992). Within this study, direct links are synonymous with the volume of FDI flows. Thus, countries with relatively large intra FDI in- an outflows *from* or *to* other EU15 member countries are regarded as the most central countries within the EU15 FDI network. In the performed centrality analysis, see appendix IV, it becomes more obvious which countries are dominant by showing the degree of network centrality for each EU15 country. Also, the network centralization index is estimated, reflecting the degree of centralization of the entire intra-EU FDI network or to what extent the network is revolved around a few key EU countries. From the 1982-1986 period to the 2002-2006 period the network centralization index decreased from 23.52% to 16.61% (Appendix IV, table IV.1.1 and IV.1.5). So, differences between the centrality indices of EU countries that previously had relatively low shares of intra-EU FDI flows and the central investing and receiving countries of FDI within the EU, decreased over time. This downward trend indicates that over time the EU15 countries moved towards a more integrated FDI-network, with less dominant FDI generating or receiving EU countries. However, in the overall period, Germany, the UK, France and the Netherlands hold on to a central position within the EU15 FDI network, despite the fact that their positions in the network become less dominant (see table 7.4 and 7.5.).

Table 7.4 Intra EU15 FDI *inflows* by main investors, 1982-2006

	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006	
	%	Million $	%	Million $	%	Million $	%	Million $	%	Million $
UK	17,7	1329	19,8	10558	15,3	10727	16,4	50569	24	66295
Fr	14,7	1102	12,8	6792	15,4	10780	9,1	28067	13	35864
NL	13,4	1008	12,4	6603	14,4	10087	8,1	24973	14,9	41152
Ger	11,3	848	10,8	5737	9,7	6761	23	70849	9,8	27218
BLUE	10,2	769	9,8	5220	11,5	8025	20,9	64445	13,1	36220
EU5	67,3	5056	65,6	34910	66,3	46380	77,5	238903	74,8	206749
EU15	100	7511	100	53265	100	69927	100	308655	100	276522

Source: UNCTAD

Notes: a. EU5 refers to the 5 main receivers of FDI flows (UK, Fr, NL, Ger, BLUE)

Table 7.5 Intra EU15 FDI *outflows* by main investors, 1982-2006

	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006	
	%	Million $	%	Million $	%	Million $	%	Million $	%	Million $
UK	17,4	1304	13	6925	17,8	12448	25,6	79089	12,3	34129
Fr	10,8	814	19,7	10516	13,2	9221	15,2	46947	13,8	38047
NL	17,6	1323	15,4	8175	14,7	10305	10,5	32416	18,9	52248
Ger	27,8	2089	24,9	13256	30,9	21637	12,6	38919	8	22041
BLUE	5,4	405	6,2	3298	8,1	5683	19,5	60025	19,5	54041
EU5	79	5935	79,2	42170	84,7	59294	83,4	257396	72,5	200506
EU15	100	7512	100	53265	100	69927	100	308655	100	276523

Source: UNCTAD

Notes: a. EU5 refers to the 5 main investors of FDI flows (UK, Fr, NL, Ger, BLUE)

The five central actors in the FDI network (UK, Fr, NL, Ger and BLUE) together are responsible for approximately 70% of all EU15 FDI inward flows and they account for about 80% of total EU15 FDI outward flows. This indicates that the dominancy of the main FDI investing and receiving EU countries is still high, but the results reveal that there is a sign that the intra-EU FDI network becomes more integrated.

7.3.3 Core-periphery analysis

In order to provide a comprehensive examination of the EU countries' integration, this section analyzes the geographical distribution of FDI within the EU. The changing investment interaction patterns between and within periphery and core regions are more thoroughly analyzed in table 7.6. The primary intention of this table is to compare the development of absolute amounts of FDI activity between regions.

Table 7.6 Geographical distribution of inter-regional FDI within the EU, 1982-2006, in million US$

Investment relation	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
Core → Core	5043	35223	54564	266897	195257
Core → Periphery	1807	14131	10672	20758	34317
Periphery → Core	589	3133	3341	17352	41338
Periphery → Periphery	71	777	1350	3647	5581
Total intra-EU FDI	7511	53265	69927	308654	276493

Source: EUROSTAT and SourceOECD

Note: a. core and periphery countries are derived from appendix IV.2

b. Absolute amount of FDI (millions $) that takes between two regions in a (five years) period

In the 2002-2006 period the amount of core-core investments decreased while for all other combinations an increase in the level of FDI is observed. However, the core region stays by far the most dominant region that generates the vast majority (71%) of FDI activity within the EU. However, this is not so remarkable, since the Core region includes more EU countries as compared to the Periphery.

The second largest share of intra-EU investments, in the 1982-2001 period, is from core to periphery countries. But, the dominance of investments from core to periphery countries slightly decreases from 1997-2001 onwards. Over time, an increasing interest of periphery countries to invest in other EU member countries can be observed. In the 2002-2006 period FDI from periphery to core countries even became higher as compared to core-periphery flows. While in 1982-1986 only 9% of intra-EU FDI was originated from periphery countries this share increased to 17% in 2002-2006.

The highest amount of investments originating from the periphery flows into core countries, but also the amount of intra-periphery investments has increased rapidly. The rising amount of intra-periphery FDI is highly dominated by flows between Spain and Portugal and between Spain and Italy, see appendix I. Although, the share of periphery-periphery FDI activity to total intra-EU FDI remains marginal, the absolute amount FDI flows origination from periphery countries are subject to higher growth rates than FDI flows which are originated from core countries.

In order to reveal the stability of the regions this section presents table 7.7. The primary contribution of this table is to examine the structure of the intra-regional FDI network within the EU and the relative development of the regions. To test the structure of the intra-regional

FDI network of the EU, this paper uses the inter-regional dummies (C-P, C-C, P-C and P-P), in which the periphery-periphery (P-P) dummy will be used as a reference group. To say something about the network structure and the integration of the regions, this analysis will focus on the periphery regions. The most extreme case would be if there are strong inter regional FDI relations between periphery countries. Then it can be confirmed that the EU functions as one integrated network. The model will be controlled for mass and physical distance, in order to properly analyze the degree of spatial integration within the EU network.

Table 7.7 Inter-regional FDI interactions within the EU, 1982-2006

	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006	
	β	Sig	β	Sig	β	Sig	β	Sig	β	Sig
DummyCC	1.589	√	1.743	√	2.412	√	2.955	√	1.922	√
DummyCP	2.001	√	2.265	√	1.862	√	2.105	√	1.552	√
DummyPC	.503	X	.263	X	.426	X	1.574	√	1.163	√

Source: Own calculations from origin-destination matrices (appendix I)

Notes: a. DummyPP is omitted and used as the reference group

b. Ln FDI-intensity as dependent variable

c. Population taken as the mass

The t-tests assess to what extent the coefficients of the C-C, C-P, P-C inter regional group FDI interaction are different compared to the reference group P-P. This is a comparison of the individual relationships of each inter-regional group to the reference Group Periphery-Periphery. The comparison of the C-C group, as well as the C-P group, to the Periphery-Periphery show statistically significant results for all examined time periods. Subjects in the CC Group had (on average) 1.589 more FDI intensity compared to the PP Group in the period 1982-1986. As expected the β coefficients of each inter-regional dummies (C-C, C-P and P-C) show a higher estimate of FDI intensity compared to the associated change of the reference group P-P. Interesting to see is that in the period 2002-2006 the relative FDI activity in the other inter-regional groups decreased compared to the FDI intensity in the Periphery-Periphery group. This suggests that the relative importance of the Periphery-Periphery FDI interaction within the EU increased in the EU since 2002 and that the hierarchy of the inter-regional FDI network becomes more converged.

These results of the core-periphery analysis suggest that the periphery countries' attractiveness probably increased substantially, because FDI, originated from other periphery

countries as well as from core countries (1987-1991 and 2002-2006), in the periphery region grows over time. The underlying vital conclusion based on this outcome, is that the EU regions become more integrated over time, with respect to FDI intensity. Furthermore, the strong relative growth rates for FDI activity originating from the periphery region indicates that companies from these countries become more involved in networks of economic activity throughout the European Union.

7.3.4 Network density

Besides analyzing the centrality of the nodes, this section analyzes the structural changes of the FDI network in the EU more thoroughly. Since, the urging global production networks stress the complex sets of intra -, inter- and extra firm networks, related to each stage of production and distribution of a good or service, the network density is an appropriate indicator of the structural development of the network. Furthermore, it is meaningful to study the network density in order to obtain a comprehensive view of the evolution of the EU production network over time. The density of the network measures the average value of all existing ties between EU countries. An increase in network density over time would than indicate that the countries in the EU become more integrated and more interdependent with respect to their production. Table 7.8 presents the network density of the intra-EU FDI network over time.

Table 7.8 Density of the total intra-EU FDI network

Period	Average value	Std Dev
1982-1986	46.94	82.29
1987-1991	313.32	563.93
1992-1996	392.85	790.57
1997-2001	1714.75	3930.11
2002-2006	1519.36	3098.12

Source: Appendix I tables I.2 - I.6

Notes: a. UCINET computer program applied (Borgatti, Everett and Freeman 1996)

b. The average value of the network of all links between the nodes or EU countries.

As expected the density of the FDI network in the EU increases. However, the last examined period (2002-2006) indicates a stagnation or even a slightly decrease in average density value. This result suggests that the integration process of EU countries rapidly proceeds until 2002 to

2006 and that during this period the process falters. A possible explanation for this outcome is that the previously made intra-regional investments in the pre-period (until 2001) created the interdependency among companies of EU countries and that in the post-period (from 2002) companies do not consider entering a country's company anymore but focus more on expanding the existing FDI relation through intra-firm trade. The intermediate inputs are than traded between different parts of a firm located in different EU countries. In order to examine the European integration process through the complex interrelationships among the networks' members more closely, the next section focuses on the interconnection of FDI and international trade within the EU.

7.3.5 Intra-industry trade within the European Union

After the Second World War, when the economic integration program established in the EU, intra-European trade flows increased. Particularly with the implementation of the single market the relative expansion of intra-EU trade occurred. These patterns are consistent with each EU member country. As economic integration in the EU progresses, trade patterns within the region are displaying a greater complexity, since IIT is growing in importance. This shifts the emphasis from country-specific determinants or comparative advantages of trade, towards industry-specific trade determinants such as economies of scope and external markets. Based on the assumption that IIT is closely related to offshore production by multinational enterprises, this paper uses the Grubel-Lloyd index to measure the extent of IIT and in order to gain more explanatory power to determine the structure of the FDI interaction pattern within the EU. A high Grubel-Lloyd index then represents a high integration of intra firm trade. In this section a light will be shed on each member country's IIT and on the IIT of industries within the EU.

<u>IIT by country</u>

Table 7.9 reports the Grubel-Lloyd index for intra-EU trade in manufactured goods by each member country.

Table 7.9 Intra-industry trade by EU15 countries, 1982-2006

Country	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
Austria	0,45	0,48	0,49	0,53	0,52
Denmark	0,53	0,56	0,53	0,52	0,55
Finland	0,44	0,45	0,43	0,43	0,40
France	0,63	0,66	0,69	0,66	0,64
Germany	0,62	0,66	0,69	0,71	0,74
Greece	0,25	0,23	0,24	0,24	0,23
Ireland	0,46	0,47	0,43	0,41	0,40
Italy	0,47	0,53	0,54	0,53	0,57
The Netherlands	0,54	0,60	0,63	0,65	0,65
Portugal	0,31	0,36	0,35	0,36	0,45
Spain	0,44	0,55	0,59	0,60	0,60
Sweden	0,53	0,56	0,54	0,51	0,54
UK	0,64	0,66	0,67	0,65	0,70
EU	0,49	0,52	0,53	0,52	0,54

Source: SourceOECD database

Note: a. Unadjusted Grubel-Lloyd indices, calculated from SITC (Rev 2) three-digit statistics, weighted by values of the intra-EU imports and exports of manufactured goods.

The results show an increase in IIT for all countries from the first period (1982-1986) to the last period (2002-2006), with the exception of Greece and Ireland. Looking at the total period, these countries have furthermore the lowest IIT compared to all the other countries. Most pronounced is the relative expansion of IIT in the 1982-1991 period, what coincides with the Pre-Single market period of negotiation and implementation.

The highest intra-EU IIT applies to France, Germany, The Netherlands and the UK. Additionally, IIT increased relatively more in Italy, Portugal and Spain, which initially had low IIT. This indicates convergence towards the core countries and to the extent that IIT reflects intra firm trade, this indicates that there is an upward trend of industrial dispersion.

The IIT findings are in line with the convergence of centrality indices within the EU15. Within section 7.3.2 France, Germany the Netherlands and the UK were found to be the main receivers as well as investors of FDI and now also turn out to have the highest levels of intra industry trade. The combination of high intra industry trade and high levels of FDI reflect the extent to which MNEs have organized their (fragmented) production operations across these countries. In addition, the more rapid increase in intra EU FDI and intra industry trade of Italy, Spain and Portugal indicate that also these peripheral countries have become more integrated into these European networks of production.

IIT by industry

In table 7.10 the IIT averages (STIC 3-digit sectors) are decomposed to SITC one-digit sectors, in order to examine whether the trends in the aggregated IIT are driven by specific industrial sectors.

Table 7.10 IIT by industry in the EU15, 1982-2006

Industry		1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
0	Food and live animals	0,41	0,44	0,46	0,48	0,50
1	Beverages and tobacco	0,49	0,51	0,52	0,49	0,52
2	Raw materials (except fuels)	0,41	0,43	0,42	0,43	0,43
3	Minerals, fuels, lubricants etc.	0,38	0,39	0,41	0,39	0,47
4	Animal and vegetable oils	0,45	0,52	0,52	0,53	0,57
5	Chemicals	0,54	0,56	0,57	0,56	0,56
6	Manufactures, by material	0,58	0,61	0,61	0,61	0,61
7	Machinery and transport equip.	0,58	0,62	0,62	0,62	0,62
8	Miscellaneous manufactures	0,57	0,59	0,62	0,63	0,61
9	Goods n.e.s.	0,44	0,53	0,50	0,50	0,48
5-8	Manufactures	0,57	0,59	0,61	0,60	0,60

Source: SourceOECD database

Note: a. This table only covers the IIT of manufactures among EU countries.

IIT increased for all sectors between the first period (1982-1986) and the last period (2002-2006), but table 7.10 shows considerable differences in IIT developments among sectors. The highest levels of intra-EU industry trade can be observed for the “machinery and equipment” and the “miscellaneous manufacturing” industries, which consist mainly of technology intensive and knowledge based industries. This is in line with expectations, because the more complex manufacturing products are the more likely it is to benefit from splitting up the value chain across different countries. That is because sophisticate manufacturers often make use of a large variety of components and processes in which economies of scale can be achieved (OECD, 2002). Furthermore, complex manufacturing products are also characterized by large varieties of differentiated final consumer goods, what facilitates two-way trade in similar but heterogeneous products. In addition, the more traditional and resource intensive industries (food, basic metals and minerals and the wood and paper industries) report relatively low IIT levels. These low shares of IIT may be explained by the fact that goods from these industries are characterized by relatively uncomplicated transformations of raw materials, for which division across different countries is less suitable.

8. Conclusions and discussion

In this chapter the conclusions will be drawn (8.1) with respect to the research question(s) and some research recommendations are provided in the discussion part (8.2).

8.1 Conclusion

Previous research (e.g. Rugman 2001, Ohmae 1985) signified that the emerging internationalization and globalization processes, reflected in international economic activity, predominantly obtain an intra-regional occurrence. MNEs explore to obtain linkages outside the home market by foreign direct investments (FDI), international trade and non-equity arrangements (e.g. licensing). However, a significant share of trade and FDI takes place among countries which are bounded by Regional Integration Areas, such as the EU. Invigorated by the liberalization of political barriers, the opportunity for MNEs located in the EU to invest in other member countries located within the same integrated geographical region has become easier. The regional integration program lowered the trade barriers and has given an impetus to the spatial interaction of international economic activity within the European Union (Molle, 1994). However, this increasing economic activity among EU countries does not apparently implicate that the EU is thereby economically integrated.

Therefore this paper tangles with the following research question:

To what extent is the European Union economically integrated in the 1982-2006 period?

In order to determine to what extent the EU can be regarded as one economic entity, this paper provides a comprehensive framework which combines the theory of international production with the theory of economic integration. With FDI as an indicator of economic relations this paper examines the network relations within the EU15 over the years spanning from 1982-2006, and therewith the functional integration process of the EU region. The functional integration process or changing FDI network relations in the EU do not happen in a vacuum. To assess the functional integration process of the European Union it is inevitable to obtain a better understanding of the context wherein economic activity takes place and to what extent this context is developing over time. Accordingly, this paper provides a study of the changing EU countries -the nodes of the intra-EU FDI network- and of the institutional developments -the network environment- in which the economic activity takes place.

Hence, this paper has been composed into three modes of integration (*Structural*, *Institutional* and *Functional* mode of integration), in order to provide a comprehensive notion of the European economic integration process and to answer the research question properly.

The functional integration process of the EU

The empirical study of the geographical distribution of FDI activity within the EU unveils a major feature of successful regional economic integration: the convergence of FDI activity within the EU over time. While there is a major upsurge observable in absolute intra-EU FDI activity in the years spanning from 1986 to 1991, substantial is the converging process which is evident in the decreasing intra-regional inequalities of FDI activity. The results show a relative increase in FDI activity of the periphery region (Spain, Portugal, Greece and Italy) compared to the core region. Especially in the period 2002-2006 the relative FDI activity in the other inter-regional groups decreased compared to the FDI intensity in the Periphery-Periphery group. This suggests that the peripheral countries' ownership- and locational advantages increased substantially and that the hierarchy of the inter-regional FDI network becomes more converged. The underlying vital conclusion based on this outcome, is that the EU regions become more integrated over time and the strong relative growth rates for FDI activity originating from the periphery region indicates that companies from these countries become more involved in the EU network of economic activity.

In addition, the European integration process is evident in the declining degree of network centrality over time, which suggests that the EU-countries become more integrated over time with respect to their FDI activity. While in the 1980's and the early 1990's some countries had a dominant position in the network, over time EU countries' positions in the network seem to equalize or integrate. Nevertheless, the Central European economies (Germany, UK, Ireland, France, BLUE and The Netherlands) remain the dominant countries of investing and receiving FDI within the EU over time. So, the core countries remain core countries with respect to FDI activity, although the relative importance of periphery countries increases over time. Furthermore, the distribution of FDI activity among EU countries is predominantly among nearby countries, which suggests that physical distance and to a smaller extent cultural links (e.g. common language) still play a major role. This is also evident in the empirical results, which shows a negative relation of the physical distance between two EU economies and the bilateral intra-EU FDI activity over time. So, although the EU eliminated its economic barriers, differences in culture, consumer taste and language still force companies to locate in

close proximity to the market. However, the impact of proximity between EU countries becomes of less importance in the FDI activity in the last five examined years (2002-2006).

Another prominent result, which confirms the ongoing European economic integration process, is that the density of the intra-EU FDI network becomes stronger over time. This also suggests that the European production network has developed into a more complex economic relational network which has increased the economic interdependency among EU countries. Moreover, the estimated Grubel Lloyd indices support these findings, with the increase in intra-firm and intra-industry trade. The composition of the economic activity pattern within the EU changed into geographically dispersed and functionally fragmented production processes. The highest levels of IIT are found for France, Germany, The Netherlands and the UK, while higher growth rates were found for countries which initially had the lowest levels of IIT.

Inter-relations

The transforming intra-EU FDI network is closely related to the other two modes of integration and vice versa. The European functional integration process is mutually affected by the economic structural changes and the institutional developments within the EU, as is evident in this paper.

The institutional environment is the context in which FDI activity takes place and is an important pillar of the European integration process. Institutional steps taken by the EU governments have provided a legislative framework in which goods, labor and capital flows can move freely across the member's borders, which has given an impetus for the rapid increase of intra-EU economic activity (e.g. 1986-1991). Within this study, complementary evidence is found that the institutional conversions introduced by the EU government -the introduction of the Euro and the Single Market Program- breed a positive impact on the integration process within the EU. One can say that the institutional steps taken within the EU have contributed to the intensification of economic relations and interdependency among EU members. Moreover, the equalizing effect of FDI activity within the EU since 1992, corresponds with the introduction of the European Single market program in 1992. This suggests that the economic institutional initiative taken by the Union has led to further integration of the intra-EU FDI network.

However, with the finding that the institutional environment has contributed to a significant increase of economic linkages among EU member countries, the nature of this process is not yet clarified. Within this study it is tried to capture the adjustment of MNEs to this new institutional environment by analyzing the industrial restructuring of economic activity on the one hand and by observing changes in FDI network patterns as well as in the underlying motives to undertake FDI on the other hand.

The results show evidence on the existence of a decrease in inequalities (e.g. more homogeneity) between EU countries in terms of their economic structure, which indicates that EU countries converged over time. This process of increasing homogeneity among EU countries is in line with the growing economic interdependency among all EU countries and suggests a mutual relation.
Furthermore, consistent with theory the process of European integration coincides with a restructuring of industrial activities. Overall, the EU countries showed an increased specialization in services as opposed to the manufacturing industry. The increasing importance of the strategic-asset seeking motive, underlines the deindustrialization process and the emergence of knowledge intensive service industries. Nevertheless, the peripheral countries remained more manufacturing orientated economies as compared to the EU core countries (Germany and Finland form the exception).

Within the 1982-2006 period two qualitatively different processes of integration can be distinguished. In the first observed period (1982-1986) the market-seeking motive played a dominant role, but over times the importance of this motive declines while the strategic-asset seeking motive gains importance over time. So, while functional linkages among member countries were first given impetus by market-seeking motives, over time strategic-asset seeking motives started to play a bigger role in the decision making process to invest abroad. This implies that bilateral FDI flows within the EU were previously affected by the market size or demand potential and later on more subject to the EU countries' obtainable knowledge. The increasing importance of the strategic-asset seeking motive, underlines the deindustrialization process and the emerging knowledge intensive service industries.

Additionally, the EU as a whole has attained a more specialized manufacturing industry towards the "chemical" and "equipment" industries, which are both categorized as technology intensive sectors. The European "textile" industry on the other hand became less dominant

over time and started to concentrate in the Southern peripheral countries. However, geographical concentration and specialization patterns seem to be driven by different forces. Some industries have become geographically more concentrated while others did become more dispersed. For the more traditional sectors, such as “textile” and “leather” industries, an increased industrial concentration in the Mediterranean countries can be observed, which is in line with the traditional theory of comparative advantages. However, with respect to the modern, high skilled labor intensive industries a different pattern is revealed, which is more in line with Krugman's (1991) model. Within this model, Krugman (1991) theorized that by a first reduction of barriers, industries would concentrate in the largest core economies and export from there to the other regions. However over time, by a further reduction of trade barriers, also smaller and peripheral countries would be able to strengthen their positions in these industries.

With respect to the functional linkages, this dichotomy between core and peripheral regions is also observable. Core countries already were involved in international networks and strengthened their positions by specializing in services and by the modern industries, which underpins the observed increase of strategic asset seeking FDI. The Peripheral countries on the other hand, initially attracted relatively large shares in the more traditional industries as a result of the reduction in trade barriers, what can be explained by its comparative advantage within these industries. However, the strong relative growth rates for FDI activity originating from the periphery region indicates that companies from these countries become more involved in networks of economic activity throughout the European Union over time.

In conclusion, the empirical findings show strong signs of the evolving economic integration process within the European Union and that the process had a more transformative impact on some member states than on others. Based on the Balassa stages of integration it can be concluded that the institutional integration of the EU is at an advanced stage. In addition, the functional interdependency among EU members has grown drastically and the EU countries show obvious signs of economic structural convergence. However, based on this paper the EU region can not be regarded as one single functioning economic “entity”. Hence, some EU countries are still quite loosely connected in terms of economic involvement (e.g. Scandinavian and Mediterranean countries) and EU policy should aim at further realization of the economic cohesiveness within the EU, in which this study provides valuable information.

8.2 Discussion

European integration policies could stimulate economic co-operation through further positive integration (the creation of common institutions) and negative integration (diminishing economic barriers). These institutional steps are aimed to create a common policy framework that leads to equal conditions for the functioning of all parts of the economy. So far, as a result of the harmonization of national regulations, compliance costs for internationally active companies decreased and it has been revealed that the integration policies have altered the geography of production by the re-organization of MNE's operations and strengthened the functional linkages among the EU15 economies.

The purpose of economic integration is that all countries gain from the membership of the European Union and therefore it may be relevant to conduct a thorough analysis of the effects of European integration on the economic performance of countries. It should be interesting to assess whether the convergence of economic structures and the higher degree of functional linkages among the EU15 countries also resulted in the desired increase of economic performance in all regions and industries. Within this study evidence is found of a restructuring of industrial activity throughout the Union which is expected to have led to a more efficient division of production, based on a country's comparative advantages and greater economies to scale. However, there is also the possibility of negative side effects such as high adjustment costs or job losses in industries that relocate to other countries. The variety of positive and negative effects of the integration process on the EU is beyond the scope of this research, but might be interesting to assess in future research.

Furthermore, some other research recommendations can be made regarding the economic integration process of the EU, which may contribute to this study. Future research could be done on the comparison between *manufacturing* and *service* industries or countries and the degree of integration within the EU. Some industries might be more involved within cross-border networks than others and also the motives to undertake FDI are likely to differ between industries. Furthermore, MNEs can be organized vertical or horizontal which makes it even more difficult to theoretically deduce the integration process. However, at this time bilateral intra-EU FDI data is incomplete at the industry level, which makes it impossible to carry out similar analyses at a more disaggregated (industry) level. When more disaggregated data becomes available it is interesting to take a closer look to the process of integration from

an industry perspective as it will definitely contribute to a better understanding of the nature of the process of European integration.

Another research recommendation that could improve the quality of this study, is to compare the results of the EU with other considered regional entities (e.g. ASEAN, NAFTA and/or the Mercosur). The other Regional Integration Areas could be used as a point of reference, what allows to compare the degree of economic interaction between the EU countries and that of other integrated areas. It allows furthermore to assess and to compare the impact of different stimulating integration policies.
Additionally, it might be sufficient to associate the intra-EU economic activity with the individual intra- EU countries' activity, in order to determine whether the EU functions as one entity. When the EU is actually functioning as one fully integrated area, it can be expected that there are no major differences in the degree of economic interaction within and between countries of the integrated region, when it is controlled of economic size and distance. By using a single European country as a reference group it can be analyzed whether trade and FDI are flowing as freely within as between member countries.

Finally, it could be argued that this paper analyzed a relatively short time period, while convergence and integration are long-run processes. Although a catching up of peripheral countries towards the EU core (e.g. Ireland which transformed from an agricultural country into one of the most countries in Europe) is observed, this process is still unfinished and can not be taken for granted (e.g. Greece and Portugal which has remained highly specialized in low-skilled labor intensive traditional industries). So, time will tell whether the European Union will ever be regarded as one economic region, especially when the EU continuously enlarges. With the Eastern enlargement of the EU the focus of policy makers will change from North-South core-periphery integration to an East-West divide. The new Eastern entrants are characterized by large structural differences and relatively low development levels as compared to the EU15 average, which makes a fully integrated Europe an even greater challenge.

References

- **Amiti, M.** (1999), "*Specialization Patterns in Europe*", Weltwirtschaftliches Archiv (Vol. 135, No. 4), pp. 573-593.
- **Ansoff, I. H.** (1957), "*Strategies for Diversification*", Harvard Business Review (Vol. 35, No. 2), pp. 113-124.
- **Bair, J.** (2005), "*Global Capitalism and Commodity Chains: looking back, going* forward", Competition and Change (Vol. 9, No. 2), Maney Publishing, pp.153–180.
- **Balassa, B.** (1961), "*The Theory of Economic Integration*", London: Richard D. Irwin.
- **Bartlett, C.A. and Ghoshal, S.** (1989), "*Managing across Borders*", London: Century Business.
- **Batchelor, R.A., Major, R.L. and Morgan, A.D.** (1980), "*Industrialisation and the Basis for Trade",* Cambridge: Cambridge University Press.
- **Bergstrand, J.H.** (1985), "*The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence*", Review of Economics Statistics (Vol. 67, No. 3), pp. 474-481.
- **Brakman, S., Garretsen, H. and Van Marrewijk, C.** (2001), "*An Introduction to Geographical Economics"*, Cambridge: Cambridge University Press.
- **Brülhart, M.** (1998), "*Trading Places: Industrial Specialisation in the European Union*", Journal of Common Market Studies (Vol. 36, No. 3), pp.319-346.
- **Brülhart, M.** (2000), "Growing Alike or Growing Apart? Industrial Specialization of EU Countries", mimeo.
- **Brülhart, M and Elliott, R.J.R.** (1998), "*Adjustment to the European Single Market: Inferences from Intra-Industry Trade Patterns*", Journal of Economic Studies (Vol. 25 No. 3), MCB University Press, pp. 225-247.
- **Brülhart, M. and Torstensson, J.** (1996), "*Regional Integration, Scale Economies and Industry Location in the European Union*", CEPR Discussion Paper No. 1435.
- **Buckley, J.P. and Casson, M.C.** (1981), "*The Optimal Timing of a Foreign Direct Investment*", Economic Journal (Vol. 91).
- **Buckley, P.J. and Ghauri, P.N.** (1993), "*Introduction and Overview*", In Buckley, P.J. and Ghauri, P.N. (eds), "*The Internationalization of the Firm: A Reader*", London: Academic Press.
- **Casson, M** (1997), "*Entrepreneurial Networks: a Theoretical Perspective*", Discussion Papers in Economics and Management (No. 371), University of Reading, MA.
- **Caves, R.E.** (1982), "*Multinational Enterprise and Economic Analysis*", Cambridge: Cambridge University Press

- **Clark, T. and Van Wincoop, E.** (2000), "*Borders and Business Cycles*", Journal of International Economics (Vol. 55), pp. 59–85.
- **Dent, C.M.** (1996), "*The European Economy"*, Routledge.
- **Dicken, P.** (1986), "*Global shift: Industrial Change in a Turbulent World*", Manchester: University of Manchester.
- **Dicken, P.** (1992), "*Global shift: The Internationalization of Economic Activity*", 2nd edition, London: Paul Chapman.
- **Dicken, P.** (1998), "*Global Shift: Transforming the World Economy*", 3th edition, London: Sage Publications.
- **Dicken, P.** (2003), "*Global Shift: Reshaping the Global Economic Map in the 21st Century*", London: Sage Publications.
- **Dicken, P.** (2004), "*Geographers and Globalisation: Another missed Boat?",* Transactions, Institute of British Geographers.
- **Dicken, P,** (2005), "*Tangled webs: Transnational Production Networks and Regional Integration*", Department of Geography, Marburg: University of Marburg.
- **Dicken, P., Kelly, P.F., Olds, K. and Yeung, H. W-C**. (2001), "*Chains and Networks, Territories and Scales: Towards a Relational Framework for Analysing the Global Economy*", Global Networks (Vol. 1, No. 2), pp. 89–112.
- **Dunning, J.H.** (1977), "*Trade, Location of Economic Activity and the MNE: a search for an Eclectic Approach*", in Ohlin, B., Hesselborn, P.O., Wijkman, P.M. (Eds),"*The International Allocation of Economic Activity*, London: Macmillan.
- **Dunning, J.H.** (1979), "*Explaining Changing Patterns of International Production: In Support of the Eclectic Theory*", Oxford bulletin of Economics and Statistics (Vol. 41).
- **Dunning, J.H.** (1981a), "*International Production and the Multinational Enterprise*", London: Allen & Unwin.
- **Dunning, J.H.** (1981b), "*Explaining the International Direct Investment position of Countries: Towards a Dynamic or Developmental approach*", Weltwirtschaftliches archive, (Vol. 117).
- **Dunning, J.H.** (1988a), "*Explaining international production*", London: Unwin Hyman.
- **Dunning, J.H.** (1988b), "*Multinationals, Technology and Competitiveness*", London: Unwin Hyman.
- **Dunning, J.H.** (1988c), "*The Eclectic Paradigm of International Production: a Restatement and some Possible Extensions*", Journal of International Business Studies (Vol. 19).
- **Dunning, J.H.** (1989), "*Transnational Corporations and Growth of Services: Some Conceptual and Theoretical Issues*", New York: United Nations.

- **Dunning, J.H.** (1993a), "*Multinational Enterprises and the Global Economy*", Wokingham: Addison-Wesley Publishing Company.
- **Dunning, J.H.** (1993b), "*The Globalization of Business: The Challenge of the 1990s*", London and New York: Routledge.
- **Dunning, J.H.** (1994), "*MNE Activity: Comparing NAFTA and the EC*", in Eden, L. (ed.), "*Multinationals in North America"*, Calgary: University of Calgary Press.
- **Dunning J.H. and Narula, R.** (2000), "*Industrial Development, Globalization and Multinational Enterprises: New Realities for Developing Countries*", Oxford Development Studies (Vol. 28), Routledge.
- **Dunning J.H. and Narula, R.** (2004) "*Multinationals and Industrial Competitiveness*", Cheltenham.
- **El-Agraa, A.** (1985), "*International Economic Integration*", in Greenway, D., "*Current Issues in International Trade, Theory and Policy*", London: Macmillan.
- **El-Agraa, A.** (2004), "*The European Union: Economics and Policies"*, 7th edition, Prentice Hall.
- **Ethier, W.J.** (1982), "*National and International Returns to Scale in the Modern Theory of International Trade*", American Economic Review (Vol. 72).
- **European Commission** (1996), "*First Report on Economic and Social Cohesion*", article 130a of the Treaty on European Union, Luxembourg: Office for Official Publications of the European Communities, pp. 13.
- **EUROSTAT** (1992), "*European Community Direct Investment, 1984-1989*", Luxembourg: Statistical Office of the European Communities.
- **Feldman, M.P.** (1994), "*The Geography of Innovation*", Dordrecht: Kluwer.
- **Frankel, J. A.** (1997), "*Regional Trading Blocs in the World Trading System*", Washington DC: Institute of International Economics.
- **Fujita, M., Krugman, P. and Venables, A.J.** (1999), "*The Spatial Economy: Cities, Regions, and International Trade"*, Cambridge: MIT Press.
- **Gereffi, G. and Korzeniewicz, M. (eds.)** (1994), "*Commodity Chains and Global Capitalism"*, Westport: Praeger.
- **Griffin, R.W. and Pustay, M.W.** (1999), "*A Managerial Perspective*", 2nd edition, New York: Addison-Wesley Publishing Company.
- **Guldager Jørgensen, J.** (1998): "*Regional integration og multinationale virksomheder – En økonomisk analyse af vilkårene for multinationale virksomheder i et integrationsmiljø*", PhD Afhandling, Odense: Odense University Press.
- **Håkanson, L.** (1979), "*Towards a Theory of Location and Corporate growth*", in Hamilton, F.E.I. and Linge, G.J.R., "*Spatial Analysis, Industry and the Industrial Environment: Industrial Systems Eds (Vol. 1)*", Chichester: John Wiley & Sons, pp. 115-138.

- **Hansson P.** (1989), "*Intra-Industry Trade: Measurements, Determinants and Growth*", Umeå, Solfjärden Offset AB.
- **Heckscher, E.F.** (1919), "*The Effect of Foreign Trade on the Distribution of Income*", Ekonomisk Tidskrift (Vol. 21).
- **Helpman, E.** (1989), "*An Exploration in the Theory of Exchange Rate Regimes*", Journal of Political Economy (Vol. 89).
- **Henderson, J., Dicken, P., Hess, M., Coe, N.M. and Yeung, H. W-C.** (2002), "*Global Production Networks and the Analysis of Economic Development*", Review of International Political Economy (Vol. 9, Issue 3), Routledge, pp. 436–464.
- **Hill, C.** (1997), "*International Business: Competing in the Global Marketplace*", Chicago: Irwin.
- **Hogenbirk, A.E.** (2002), "*Determinants of Inward Foreign Direct Investment: The Case of the Netherlands*", Maastricht: Maastricht University.
- **Horstmann, I.J. and Markusen, J.R.** (1992), "*Endogenous Market Structures in International Trade*", Journal of International Economics (Vol. 32).
- **IMF** (2001), "*Direction of Trade Statistics Yearbook*", Washington DC: International Monetary Fund (IMF).
- **Jaffe, A.** (1986), "*Technological Opportunity and Spillovers from R&D: Evidence from Firms' Patents, Profits and Market Value*", American Economic Review (Vol. 76), pp. 984–1001.
- **Jemison, D.B. and Sitkin, S.B.** (1986), "*Corporate Acquisitions: a Process Perspective*", Academy of Management Review (Vol. 11).
- **Johanson, J. and Vahlne, J.E.** (1977), "*The Internalization Process of the Firm: A Model of Knowledge Development and Increasing Foreign Market Commitments*", Journal of International Business Studies, pp. 23–32.
- **Krugman, P.R.** (1979), "*Increasing Returns, Monopolistic Competition, and International Trade*", Journal of International Economics (Vol. 9).
- **Krugman, P** (1991), "*Geography and Trade*", Cambridge: MIT Press.
- **Krugman, P. and Obstfeld, M.** (2000), "*International Economics: Theory and Policy*", 5th edition, Reading: Addison Wesley.
- **Krugman, P. and Venables, A.** (1994), "*The Location of Economic Activity: New Theories and Evidence"*, London: Centre of Economic Policy Research.
- **Lancaster, K.** (1980), "*Intra-Industry Trade under Perfect Monopolistic Competition*", Journal of International Economics (Vol. 10).
- **Levitt, T.** (1983). "*After the Sale is Over*", Harvard Business Review *(Vol. 61)*.
- **Markusen, J.R.** (1983), "*Factor Movements and Commodity Trade as Complements*", Journal of International Economics (Vol. 13).

- **Markusen, J.R., Morey, E.R. and Olewiler, N.D.** (1995), "*Competition in regional environmental policies when plant locations are endogenous*" Journal of Public Economics (Vol. 56), pp. 55-77.
- **Markusen, J.R.** (2002), "*Multinational Firms and the Theory of International Trade*", Cambridge: MIT Press.
- **Markusen, J.R. and Venables, A.J.** (1998), "*Multinational Firms and New Trade Theory*", Journal of International Economics (Vol. 46, No. 2), pp.183–203.
- **Markusen, J.R. and Venables, A.J.** (2000), "*The Theory of Endowment, Intra-Industry and Multinational Trade*", Journal of International Economics (Vol. 52, No. 2), pp. 209–234.
- **Marshall, A.** (1890), "*Principles of Economics*", 2nd edition, London: Macmillan.
- **Midelfart-Knarvik, K.H., Overman, H.G. and Venables, A.J.** (2000), "*Comparative Advantage and Economic Geography: Estimating the Determinants of Industrial Location in the EU*", CEPR Discussion Paper (No. 2618).
- **Molle, W.T.M.** (1994), "*The Economics of European Integration, Theory, Practice, Policy"*, 2nd Edition, Aldershot: Dartmouth.
- **Mongelli, F.P., Dorrucci, E., Agur, I.** (2005), "*What does European Institutional Integration tell us about Trade Integration*?", Occasional Paper Series (Vol. 40), European Central Bank (ECB).
- **Morsink, R.L.A.** (1997), "*Corporate Networking and Foreign Direct Investment*", Rotterdam: Erasmus University Rotterdam.
- **Morsink, R.L.A.** (1998) "*Foreign Direct Investments and Corporate Networking*", Cheltenham: Edward Elgar.
- **Navaretti, G.B. and Venables, A.J.** (2004), "*Multinational Firms in the World Economy*", Princeton University Press.
- **Ng, F. and Yeats, A.** (2003) "Major Trade Trends in Asia," Policy Research Working Paper (No. 3084), Washington: World Bank.
- **Nicoletti, G., Golub, S., Hajkova, D., Mirza, D. and Yoo, K.-Y.** (2003), "*The Influence of Policies on Trade and Foreign Direct Investment*", OECD Economic Studies (Vol. 36).
- **Nooteboom, B.** (1992), "*Towards a Dynamic Theory of Transactions*", Journal of Evolutionary Economics (Vol. 2, No. 4), Berlin/Heidelberg: Springer.
- **OECD** (1987), "*Structural Adjustment and Economic Performance*", Organisation for Economic Co-operation and Development, Paris.
- **OECD** (1993), "*International Direct Investment Statistics Yearbook"*, Organisation for Economic Co-operation and Development, Paris.
- **OECD** (1996), "*International Direct Investment Statistics Yearbook"*, Organisation for Economic Co-operation and Development, Paris.

- **OECD (2002),** "*Economic Outlook*", No 71, Organisation for Economic Co-operation and Development, Paris, pp. 161-162.
- **Ohlin, B.** (1933), "*Interregional and International Trade*", Cambridge, MA.
- **Ohmae, K.** (1985), "*Triad Power: The Coming Shape of Global Competition*", New York: The Free Press.
- **Ohmae, K.** (1989), "*The Global Logic of Strategic Alliances*", Harvard Business Review (Vol. 67, No. 2), pp. 143-54.
- **Parjanne M-L.** (1989), "*Measurement Problems in Intra-Industry Trade*", Helsinki: The Helsinki School of Economics.
- **Pelkmans, J.** (1983), "*European Direct Investments in the European Community"*, Journal of European integration (Vol. VII).
- **Pelkmans, J.** (1997), "*European Integration: Methods and Economic Analysis*", Harlow: Longman.
- **Peneder, M.** (2002). "*Intangible Investments and Human Resources*", Journal of Evolutionary Economics (Vol. 12), Springer-Verlag, pp. 107-134.
- **Phisalaphong, R**. (2004), "*The Impact of Economic Integration Programs on Inward Foreign Direct Investments*", Tinbergen institute.
- **Porter, M**. (1990), "*The Competitive Advantage of Nations"*, London: Macmillan.
- **Prahalad, C.K. and Doz, Y.** (1987), "*The Multinational Mission: Balancing Local Demands and Global Vision*", New York: The Free Press.
- **Pratten, C.** (1988), "*A Survey of the Economies of Scale*", in "*Commission of the European Communities: Research on the 'Cost of non-Europe'",* Studies on Economic Integration (Vol. II), Luxembourg: Office for Official Publications of the European Communities.
- **Rollet, P.** (1988), "*The Evolution of the Specialization of Industrial Activities in Europe*", Empirica journal (Vol. 15), Springer Netherlands, pp. 117-136.
- **Root, F.R.** (1994), "*Entry Strategies for International Markets*", Revised and Expanded Edition, San Francisco: Lexington Books.
- **Rothwell, R.** (1982), "*The Role of Technology in Industrial Change: Implications for Industrial Policy*", Regional Studies (Vol. 16).
- **Rowthorn, R. and Ramaswamy R.** (1997), "*Deindustrialization: Causes and Implications*", IMF working paper.
- **Rugman, A.M.** (1977), "*International Diversification by Financial and Direct Investment*", Journal of Economics and Business (Vol. 30).
- **Rugman, A.M.** (2000), "*The End of Globalization*", London: Random House and New York: Amacom-McGraw Hill.
- **Rugman, A.M.** (2001), "*The Myth of Global Strategy*", AIB Newsletter (Vol. 7, No. 2), pp. 11-14.

- **Sapir, A** (2007) (ed), "*Fragmented Power: Europe and the global economy*", Brussels: Bruegel Book Series (No. 1).
- **Swank, J. et al.** (2003), "*Economische Integratie in Europa, een Inventariserende Literatuurstudie*", Onderzoekscentrum voor Financieel Economisch Beleid.
- **Taylor, M.J.** (1975), "*Organizational Growth, Spatial Interaction and Location Decision-Making*", The journal of the Regional Studies Association (Vol. 9, No. 4), Routledge, pp. 313-323.
- **Tinbergen, J.** (1954), "*International Economic Integration*", Amsterdam: Elsevier.
- **UNCTAD** (1989), "*Foreign Direct Investment and Transnational Corporations in Services*", New York/Geneva: United Nations.
- **UNCTAD** (1993), "*World Investment Report 1993: Transnational Corporations and Integrated International Production",* New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2000), "*World Investment Report: Cross-border Mergers and Acquisitions*", New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2001), "*World Investment Report: Promoting Linkages*", New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2003), "*World Investment Report: FDI Policies for Development: National and International Perspectives*", New York/ Geneva: United Nations Conference on Trade and Development, pp.69.
- **UNCTAD** (2004), "*World Investment Report: The Shift Towards Services*", New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2006), "*World Investment Report: FDI from Developing and Transition Economies: Implications for Development",* New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2007), "*World Investment Report: Transnational Corporations, Extractive Industries and development*", New York/ Geneva: United Nations Conference on Trade and Development.
- **UNCTAD** (2008), "*Development and Globalization: Facts and Figures 2008*", New York/ Geneva: United Nations Conference on Trade and Development.
- **Venables, A.J.** (2000), "*International trade; Regional Economic Integration*", London: London School of Economics.
- **Welford, R. and Prescott, K.** (1996), "*European Business, an Issue-Based Approach"*, London: Financial Times Management, pp.412.
- **World Bank** (1995), "*World Development Report 1995: Workers in an Integrating World*", New York: Oxford University Press.

- **Yeats, A. J.** (2001), "*Just How Big is Global Production Sharing?*" in Arndt, S.W. and Kierzkowski, H. (eds.), "*Fragmentation: New Production Patterns in the World Economy",* Oxford: Oxford University Press, pp. 108–43.

Data resources:

- **Organisation for Economic Co-operation and Development (OECD)**: *SourceOECD database.*
- **The European Commission**: *EUROSTAT database and KLEMS Database.*
- **The World Bank**: *World Development Indicators Online (WDI).*
- **United Conference on Trade and Development (UNCTAD)**: *Foreign Direct Investment Database.*
- **United Nations Educational Scientific and Cultural Organization (UNESCO)**: Online Data Centre.

Appendices

Appendix I Origin-destination matrices from 1982-2006

Table I.1 Defined countries

Au	Austria
BLUE	Belgium & Luxembourg
Den	Denmark
Fin	Finland
Fr	France
Ger	Germany
Gre	Greece
Ire	Ireland
It	Italy
NL	Netherlands
Por	Portugal
Sp	Spain
Swe	Sweden
UK	United Kingdom

Table I.2 Origin destination matrix of intra-EU FDI, 1982-1986 (US$ in millions)

From \ To	Au	BLUE	Den	Fin	Fr	Ger	Gre	Ire	It	NL	Por	Sp	Swe	UK	EU-15
Au	0	1	0	0	6	29	N.A.	N.A.	0	7	N.A.	1	0	1	45
BLUE	N.A.	0	1	-6	108	97	2	3	-1	78	6	19	1	97	405
Den	1	4	0	1	17	25	0	1	1	8	1	7	1	41	108
Fin	0	18	8	0	7	21	0	7	3	18	0	3	91	18	195
Fr	5	90	0	1	0	140	15	6	113	107	2	115	11	208	814
Ger	173	198	25	3	325	0	46	22	266	410	64	316	16	227	2089
Gre	N.A.	N.A.	0	N.A.	2	1	0	0	0	N.A.	N.A.	0	0	N.A.	3
Ire	N.A.	4	0	N.A.	4	-6	N.A.	0	3	N.A.	4	4	-1	11	23
It	5	117	-3	0	119	69	4	1	0	124	3	30	1	93	563
NL	26	162	7	4	170	198	N.A.	5	84	0	5	108	28	524	1323
Por	N.A.	3	-1	N.A.	5	0	N.A.	0	0	N.A.	0	0	0	-1	7
Sp	N.A.	8	-3	N.A.	13	6	N.A.	1	3	7	19	0	0	12	65
Swe	4	48	59	72	73	60	1	2	58	70	5	17	0	99	567
UK	14	114	2	0	253	209	11	89	171	181	113	121	26	0	1304
EU-15	229	769	95	76	1102	848	79	37	700	1008	221	741	175	1329	0

Source: International Direct Investment Statistics Yearbook (EUROSTAT 1991) and the SourceOECD database

Notes: a. Incomplete FDI data for specifically Greece and Ireland.

b. In order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE)

c. For the years 1982-1984, the national currencies are transformed into Dollars according to the yearly exchange-rates (source: www.stats.oecd.org/WBOS).

Table I.3 Origin destination matrix of intra-EU FDI, 1987-1991 (US$ in millions)

From \ To	Au	BLUE	Den	Fin	Fr	Ger	Gre	Ire	It	NL	Por	Sp	Swe	UK	EU-15
Au	0	22	0	N.A.	14	162	N.A.	0	71	40	14	8	32	78	442
BLUE	-312	0	32	2	534	1425	90	99	-144	668	57	215	53	580	3298
Den	1	6	0	11	122	166	11	76	20	179	22	48	146	240	1047
Fin	1	103	55	0	137	103	2	18	40	-146	17	54	371	137	891
Fr	26	1828	111	8	0	1394	107	82	1140	1146	202	1575	496	2402	10516
Ger	859	1050	87	36	1934	0	131	2873	794	1263	159	1330	231	2508	13256
Gre	N.A.	1	0	N.A.	1	8	0	0	-11	N.A.	N.A.	2	N.A.	-6	-5
Ire	N.A.	23	0	N.A.	18	93	N.A.	0	3	91	13	15	0	268	523
It	-17	454	1	-1	572	361	39	4	0	261	17	275	15	197	2178
NL	160	1167	49	55	875	744	194	13	207	0	82	1482	292	2855	8175
Por	1	7	0	N.A.	13	0	0	0	8	2	0	72	0	11	113
Sp	4	119	-2	N.A.	158	121	8	3	67	180	264	0	0	181	1101
Swe	11	131	277	99	839	579	8	441	54	1088	33	136	0	1109	4805
UK	91	307	59	13	1576	583	98	291	511	1831	243	1227	94	0	6925
EU-15	825	5220	668	222	6792	5737	688	3900	2760	6603	1123	6439	1730	10558	0

Source: SourceOECD database

Notes: a. Incomplete FDI data for specifically Greece and Ireland.

b. In order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE)

Table I.4 Origin destination matrix of intra-EU FDI, 1992-1996 (US$ in millions)

From \ To	Au	BLUE	Den	Fin	Fr	Ger	Gre	Ire	It	NL	Por	Sp	Swe	UK	EU-15
Au	0	80	1	1	53	373	3	51	25	20	11	31	18	83	750
BLUE	-167	0	51	-9	1797	1399	-5	382	482	985	-1	433	270	66	5683
Den	40	110	0	101	61	68	2	216	17	189	20	152	390	103	1467
Fin	44	87	166	0	122	227	0	42	11	-122	19	51	479	159	1285
Fr	100	2155	16	25	0	1648	77	137	1066	1257	175	1298	86	1181	9221
Ger	3088	1964	389	118	2650	0	101	428	1543	2681	301	1453	625	6297	21637
Gre	N.A.	-11	0	N.A.	-15	-6	0	0	1	7	0	4	N.A.	0	-19
Ire	N.A.	51	140	-18	191	238	5	0	23	651	16	148	0	130	1574
It	-55	811	12	0	1090	-296	192	100	0	700	94	506	15	299	3469
NL	145	2240	163	45	1839	1357	162	636	355	0	129	798	472	1965	10305
Por	2	11	1	-1	31	7	1	25	11	4	0	220	-1	23	332
Sp	4	90	0	1	128	105	2	61	52	59	267	0	4	137	909
Swe	56	-8	138	321	250	-559	4	-116	132	329	4	31	0	285	868
UK	102	448	488	131	2584	2200	175	1149	506	3325	238	683	419	0	12448
EU-15	3359	8025	1565	713	10780	6761	717	3112	4224	10087	1272	5808	2776	10727	0

Source: SourceOECD database

Notes: a. Incomplete FDI data for specifically Greece and Ireland.

b. In order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE)

Table I.5 Origin destination matrix of intra-EU FDI, 1997-2001 (US$ in millions)

From \ To	Au	BLUE	Den	Fin	Fr	Ger	Gre	Ire	It	NL	Por	Sp	Swe	UK	EU-15
Au	0	68	24	-13	46	884	0	-32	80	24	-157	43	144	161	1273
BLUE	139	0	2028	-73	6431	25259	25	966	863	8402	232	2530	859	12365	60025
Den	20	1500	0	442	458	176	10	278	182	527	4	2	730	598	4927
Fin	6	-47	272	0	174	1725	6	96	95	1160	-13	26	4039	226	7766
Fr	200	12796	485	-8	0	8877	-140	576	1617	3959	167	1656	513	16251	46947
Ger	3718	10791	371	189	6093	0	424	879	1133	-636	341	2058	2828	10730	38919
Gre	1	-58	-1	N.A.	7	-3	0	N.A.	3	28	1	4	0	35	15
Ire	-2	1673	207	22	552	348	5	0	41	1273	110	294	-76	965	5412
It	117	2022	43	21	1179	1429	40	291	0	759	172	395	109	1486	8063
NL	22	7697	1076	381	5195	4809	201	2418	1296	0	746	1699	1026	5852	32416
Por	24	304	3	0	84	66	14	158	76	383	0	1327	1	121	2561
Sp	97	4373	224	45	1103	734	12	257	570	1009	1034	0	26	876	10361
Swe	-8	756	1787	4077	552	1550	-2	144	153	737	36	195	0	905	10881
UK	599	22571	364	230	6194	24996	505	3884	965	7347	471	2858	8105	0	79089
EU-15	4931	64445	6884	5313	28067	70849	1100	9915	7074	24973	3145	13086	18304	50569	0

Source: SourceOECD database

Notes: a. Incomplete FDI data for specifically Greece and Ireland.

b. In order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE)

Table I.6 Origin destination matrix of intra-EU FDI, 2002-2006 (US$ in millions)

From \ To	Au	BLUE	Den	Fin	Fr	Ger	Gre	Ire	It	NL	Por	Sp	Swe	UK	EU-15
Au	0	141	309	28	199	336	20	25	309	248	27	90	61	207	2001
BLUE	559	0	-532	239	11402	5166	145	5739	2279	17401	840	4957	-677	6524	54040
Den	-125	-8	0	60	252	1451	18	-47	143	449	83	157	529	451	3413
Fin	86	1173	-330	0	-4	-90	-3	-51	-32	301	23	-7	-573	51	541
Fr	318	10031	348	170	0	3879	728	1678	4686	4991	636	1674	587	8321	38047
Ger	2327	3644	336	442	3206	0	55	75	-514	2249	91	306	1346	8477	22041
Gre	0	31	1	-2	57	32	0	32	8	-24	2	16	1	126	279
Ire	20	3809	-8	28	1007	2192	6	0	96	1299	16	1223	-162	2348	11874
It	614	252	86	63	1675	5199	20	267	0	5167	80	583	63	644	14713
NL	480	8383	62	160	4387	4577	86	381	5850	0	112	3485	601	23684	52248
Por	-19	-273	550	0	34	-2	67	217	-10	531	0	729	30	50	1904
Sp	284	2978	130	142	4601	1313	141	-208	1608	2095	2338	0	312	14319	30054
Swe	103	2130	1369	3160	656	864	7	600	329	48	-35	914	0	1094	11239
UK	518	3929	788	381	8392	2301	205	1522	1172	6396	217	3924	4385	0	34129
EU-15	5165	36220	3108	4871	35864	27218	1495	10230	15924	41152	4430	18050	6503	66295	0

Source: SourceOECD database

Notes: a. Incomplete FDI data for specifically Greece and Ireland.

b. In order to simplify the data collection Belgium and Luxembourg will be considered as one country (BLUE)

Appendix II Structural integration

Appendix II.1 PCA

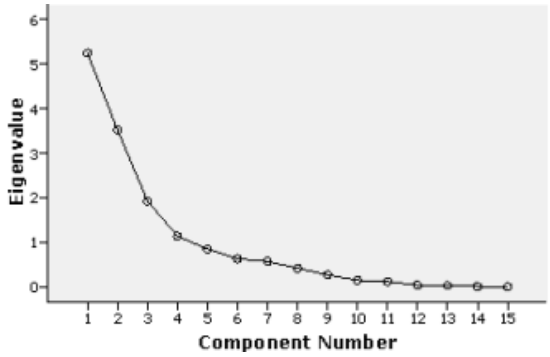
Before clustering the fifteen EU countries the sixteen original variables (see table II.1.2) will be reduced to five components with a principal component analysis. The components will be derived in decreasing of importance. The first components account for the bigger part of the variation in the data. This way a smaller set of variables will be used for the hierarchical cluster analysis without losing a lot of information. In table II.1.1 the total variances of the first five components are explained.

Table II.1.1 Total variances of the Principal component analysis

Component	Initial Eigenvalues	Rotation Sums of Squared Loadings		
	Total	Total	% of Variances	Cumulative %
1	5.246	4.004	26.694	26.694
2	3.527	3.247	21.645	48.340
3	1.929	2.183	14.555	62.895
4	1.143	1.896	12.638	75.533
5	.854	1.370	9.132	84.664

This table shows that with four components the initial eigenvalues stay underneath 1, but taking into account the other approaches it might be appropriate to use five components. One other approach is to retain all the components that cumulatively explain for at least 80 percent of the total variance. In this table it is obvious that the first five components explain for **84.66%** the total variances of the data. Furthermore, the scree plot shows a breaking point between four and five components, which remains subjective (see figure II.1.1). The components before the breaking point in the plot will be retained. One can say that from the fifth component on the line is almost flat, which could mean the breaking point. The first five components account for the highest share of the total variance and the successive components contribute very little to the total variance. So, according to the scree plot, the first five components will be extracted.

Figure II.1.1 The Scree plot



The rotated component matrix contains all the component loadings. It shows the correlations between the variable and the component. Correlation values fluctuate between -1 to +1. The loadings higher than .6 will be considered as important variables in that component.

Table II.1.2 Rotated component matrix

Rotated Component Matrix					
	Components				
Variables	**1**	**2**	**3**	**4**	**5**
Unemployment	-.080	.073	-.061	.063	**-.911**
Export	.230	-.193	**.930**	.176	.072
Import	.139	-.265	**.928**	.087	.038
GDP	.231	**.891**	-.174	-.127	-.078
Industry, value added	-.377	.154	.147	**.825**	-.005
Service, value added	.645	.091	-.045	**-.700**	.083
Population	-.003	**.873**	-.309	.021	-.212
GDP growth	.224	-.272	.094	**.755**	-.059
GDP per capita	**.651**	.259	.291	.019	.504
Wages	**.863**	.199	.094	-.170	.094
High Education	**.885**	-.062	.004	-.106	.042
Inflation	**-.828**	-.241	-.202	-.128	.045
Labour productivity	**.724**	.266	.386	-.174	.229
R&D	.292	**.635**	-.104	-.088	.381
Patents	.131	**.911**	.006	-.038	.091

Varimax with Kaiser Normalization

The first component shows high components loadings on GDP per capita, wages, high education, inflation and labor productivity. This factor will be characterized as the 'purchasing power component'. The second component has high component loadings on GDP, Population, R&D and Patents. This component can be characterized as 'market size and innovation component'. The third component will be illustrated as the 'international activity component', with high correlation on export and import. The variables that contribute to component 4 are; industry (value added), service (value added) and GDP growth. This first component characterizes the market structure and will be labelled as so. According to the negative loadings on service in this component, one can interpret this as a 'manufacturing component'. Than the fifth is a unique component. It only has one variable that has a high component loading on unemployment.

Appendix II.2 Hierarchical cluster analysis

Now that the data is reduced in the principal component analysis, the hierarchical cluster analysis can be performed. Clusters will be obtained subjectively and may differ per individual periodical analysis. In order to cluster, the intra- and inter-cluster distance will be taken into account.

1982-1986 period

Figure II.2.1 Dendogram of the EU15, 1982-1986

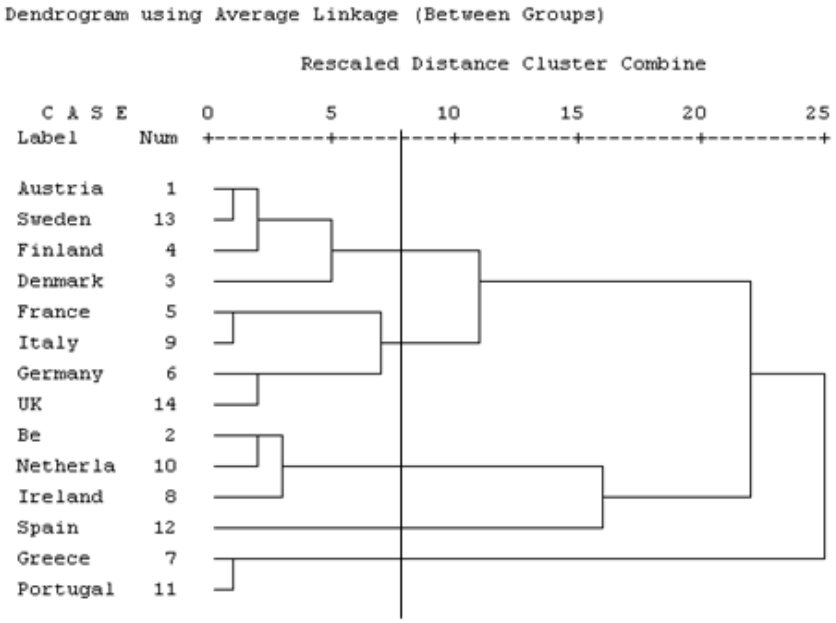


Table II.2.1 Country clusters 1982-1986

1	Austria, Sweden, Finland and Denmark
2	France, Italy, Germany and UK
3	Belgium, Netherlands and Ireland
4	Spain
5	Portugal and Greece

Figure II.2.1 presents the dendogram of the first examined period (1982-1986). This graphical presentation of the cluster analysis indicates a few EU countries that show strong similarities. Austria and Sweden, France and Italy and Greece and Portugal are homogeneous countries according to the cluster analysis. When taken the intra cluster distance on a broader scale, more clusters can be obtained. According to observable intra cluster distances showed in the dendogram, the fourteen EU countries can be classified in 5 clusters. Then, the first cluster one consists of four countries; Austria, Sweden, Finland and Denmark. This first cluster has the closest inter cluster distance between the countries of the so called cluster two; France, Italy Germany and UK. Within this cluster is France more similar to Italy and Germany more to the United Kingdom. The next cluster that merges with the

first two clusters is the cluster consisting of the following EU countries; Belgium, The Netherlands and Ireland. In which Belgium and The Netherlands have the smallest intra-cluster distance. In this examined period Spain more or less forms a cluster on its own, which joins the former cluster before the first two clusters will unite. Finally, Greece and Portugal as a single cluster merges with the rest. Greece and Portugal as similar countries, with respect to their economic structure, seem quite heterogeneous to the other EU countries according to this dendogram. All created country clusters from the period 1982 to 1986 in the EU are presented in table II.2.1.

1987-1991 period

Figure II.2.2 Dendogram of the EU15, 1987-1991

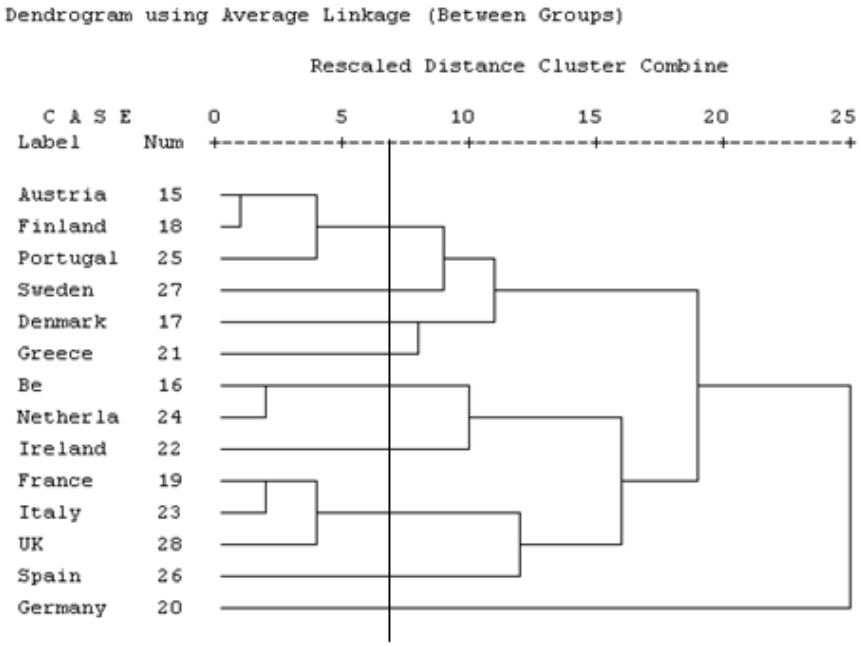


Table II.2.2 Country clusters 1987-1991

1	Belgium, Netherlands
2	France, Italy, UK
3	Austria, Finland, Portugal
4	Germany
5	Ireland
6	Greece
7	Spain
8	Sweden
9	Denmark

The subsequent examined period from 1987 to 1991 is classified into nine clusters, presented in figure and table II.2.2. In this period Austria and Finland are still homogeneous, but the composition of the cluster changed compared to the previous period. Now Portugal, which was very strong connected with Greece, merges with Austria and Finland. Sweden, Denmark and Greece are now quite heterogeneous compared to the other EU countries and each form a cluster on its own. As for Belgium and The Netherlands they are still considered homogeneous, although to a lesser extent. Furthermore, in this period France, Italy and the UK still compose a cluster, except for Germany who dropped out and formed a new cluster on its own. Overall, the intra-cluster distances seem to have increased over time, indicating that during 1987 to 1991 the EU evolved into a more heterogeneous region compared to the previous five years.

1992-1996 period

Figure II.2.3 Dendogram of the EU15, 1992-1996

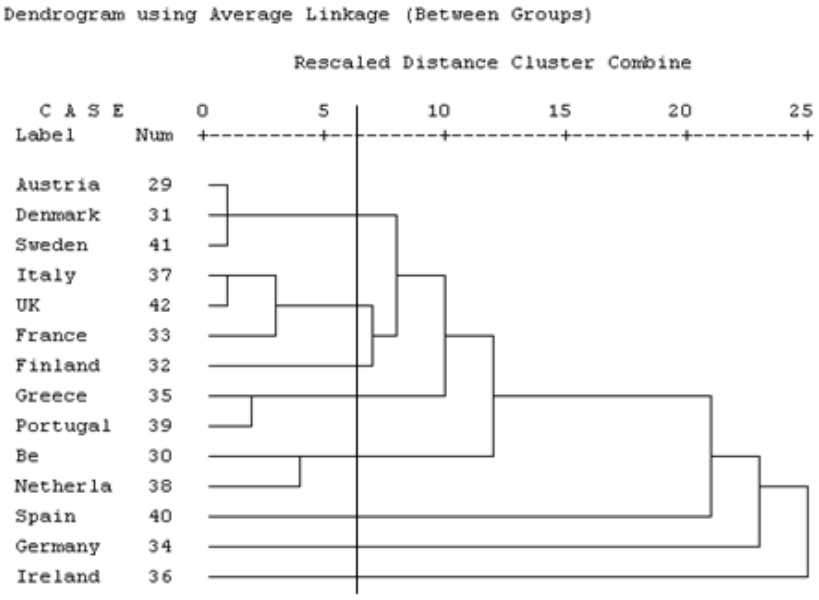


Table II.2.3 Country clusters 1992-1996

1	Belgium, Netherlands
2	France, Italy, UK
3	Austria, Sweden, Denmark
4	Germany
5	Ireland
6	Greece, Portugal
7	Spain
8	Finland

From 1992 until 1996, the fourteen EU countries are categorized in eight clusters, presented in figure and table II.2.3. In this period a strong homogeneity can be observed between the countries Austria, Denmark and Sweden. Furthermore, a connection can still be spotted between Italy, UK and France and Belgium with the Netherlands. However, over time the intra-cluster distance between Belgium and the Netherlands increases. Finally, Spain Germany and Ireland grow further away from the other EU countries, because the inter-cluster is large between the other EU countries. Each of these countries develops an individual cluster. Apart from these three countries this period suggests a more converged EU region with smaller intra- and inter-cluster distances as compared to the previous ten years.

1997-2001 period

Figure II.2.4 Dendogram of the EU15, 1997-2001

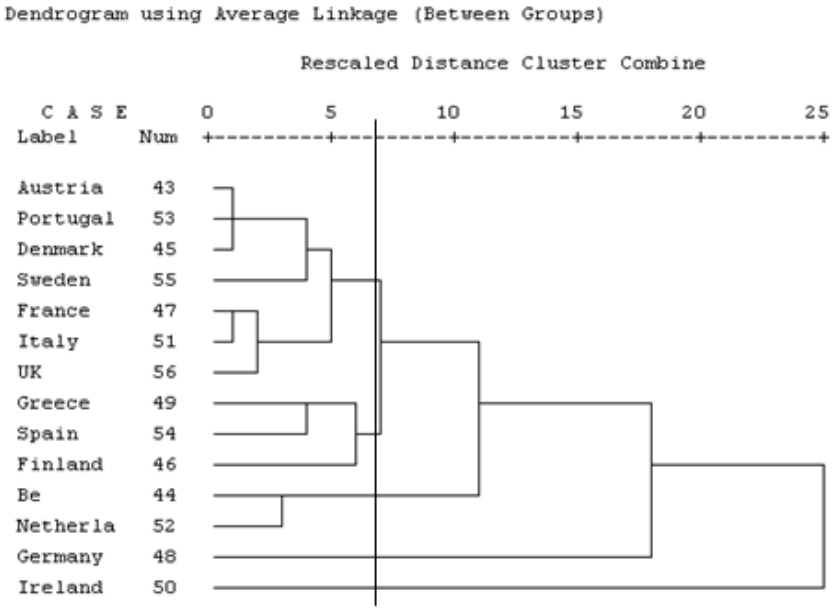


Table II.2.4 Country clusters 1997-2001

1	Belgium, Netherland
2	France, Italy, UK
3	Austria, Sweden, Denmark, Portugal
4	Germany
5	Ireland
6	Greece, Finland, Spain

In the period 1997-2001 the countries are grouped into six clusters, see table II.2.4. Remarkable in this dendogram is that Portugal joined the cluster with Austria and Denmark and that Sweden indicates a larger intra cluster distance to these three countries. However, they still make one cluster, including Portugal. Not so extraordinary are the clusters Belgium and the Netherlands and France, Italy and the UK. Furthermore, Spain seems to have hooked up with Greece and to a certain extent Finland. Germany and particularly Ireland show dissimilar economic characteristics compared to the rest of the EU countries. Also in this examined period the outcome provides signs of a more homogeneous region, with intra- and inter-cluster distances becoming even smaller, except for Germany and Ireland.

2002-2006 period

Figure II.2.5 Dendogram of the EU15, 2002-2006

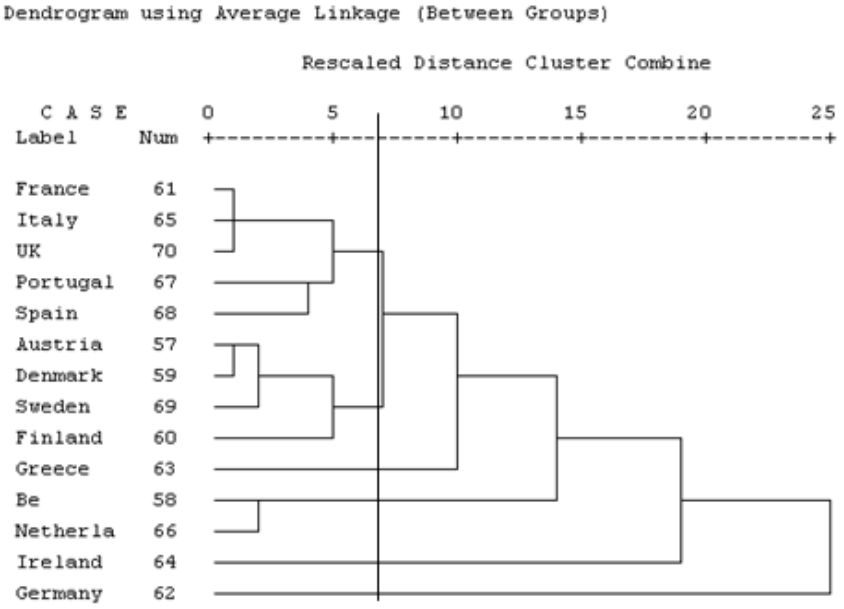


Table II.2.5 Country clusters 2002-2006

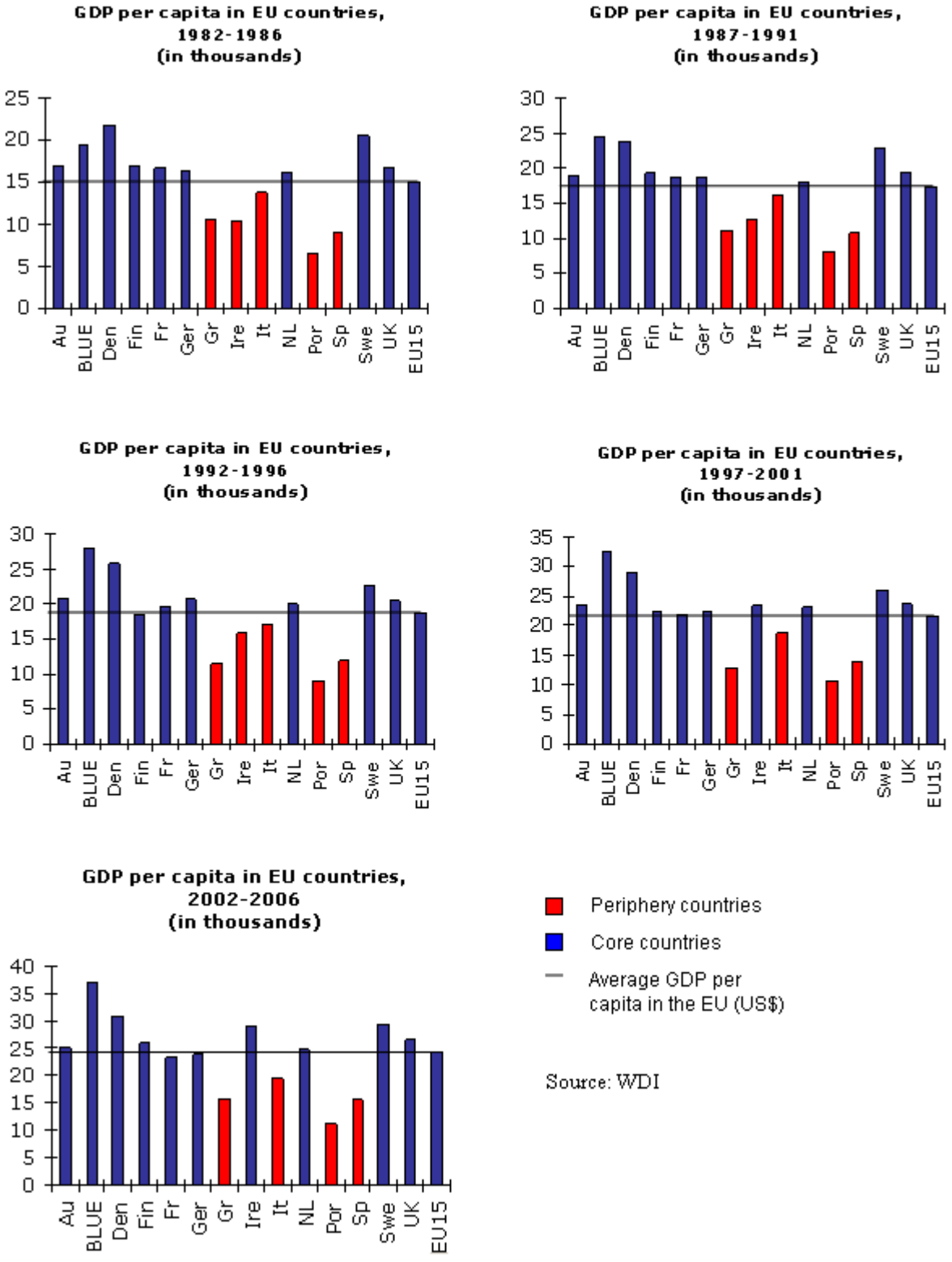
1	Belgium, Netherlands
2	France, Italy, UK
3	Austria, Sweden, Denmark, Finland
4	Germany
5	Ireland
6	Greece
7	Portugal, Spain

The period 2000 to 2004 shows seven clusters, see figure and table II.2.5. Most of the clusters provide the same composition as before. The only differences that can be discovered are all Scandinavian

countries, including Austria, merge in one cluster and that Portugal and Spain shows a relatively small intra-cluster distance.

Compared to the first ten examined years (1982-1991) the EU countries became more homogeneous, indicating that the EU as a region converged over time. However, the last ten examined years (1997-2006) show no significant differences, except that Ireland, Germany, Belgium and the Netherlands become more diverged to the rest of the EU.

Figure II.2.6 Core & Periphery countries in the EU, 1982-2006



Appendix II.3 Concentration of industries in the EU, per country and per stable cluster

Table II.3.1 Classification of the industries

Sic code	Manufacturing industries
15-16	FOOD , BEVERAGES AND TOBACCO
17-19	TEXTILES, TEXTILE , LEATHER AND FOOTWEAR
20-22	WOOD, PULP, PAPER, PRINTING AND PUBLISHING
23-26	CHEMICAL INDUSTRIES
27-28	BASIC METALS AND FABRICATED METAL
29	MACHINERY
30-35	ELECTRICAL, OPTICAL AND TRANSPORT EQUIPMENT
Sic code	**Service industries**
50	WHOLESALE AND RETAIL TRADE OF MOTORVEHICLES AND -CYCLES
50-51	OTHER WHOLESALE AND RETAIL TRADE
53-55	HOTELS AND RESTAURANTS
60-63	TRANSPORT AND STORAGE
64	POST AND TELECOMMUNICATIONS
65-67	FINANCIAL INTERMEDIATION
70-74	REAL ESTATE, RENTING AND BUSINESS ACTIVITIES

Source: European NACE (rev. 1) Classification.

Concentration of industries in the EU

Table II.3.2 Herfindahl-index in the EU per industry, manufacturing and service

Herfindahl-index per country in the EU, 1982-2006						
Country	**Industry**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Au	Manufacturing	0.145	0.146	0.148	0.151	0.154
	Service	0.207	0.204	0.206	0.207	0.209
Be	Manufacturing	0.159	0.158	0.160	0.162	0.166
	Service	0.203	0.202	0.199	0.203	0.210
Den	Manufacturing	0.153	0.154	0.156	0.159	0.161
	Service	0.221	0.219	0.218	0.223	0.226
Fin	Manufacturing	0.161	1.163	1.169	1.169	1.170
	Service	0.211	0.201	0.199	0.207	0.216
Fr	Manufacturing	0.155	0.154	0.155	0.158	0.162
	Service	0.205	0.213	0.218	0.229	0.234
Ger	Manufacturing	0.162	0.168	0.168	0.173	0.179
	Service	0.220	0.216	0.218	0.224	0.224
Gr	Manufacturing	0.180	0.180	0.179	0.175	0.173
	Service	0.197	0.182	0.173	0.170	0.169
Ire	Manufacturing	0,175	0.172	0.176	0.196	0.201
	Service	0.199	0.194	0.198	0.195	0.195
It	Manufacturing	0.158	0.158	0.156	0.154	0.153
	Service	0.179	0.178	0.182	0.187	0.198
NL	Manufacturing	0.163	0.161	0.161	0.160	0.162
	Service	0.224	0.234	0.241	0.254	0.254
Por	Manufacturing	0.211	0.224	0.219	0.204	0.197
	Service	0.261	0.249	0.246	0.233	0.237
Sp	Manufacturing	0.155	0.154	0.154	0.152	0.151
	Service	0.191	0.192	0.196	0.207	0.210
Swe	Manufacturing	0.174	0.176	0.178	0.182	0.181
	Service	0.218	0.214	0.217	0.220	0.228
UK	Manufacturing	0.158	0.155	0.153	0.159	0.163
	Service	0.212	0.215	0.220	0.227	0.230

Source: KLEMS DATABASE

Table II.3.3 Herfindahl-index per Industry in the EU, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.014	0.014	0.014	0.017	0.018
Textile industry	17-19	0.018	0.016	0.011	0.010	0.007
Wood and Paper	20-22	0.012	0.013	0.014	0.015	0.014
Chemical industry	23-26	0.025	0.027	0.025	0.027	0.028
Metal industry	27-28	0.022	0.021	0.019	0.023	0.024
Machinery	29	0.014	0.014	0.016	0.013	0.014
Equipment	30-35	0.047	0.048	0.055	0.048	0.049
Total Manufacturing	15-35	**0.151**	**0.152**	**0.155**	**0.153**	**0.154**
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.004	0.004	0.003	0.003	0.003
Other wholesale and retail	51-52	0.123	0.114	0.111	0.099	0.093
Hotels and Restaurants	53-55	0.009	0.009	0.012	0.011	0.012
Transport and Storage	60-63	0.019	0.016	0.016	0.012	0.012
Communication industry	64	0.004	0.004	0.003	0.002	0.002
Financial intermediation	65-67	0.011	0.010	0.010	0.007	0.006
Real estate & Business	70-74	0.034	0.048	0.047	0.081	0.091
Total Service	50-74	**0.204**	**0.204**	**0.202**	**0.216**	**0.219**

Source: KLEM DATABASE (see appendix x)

Note: a. HHI of five year-periods

b. A higher H-index implies a higher degree of concentration within the EU15.

c. The Energy industry is excluded from the manufacturing industries and the community, social and personal services are excluded from the service industries.

Concentration of industries per EU country

Table II.3.4 Herfindahl-index per industry of Austria, 1982-2006

Austria	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,020	0,020	0,022	0,020	0,019
TEXTILE INDUSTRY	0,018	0,013	0,008	0,005	0,003
WOOD AND PAPER INDUSTRY	0,016	0,019	0,021	0,021	0,020
CHEMICAL INDUSTRIES	0,023	0,024	0,025	0,026	0,026
METAL INDUSTRY	0,030	0,027	0,025	0,028	0,032
MACHINERY	0,012	0,013	0,015	0,017	0,020
EQUIPMENT	0,026	0,029	0,032	0,034	0,035
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,004	0,004	0,004	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,132	0,127	0,125	0,117	0,109
HOTELS AND RESTAURANTS	0,013	0,015	0,017	0,016	0,018
TRANSPORT AND STORAGE	0,022	0,020	0,020	0,019	0,018
POST AND TELECOMMUNICATIONS	0,004	0,004	0,003	0,002	0,002
FINANCIAL INTERMEDIATION	0,009	0,010	0,008	0,007	0,006
REAL ESTATE AND BUSINESS ACTIVITIES	0,022	0,026	0,029	0,042	0,053

Table II.3.5 Herfindahl-index per industry of Belgium, 1982-2006

Belgium	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,017	0,018	0,020	0,022	0,024
TEXTILE INDUSTRY	0,020	0,017	0,013	0,009	0,006
WOOD AND PAPER INDUSTRY	0,007	0,009	0,010	0,011	0,010
CHEMICAL INDUSTRIES	0,038	0,041	0,047	0,051	0,056
METAL INDUSTRY	0,036	0,031	0,029	0,028	0,030
MACHINERY	0,005	0,005	0,005	0,005	0,005
EQUIPMENT	0,036	0,037	0,036	0,037	0,034
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,002	0,002	0,002	0,002	0,002
OTHER WHOLESALE AND RETAIL	0,114	0,110	0,099	0,084	0,088
HOTELS AND RESTAURANTS	0,004	0,004	0,006	0,006	0,006
TRANSPORT AND STORAGE	0,039	0,030	0,026	0,024	0,022
POST AND TELECOMMUNICATIONS	0,008	0,005	0,005	0,004	0,003
FINANCIAL INTERMEDIATION	0,016	0,015	0,013	0,011	0,009
REAL ESTATE AND BUSINESS ACTIVITIES	0,020	0,035	0,048	0,072	0,080

Table II.3.6 Herfindahl-index per industry of Denmark, 1982-2006

Denmark	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,044	0,042	0,041	0,036	0,038
TEXTILE INDUSTRY	0,007	0,004	0,003	0,001	0,001
WOOD AND PAPER INDUSTRY	0,020	0,023	0,023	0,026	0,023
CHEMICAL INDUSTRIES	0,020	0,021	0,023	0,027	0,030
METAL INDUSTRY	0,012	0,015	0,016	0,016	0,015
MACHINERY	0,024	0,026	0,027	0,027	0,027
EQUIPMENT	0,025	0,023	0,022	0,024	0,027
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,005	0,004	0,004	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,145	0,137	0,133	0,128	0,119
HOTELS AND RESTAURANTS	0,004	0,005	0,005	0,006	0,006
TRANSPORT AND STORAGE	0,019	0,018	0,019	0,016	0,014
POST AND TELECOMMUNICATIONS	0,004	0,004	0,003	0,003	0,003
FINANCIAL INTERMEDIATION	0,010	0,011	0,009	0,007	0,007
REAL ESTATE AND BUSINESS ACTIVITIES	0,034	0,041	0,046	0,059	0,075

Table II.3.7 Herfindahl-index per industry of Finland, 1982-2006

Finland	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,014	0,015	0,015	0,010	0,009
TEXTILE INDUSTRY	0,015	0,008	0,003	0,002	0,001
WOOD AND PAPER INDUSTRY	0,069	0,071	0,072	0,058	0,054
CHEMICAL INDUSTRIES	0,015	0,017	0,017	0,017	0,018
METAL INDUSTRY	0,010	0,011	0,013	0,017	0,022
MACHINERY	0,015	0,017	0,019	0,020	0,022
EQUIPMENT	0,023	0,024	0,031	0,044	0,044
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,004	0,004	0,003	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,135	0,119	0,107	0,103	0,100
HOTELS AND RESTAURANTS	0,009	0,009	0,008	0,008	0,008
TRANSPORT AND STORAGE	0,026	0,023	0,025	0,024	0,021
POST AND TELECOMMUNICATIONS	0,006	0,005	0,006	0,005	0,004
FINANCIAL INTERMEDIATION	0,008	0,009	0,008	0,004	0,003
REAL ESTATE AND BUSINESS ACTIVITIES	0,023	0,032	0,041	0,060	0,077

Table II.3.8 Herfindahl-index per industry of France, 1982-2006

France	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,013	0,015	0,018	0,022	0,025
TEXTILE INDUSTRY	0,018	0,014	0,010	0,007	0,004
WOOD AND PAPER INDUSTRY	0,010	0,012	0,013	0,013	0,012
CHEMICAL INDUSTRIES	0,023	0,024	0,025	0,024	0,026
METAL INDUSTRY	0,029	0,028	0,028	0,030	0,032
MACHINERY	0,011	0,010	0,010	0,010	0,009
EQUIPMENT	0,052	0,051	0,050	0,052	0,053
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,003	0,003	0,002	0,002	0,002
OTHER WHOLESALE AND RETAIL	0,099	0,089	0,081	0,074	0,073
HOTELS AND RESTAURANTS	0,005	0,006	0,006	0,006	0,006
TRANSPORT AND STORAGE	0,017	0,014	0,013	0,013	0,012
POST AND TELECOMMUNICATIONS	0,004	0,004	0,003	0,003	0,002
FINANCIAL INTERMEDIATION	0,012	0,010	0,009	0,007	0,006
REAL ESTATE AND BUSINESS ACTIVITIES	0,065	0,088	0,103	0,125	0,132

Table II.3.9 Herfindahl-index per industry of Germany, 1982-2006

Germany	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,011	0,009	0,011	0,014	0,015
TEXTILE INDUSTRY	0,007	0,005	0,002	0,001	0,001
WOOD AND PAPER INDUSTRY	0,010	0,011	0,014	0,013	0,011
CHEMICAL INDUSTRIES	0,027	0,026	0,028	0,027	0,025
METAL INDUSTRY	0,020	0,020	0,021	0,021	0,021
MACHINERY	0,024	0,026	0,023	0,022	0,023
EQUIPMENT	0,063	0,072	0,068	0,074	0,082
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,004	0,004	0,003	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,149	0,139	0,132	0,117	0,101
HOTELS AND RESTAURANTS	0,005	0,006	0,007	0,008	0,010
TRANSPORT AND STORAGE	0,022	0,020	0,015	0,012	0,011
POST AND TELECOMMUNICATIONS	0,005	0,004	0,003	0,002	0,001
FINANCIAL INTERMEDIATION	0,011	0,010	0,009	0,008	0,007
REAL ESTATE AND BUSINESS ACTIVITIES	0,024	0,032	0,047	0,075	0,091

Table II.3.10 Herfindahl-index per industry of Greece, 1982-2006

Greece	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,051	0,051	0,051	0,054	0,053
TEXTILE INDUSTRY	0,068	0,068	0,067	0,059	0,056
WOOD AND PAPER INDUSTRY	0,011	0,011	0,011	0,013	0,013
CHEMICAL INDUSTRIES	0,030	0,030	0,030	0,030	0,030
METAL INDUSTRY	0,009	0,009	0,009	0,010	0,011
MACHINERY	0,003	0,003	0,003	0,003	0,003
EQUIPMENT	0,007	0,007	0,007	0,007	0,007
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,002	0,003	0,003	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,039	0,046	0,058	0,062	0,056
HOTELS AND RESTAURANTS	0,013	0,015	0,019	0,021	0,021
TRANSPORT AND STORAGE	0,111	0,082	0,055	0,039	0,034
POST AND TELECOMMUNICATIONS	0,011	0,008	0,006	0,005	0,005
FINANCIAL INTERMEDIATION	0,009	0,012	0,014	0,015	0,015
REAL ESTATE AND BUSINESS ACTIVITIES	0,013	0,017	0,019	0,025	0,035

Table II.3.11 Herfindahl-index per industry of Ireland, 1982-2006

Ireland	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,074	0,062	0,051	0,041	0,047
TEXTILE INDUSTRY	0,023	0,017	0,010	0,003	0,001
WOOD AND PAPER INDUSTRY	0,011	0,012	0,014	0,015	0,016
CHEMICAL INDUSTRIES	0,026	0,030	0,033	0,034	0,042
METAL INDUSTRY	0,005	0,005	0,004	0,004	0,005
MACHINERY	0,004	0,004	0,004	0,004	0,003
EQUIPMENT	0,032	0,041	0,060	0,094	0,086
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,003	0,003	0,003	0,002	0,002
OTHER WHOLESALE AND RETAIL	0,123	0,114	0,115	0,098	0,096
HOTELS AND RESTAURANTS	0,017	0,019	0,025	0,027	0,027
TRANSPORT AND STORAGE	0,015	0,012	0,009	0,010	0,009
POST AND TELECOMMUNICATIONS	0,009	0,008	0,005	0,003	0,003
FINANCIAL INTERMEDIATION	0,011	0,014	0,015	0,014	0,015
REAL ESTATE AND BUSINESS ACTIVITIES	0,019	0,024	0,026	0,041	0,044

Table II.3.12 Herfindahl-index per industry of Italy, 1982-2006

Italy	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,006	0,007	0,008	0,008	0,008
TEXTILE INDUSTRY	0,046	0,049	0,046	0,037	0,030
WOOD AND PAPER INDUSTRY	0,007	0,008	0,008	0,007	0,007
CHEMICAL INDUSTRIES	0,023	0,027	0,026	0,027	0,026
METAL INDUSTRY	0,027	0,022	0,024	0,029	0,034
MACHINERY	0,014	0,013	0,014	0,017	0,020
EQUIPMENT	0,034	0,032	0,030	0,029	0,028
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,006	0,006	0,005	0,004	0,004
OTHER WHOLESALE AND RETAIL	0,089	0,081	0,080	0,071	0,067
HOTELS AND RESTAURANTS	0,009	0,009	0,011	0,013	0,016
TRANSPORT AND STORAGE	0,030	0,024	0,019	0,021	0,017
POST AND TELECOMMUNICATIONS	0,006	0,005	0,004	0,003	0,002
FINANCIAL INTERMEDIATION	0,016	0,015	0,014	0,011	0,008
REAL ESTATE AND BUSINESS ACTIVITIES	0,021	0,040	0,048	0,065	0,084

Table II.3.13 Herfindahl-index per industry of The Netherlands, 1982-2006

The Netherlands	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,035	0,031	0,033	0,032	0,032
TEXTILE INDUSTRY	0,002	0,002	0,002	0,001	0,001
WOOD AND PAPER INDUSTRY	0,025	0,028	0,032	0,028	0,026
CHEMICAL INDUSTRIES	0,028	0,030	0,031	0,031	0,033
METAL INDUSTRY	0,020	0,020	0,021	0,023	0,023
MACHINERY	0,008	0,008	0,009	0,012	0,013
EQUIPMENT	0,045	0,042	0,033	0,034	0,034
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,002	0,002	0,002	0,001	0,002
OTHER WHOLESALE AND RETAIL	0,129	0,116	0,112	0,099	0,101
HOTELS AND RESTAURANTS	0,003	0,004	0,005	0,005	0,005
TRANSPORT AND STORAGE	0,017	0,014	0,011	0,009	0,009
POST AND TELECOMMUNICATIONS	0,003	0,002	0,001	0,001	0,001
FINANCIAL INTERMEDIATION	0,011	0,009	0,007	0,007	0,006
REAL ESTATE AND BUSINESS ACTIVITIES	0,058	0,088	0,101	0,132	0,129

Table II.3.14 Herfindahl-index per industry of Portugal, 1982-2006

Portugal	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,017	0,016	0,016	0,016	0,016
TEXTILE INDUSTRY	0,143	0,160	0,153	0,132	0,121
WOOD AND PAPER INDUSTRY	0,012	0,011	0,013	0,014	0,013
CHEMICAL INDUSTRIES	0,019	0,017	0,017	0,018	0,020
METAL INDUSTRY	0,009	0,008	0,009	0,010	0,011
MACHINERY	0,003	0,003	0,002	0,003	0,003
EQUIPMENT	0,009	0,008	0,009	0,012	0,012
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,006	0,006	0,006	0,007	0,007
OTHER WHOLESALE AND RETAIL	0,198	0,187	0,180	0,157	0,158
HOTELS AND RESTAURANTS	0,030	0,025	0,020	0,026	0,026
TRANSPORT AND STORAGE	0,015	0,015	0,011	0,010	0,009
POST AND TELECOMMUNICATIONS	0,001	0,001	0,001	0,001	0,001
FINANCIAL INTERMEDIATION	0,005	0,005	0,005	0,004	0,003
REAL ESTATE AND BUSINESS ACTIVITIES	0,005	0,011	0,023	0,028	0,033

Table II.3.15 Herfindahl-index per industry of Spain, 1982-2006

Spain	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,029	0,030	0,032	0,026	0,024
TEXTILE INDUSTRY	0,027	0,023	0,018	0,018	0,015
WOOD AND PAPER INDUSTRY	0,010	0,013	0,014	0,014	0,015
CHEMICAL INDUSTRIES	0,033	0,030	0,030	0,031	0,033
METAL INDUSTRY	0,021	0,019	0,020	0,023	0,027
MACHINERY	0,004	0,004	0,004	0,005	0,006
EQUIPMENT	0,032	0,035	0,035	0,034	0,033
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,006	0,006	0,005	0,005	0,004
OTHER WHOLESALE AND RETAIL	0,106	0,106	0,105	0,110	0,108
HOTELS AND RESTAURANTS	0,022	0,024	0,023	0,024	0,026
TRANSPORT AND STORAGE	0,029	0,018	0,014	0,013	0,013
POST AND TELECOMMUNICATIONS	0,003	0,002	0,002	0,001	0,001
FINANCIAL INTERMEDIATION	0,015	0,011	0,009	0,006	0,005
REAL ESTATE AND BUSINESS ACTIVITIES	0,011	0,025	0,039	0,049	0,053

Table II.3.16 Herfindahl-index per industry of Sweden, 1982-2006

Sweden	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,008	0,009	0,010	0,008	0,008
TEXTILE INDUSTRY	0,001	0,001	0,001	0,000	0,000
WOOD AND PAPER INDUSTRY	0,044	0,043	0,044	0,036	0,033
CHEMICAL INDUSTRIES	0,014	0,014	0,014	0,015	0,016
METAL INDUSTRY	0,024	0,022	0,022	0,025	0,026
MACHINERY	0,020	0,021	0,020	0,020	0,022
EQUIPMENT	0,063	0,067	0,068	0,077	0,077
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,004	0,003	0,003	0,003	0,003
OTHER WHOLESALE AND RETAIL	0,138	0,121	0,112	0,099	0,092
HOTELS AND RESTAURANTS	0,005	0,006	0,005	0,006	0,006
TRANSPORT AND STORAGE	0,023	0,020	0,020	0,018	0,016
POST AND TELECOMMUNICATIONS	0,007	0,006	0,005	0,004	0,003
FINANCIAL INTERMEDIATION	0,004	0,005	0,004	0,004	0,004
REAL ESTATE AND BUSINESS ACTIVITIES	0,036	0,054	0,067	0,086	0,104

Table II.3.17 Herfindahl-index per industry of the United Kingdom, 1982-2006

United Kingdom	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006
MANUFACTURING INDUSTRIES					
FOOD INDUSTRY	0,013	0,013	0,015	0,018	0,021
TEXTILE INDUSTRY	0,014	0,013	0,011	0,007	0,003
WOOD AND PAPER INDUSTRY	0,012	0,015	0,020	0,020	0,025
CHEMICAL INDUSTRIES	0,028	0,030	0,030	0,030	0,034
METAL INDUSTRY	0,020	0,019	0,020	0,018	0,018
MACHINERY	0,011	0,011	0,011	0,009	0,009
EQUIPMENT	0,060	0,054	0,046	0,056	0,053
SERVICES INDUSTRIES					
WHOLESALE AND RETAIL TRADE	0,004	0,003	0,003	0,002	0,002
OTHER WHOLESALE AND RETAIL	0,125	0,117	0,112	0,105	0,100
HOTELS AND RESTAURANTS	0,013	0,014	0,015	0,016	0,016
TRANSPORT AND STORAGE	0,009	0,007	0,007	0,006	0,006
POST AND TELECOMMUNICATIONS	0,003	0,003	0,002	0,002	0,002
FINANCIAL INTERMEDIATION	0,009	0,011	0,009	0,007	0,006
REAL ESTATE AND BUSINESS ACTIVITIES	0,048	0,061	0,072	0,089	0,097

Concentration per stable cluster

In the next tables the concentration of industries per stable clusters will be presented. When countries are clustered as being homogeneous in their economic structure, it is expected that these countries will specialize more in the same type of industries. So, in this section will be examined which sectors are concentrated in the manufacturing industry and in the service industry within the stable clusters.

Table II.3.18 Herfindahl-index of 'Be, NL' as a stable cluster, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.026	0.025	0.027	0.027	0.029
Textile industry	17-19	0.008	0.007	0.005	0.004	0.002
Wood and Paper	20-22	0.016	0.018	0.021	0.020	0.018
Chemical industry	23-26	0.032	0.035	0.037	0.039	0.042
Metal industry	27-28	0.027	0.024	0.024	0.025	0.026
Machinery	29	0.006	0.007	0.007	0.009	0.009
Equipment	30-35	0.041	0.039	0.035	0.035	0.034
Total Manufacturing		0.156	0.156	0.156	0.158	0.161
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.002	0.002	0.002	0.002	0.002
Other wholesale and retail	51-52	0.124	0.114	0.108	0.095	0.097
Hotels and Restaurants	H	0.003	0.004	0.006	0.005	0.005
Transport and Storage	60-63	0.023	0.018	0.015	0.012	0.013
Communication industry	64	0.004	0.003	0.002	0.002	0.002
Financial intermediation	65-67	0.013	0.011	0.009	0.008	0.007
Real estate & Business	70-74	0.043	0.068	0.083	0.113	0.114
Total Service		0.213	0.220	0.225	0.237	0.239

Source: KLEMS DATABASE

The dominant sectors of the manufacturing industry in this stable cluster (Be, NL) are; Food, Chemical, Metal and equipment. Furthermore the dominant sectors of the service industry in this cluster are; Other wholesale and retail (except motor vehicles) and real estate and other business activities.

Table II.3.19 Herfindahl-index of 'Fr, It & UK' as a stable cluster, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.010	0.011	0.013	0.015	0.016
Textile industry	17-19	0.024	0.023	0.020	0.015	0.011
Wood and Paper	20-22	0.010	0.011	0.013	0.013	0.013
Chemical industry	23-26	0.025	0.027	0.027	0.027	0.028
Metal industry	27-28	0.025	0.023	0.024	0.025	0.028
Machinery	29	0.012	0.012	0.012	0.012	0.013
Equipment	30-35	0.048	0.045	0.041	0.044	0.043
Total Manufacturing		0.154	0.152	0.150	0.151	0.152
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.004	0.003	0.003	0.003	0.002
Other wholesale and retail	51-52	0.109	0.100	0.094	0.087	0.083
Hotels and Restaurants	H	0.009	0.010	0.011	0.012	0.012
Transport and Storage	60-63	0.015	0.012	0.011	0.011	0.010
Communication industry	64	0.004	0.003	0.003	0.002	0.002
Financial intermediation	65-67	0.011	0.011	0.010	0.008	0.007
Real estate & Business	70-74	0.047	0.064	0.076	0.095	0.105
Total Service		0.199	0.204	0.208	0.217	0.222

Source: KLEMS DATABASE

The dominant sectors of the manufacturing industry in this stable cluster (Fr, It, UK) are; Chemical and equipment. Furthermore the dominant sectors of the service industry in this cluster are; Other wholesale and retail (except motor vehicles) and real estate and other business activities. Additionally the concentration of the Textile industry and Transport and storage industry is decreasing over time.

Table II.3.20 Herfindahl-index of 'Fin, Den Swe Au' as a stable cluster, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.018	0.018	0.019	0.016	0.016
Textile industry	17-19	0.008	0.005	0.003	0.002	0.001
Wood and Paper	20-22	0.034	0.035	0.036	0.033	0.030
Chemical industry	23-26	0.017	0.019	0.020	0.020	0.021
Metal industry	27-28	0.020	0.020	0.020	0.022	0.024
Machinery	29	0.017	0.019	0.020	0.021	0.022
Equipment	30-35	0.036	0.038	0.039	0.046	0.047
Total Manufacturing		0.150	0.153	0.156	0.160	0.162
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.004	0.004	0.003	0.003	0.003
Other wholesale and retail	51-52	0.137	0.125	0.120	0.111	0.104
Hotels and Restaurants	H	0.008	0.008	0.009	0.009	0.009
Transport and Storage	60-63	0.022	0.020	0.021	0.019	0.017
Communication industry	64	0.005	0.005	0.004	0.003	0.003
Financial intermediation	65-67	0.007	0.008	0.007	0.006	0.005
Real estate & Business	70-74	0.029	0.039	0.046	0.061	0.077
Total Service		0.213	0.208	0.209	0.212	0.217

Source: KLEMS DATABASE

The dominant sectors of the manufacturing industry in this stable cluster (Fin, Den, Swe, Au) are; Wood and Paper and the Equipment industry. Furthermore the dominant sectors of the service industry in this cluster are; other wholesale and retail (except motor vehicles) and real estate and other business activities. Additionally the concentration of the Transport and storage industry is decreasing and the Chemical and Metal industry is increasing over time.

Table II.3.21 Herfindahl-index of 'Germany' as a stable cluster, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.011	0.009	0.011	0.014	0.015
Textile industry	17-19	0.007	0.005	0.002	0.001	0.001
Wood and Paper	20-22	0.010	0.011	0.014	0.013	0.011
Chemical industry	23-26	0.027	0.026	0.028	0.027	0.025
Metal industry	27-28	0.020	0.020	0.021	0.021	0.021
Machinery	29	0.024	0.026	0.023	0.022	0.023
Equipment	30-35	0.063	0.072	0.068	0.074	0.082
Total Manufacturing		0.162	0.168	0.168	0.173	0.179
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.004	0.004	0.003	0.003	0.003
Other wholesale and retail	51-52	0.149	0.139	0.132	0.117	0.101
Hotels and Restaurants	H	0.005	0.006	0.007	0.008	0.010
Transport and Storage	60-63	0.022	0.020	0.015	0.012	0.011
Communication industry	64	0.005	0.004	0.003	0.002	0.001
Financial intermediation	65-67	0.011	0.010	0.009	0.008	0.007
Real estate & Business	70-74	0.024	0.032	0.047	0.075	0.091
Total Service		0.220	0.216	0.218	0.224	0.224

Source: KLEMS DATABASE

The dominant sectors of the manufacturing industry in this stable cluster (Germany) are; Chemical, Machinery and the Equipment industry. The Equipment industry is probably dominant because of the Auto industry. Furthermore the dominant sectors of the service industry in this cluster are; other wholesale and retail (except motor vehicles) and real estate and other business activities. Additionally the concentration of the Transport and storage industry is decreasing over time.

Table II.3.22 Herfindahl-index of 'Ireland' as a stable cluster, 1982-2006

Industries	SIC	Time Periods				
Maunufacturing	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Food industry	15-16	0.074	0.062	0.051	0.041	0.047
Textile industry	17-19	0.023	0.017	0.010	0.003	0.001
Wood and Paper	20-22	0.011	0.012	0.014	0.015	0.016
Chemical industry	23-26	0.026	0.030	0.033	0.034	0.042
Metal industry	27-28	0.005	0.005	0.004	0.004	0.005
Machinery	29	0.004	0.004	0.004	0.004	0.003
Equipment	30-35	0.032	0.041	0.060	0.094	0.086
Total Manufacturing		0.175	0.172	0.176	0.196	0.201
Service	**codes**	**'82-'86**	**'87-'91**	**'92-'96**	**'97-'01**	**'02-'06**
Wholesale and retail	50	0.003	0.003	0.003	0.002	0.002
Other wholesale and retail	51-52	0.123	0.114	0.115	0.098	0.096
Hotels and Restaurants	H	0.017	0.019	0.025	0.027	0.027
Transport and Storage	60-63	0.015	0.012	0.009	0.010	0.009
Communication industry	64	0.009	0.008	0.005	0.003	0.003
Financial intermediation	65-67	0.011	0.014	0.015	0.014	0.015
Real estate & Business	70-74	0.019	0.024	0.026	0.041	0.044
Total Service		0.199	0.194	0.198	0.195	0.195

Source: KLEMS DATABASE

The dominant sectors of the manufacturing industry in this stable cluster (Ireland) are; Chemical and the Equipment industry. Furthermore the dominant sectors of the service industry in this cluster are; Other wholesale and retail (except motor vehicles) and real estate and other business activities. Additionally the concentration of the Food industry and the Transport and storage industry is decreasing and the Hotel and Restaurant industry is increasing over time.

Table II.3.23 The HHI of manufacturing and service industries per stable cluster, 1982-2006

	Stable clusters				
Maunufacturing	**BE, NL**	**Fr, It, UK**	**Fin, Den, Swe, Au**	**Ger**	**Ire**
Food industry	+	+/-	+	+/-	++
Textile industry	--	+	-	-	+
Wood and Paper	+/-	+/-	+/-	+/-	+
Chemical industry	++	+	+	+	++
Metal industry	+	+	+	+	-
Machinery	-	+/-	+	+	-
Equipment	++	++	++	++	++
Total Manufacturing	+/-	+/-	+/-	+	+
Service					
Wholesale and retail	--	-	-	-	-
Other wholesale and retail	++	++	++	++	++
Hotels and Restaurants	-	+/-	+/-	+/-	+
Transport and Storage	+	+/-	+	+	+/-
Communication industry	-	-	-	-	+/-
Financial intermediation	+/-	+/-	+/-	+/-	+
Real estate & Business	++	++	++	++	++
Total Service	++	++	++	++	+

Source: Extracted from appendix x

Notes: a. ++ indicates a highly concentrated industry (HHI > 0.025), + indicates a concentrated industry (0.010<HHI<0.025), +/- indicates a moderate concentrated industry (0.05<HHI< 0.010), - indicates a specialized industry (0.03<HHI<0.05) and --indicates a highly specialized industry (HHI<0.03).

b. “Other wholesale and retail” is disproportionately aggregated compared to the other industries. So this might present an incorrect impression and needs careful interpretation.

Table II.3.24 Industry classification

TOTAL MANUFACTURING	
Food and beverages	Resource intensive
Tobacco	Resource intensive
Textiles and textile	Labor intensive
Leather, leather and footwear	Labor intensive
WOOD AND OF WOOD AND CORK	Resource intensive
Pulp, paper and paper	Resource intensive
Printing, publishing and reproduction	Capital intensive
Coke, refined petroleum and nuclear fuel	Capital intensive
Chemicals and chemical	Technology intensive
Rubber and plastics	Capital intensive
OTHER NON-METALLIC MINERAL	Resource intensive
Basic metals	Capital intensive
Fabricated metal	Labor intensive
MACHINERY, NEC	Technology intensive
Office, accounting and computing machinery	Technology intensive
Electrical machinery and apparatus, nec	Technology intensive
Radio, television and communication equipment	Technology intensive
Medical, precision and optical instruments	Technology intensive
TRANSPORT EQUIPMENT	Technology intensive
MANUFACTURING NEC; RECYCLING	Labor intensive

Source: OECD (1987), p. 272

Table II.3.25 Manufacturing Industries ranked by size of Economies of Scale (EOS)

Industry description	Rank	Remarks
Motor vehicles	1	Very substantial EOS in production and in development costs
Other transport equipment	2	Variable EOS: small for cycles and shipbuilding, very substantial in aircraft (development costs)
Chemicals	3	Substantial EOS in production processes. In some segments of the industry (pharmaceutical products), R&D is an important source of EOS
Metals	4	Substantial EOS in general for production processes. Also possible in production and series production
Office, data processing	5	Substantial EOS at product level
Mechanical engineering	6	Limited EOS at firm level but substantial production
Electrical engineering	7	Substantial EOS at product level and for development costs
Instrument engineering	8	Substantial EOS at product level, via development costs
Paper and printing	9	Substantial EOS in paper mills and, in particular, printing (books)
Non-metallic minerals	10	Substantial EOS in cement and flat glass production processes.
Metal articles	11	EOS are lower at plant level but possible at production and series production level
Rubber and plastics	12	Moderate EOS in tyre manufacture. Small EOS in factories making rubber and moulded plastic articles but potential for EOS at product and series production level.
Drink and tobacco	13	Only in marketing EOS are considerable
Food	14	Principal source of EOS is the individual plant. EOS at marketing and distribution level
Other manufacturing	15	Possible EOS from specialization and the length of production runs
Textile industry	16	EOS are more limited than in the other sectors, but possible economies from specialization and the length of production runs
Timber and wood	17	No EOS for plants in these sectors. Possible EOS from specialization and longer production runs
Footwear and clothing	18	Small EOS at plant level but possible EOS from specialization and longer production runs
Leather and leather goods	19	Small EOS

Source: Pratten, 1988

Appendix III Institutional integration

Appendix III.1 Gravity model

Table III.1.1 Applied variables or proxies for the regressions

Variables	Description	Source
GDP	Gross Domestic Product (billions of current US$)	WDI
GDP per capita	GDP per capita (constant 2000, US$)	WDI
Population	Total country population (millions)	WDI
Unit labor costs	Average labor cost per unit of output	OECD
GDP growth	Annual GDP growth (%)	WDI
High education	Tertiary gross enrolment ratio (%). Nr of actual students enrolled divided by the nr of potential student enrolled.	UNESCO
Labor productivity	Labor productivity per person employed	OECD
Patents	Total patents, the applicant as reference country (EPO patent application)	OECD
R&D expenditure	Gross domestic expenditures on R&D (constant 2000, millions of US$)	OECD
Industry, value added	The industry value added as a % of GDP	WDI
Services, value added	The service value added as a % of GDP	WDI
Employment in industry	The as % of civilian employment	OECD
Employment in services	as % of civilian employment	OECD
Inflation	Annual inflation (%)	WDI
Unemployment	Unemployment rate as % of Civilian Labour Force	OECD
Exports	Exports of goods and services (% of GDP)	WDI
Imports	Imports of goods and services (% of GDP)	WDI
Distance	Physical distances between capital cities of two countries (Km)	-
Dummyperiod	The years that cover the analysis are dummied into five year periods	-
DummySingle- market	Dummy of the pre-Single Market period 1982–1991 (0) and the post-Single market period 1992-2006 (1).	-
DummyEURO	Dummy of the pre-EURO period 1982-2001 (0) and the post-EURO period 2002-2006 (1).	-
DummyC-C	Dummies of activity from Core to Core countries	-
DummyC-P	Dummies of activity from Core to Periphery countries	-
DummyP-C	Dummies of activity from Periphery to Core countries	-
DummyP-P	Dummies of activity from Periphery to Periphery	-

Appendix IV Functional integration

Appendix IV.1 Centrality analysis

Table IV.1.1 Centrality of the intra-EU FDI network between 1982-1986

Degree of network centrality, 1982-1986 (Freeman)			
Country	Degree	NrmDegree	Share
Ger	2150.5	31.593	0.197
UK	1793.4	26.347	0.165
NL	1630.5	23.954	0.150
Fr	1219.3	17.913	0.112
It	903.8	13.278	0.083
BLUE	802.9	11.796	0.074
Sp	759.4	11.156	0.070
Swe	586.5	8.616	0.054
Au	232.6	3.417	0.021
Por	224.3	3.295	0.021
Fin	194.8	2.862	0.018
Den	172.8	2.539	0.016
Ire	146.3	2.149	0.013
Gr	79.3	1.165	0.007
Network Centralization = 23.52%			

Table IV.1.2 Centrality of the intra-EU FDI network between 1987-1991

Degree of network centrality, 1987-1991 (Freeman)			
Country	Degree	NrmDegree	Share
Ger	14123.399	37.819	0.179
UK	12291.500	32.913	0.156
Fr	11538.801	30.898	0.146
NL	10023.101	26.839	0.127
Sp	6635.900	17.769	0.084
BLUE	6202.700	16.609	0.078
Swe	5097.200	13.649	0.064
Ire	4002.300	10.717	0.051
It	3680.100	9.854	0.047
Au	1286.000	3.444	0.016
Den	1248.000	3.342	0.016
Por	1122.900	3.007	0.014
Fin	1091.600	2.923	0.014
Gr	687.700	1.841	0.009
Network Centralization = 26.49%			

Table IV.1.3 Centrality of the intra-EU FDI network between 1992-1996

Degree of network centrality, 1992-1996 (Freeman)			
Country	Degree	NrmDegree	Share
Ger	21746.801	26.568	0.216
UK	16572.398	20.246	0.164
NL	13375.600	16.341	0.133
Fr	12591.900	15.383	0.125
BLUE	8983.100	10.974	0.089
Sp	5854.600	7.152	0.058
It	5776.700	6.997	0.057
Au	3776.700	4.614	0.037
Ire	3388.300	4.139	0.034
Swe	3132.000	3.826	0.031
Den	2238.000	2.734	0.022
Fin	1452.100	1.774	0.014
Por	1293.000	1.580	0.013
Gr	720.100	0.880	0.007
Network Centralization = 20.73%			

Table IV.1.4 Centrality of the intra-EU FDI network between 1997-2001

Degree of network centrality, 1997-2001 (Freeman)			
Country	Degree	NrmDegree	Share
UK	89899.789	27.378	0.218
BLUE	80403.898	24.486	0.195
Ger	77713.797	23.667	0.188
Fr	48550.898	14.786	0.118
NL	35398.098	10.780	0.086
Swe	19906.100	6.062	0.048
Sp	15409.199	4.693	0.037
Ire	10693.500	3.257	0.026
It	9469.899	2.884	0.023
Fin	8010.900	2.440	0.019
Den	7510.200	2.287	0.018
Au	5089.799	1.550	0.012
Por	3765.600	1.147	0.009
Gr	1249.900	0.381	0.003
Network Centralization = 21.46%			

Table IV.1.5 Centrality of the intra-EU FDI network between 2002-2006

Degree of network centrality, 2002-2006 (Freeman)			
Country	Degree	NrmDegree	Share
UK	71408.305	23.192	0.185
NL	63734.398	20.700	0.165
BLUE	58306.301	18.937	0.151
Fr	42485.301	13.799	0.110
Ger	36515.898	11.860	0.095
Sp	35482.402	11.524	0.092
It	22308.600	7.245	0.058
Ire	15640.3000	5.080	0.041
Swe	15630.101	5.076	0.040
Fin	6026.100	1.957	0.016
Au	5669.500	1.841	0.015
Por	5645.100	1.833	0.015
Den	5625.700	1.827	0.015
Gr	1521.400	0.494	0.004
Network Centralization = 16.61%			