PBL Netherlands Environmental Assessment Agency

THE EUROPEAN LANDSCAPE OF KNOWLEDGE-INTENSIVE FOREIGN-OWNED FIRMS AND THE ATTRACTIVENESS OF DUTCH REGIONS

POLICY STUDIES

The European landscape of knowledge-intensive foreign-owned firms and the attractiveness of Dutch regions

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Corresponding author
otto.raspe@pbl.nl

Authors
Anet Weterings, Otto Raspe, Martijn van den Berge

Supervisor
Dorien Manting

English-language editing
Annemieke Righart

Graphics
Marian Abels, Allard Warrink

Layout
Martin Middelburg, Studio RIVM, Bilthoven

Printer
DeltaHage bv

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Feedback group:
Martijn Arnoldus MA (Stichting Nederland Kennisland)
Dr. Pieter de Bruijn (Ministry of Economic Affairs, Agriculture and Innovation, NL Agency)
Piet Donselaar MSc (Ministry of Economic Affairs, Agriculture and Innovation, DG Entrepreneurship and Innovation)
Edgar Jehee MSc (Ministry of Economic Affairs, Agriculture and Innovation, Netherlands Foreign Investment Agency)
Victor Joosen MSc (Ministry of Economic Affairs, Agriculture and Innovation, DG Entrepreneurship and Innovation)
Dr. Marcel Kleijn (Dutch Advisory Council for Science and Technology Policy)
Roger Kleinenberg MSc (Ministry of Economic Affairs, Agriculture and Innovation, Netherlands Foreign Investment Agency)
Linco Nieuwenhyzen MSc (Brainport Development)
Dr. Evert-Jan Visser (Ministry of Economic Affairs, Agriculture and Innovation, DG Entrepreneurship and Innovation)

Advisors:
Prof. dr. Ewald Engelen (University of Amsterdam, Amsterdam institute for Metropolitan and International Development Studies; Geographies of Globalisations)
Dr. Hugo Erken (Ministry of Social Affairs)
Jeroen Heijs MSc (Ministry of Economic Affairs, Agriculture and Innovation, NL Agency)
Dr. Bart Leten (Catholic University Leuven Department of Managerial Economics, Strategy and Innovation)
Prof. dr. Frank van Oort (Utrecht University, Faculty of Geosciences, Department of Economic Geography)
Dr. Theo Roelandt (Ministry of Economic Affairs, Agriculture and Innovation, DG Entrepreneurship and Innovation)

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Summary

Spatial distribution of foreign-owned firms: regional differences matter

Governments that aim to attract investments by foreign firms (so-called foreign direct investment (FDI)), and especially those involved in knowledge-intensive activities, should focus on policies on national as well as regional levels. Macroeconomic policies are not sufficient, as regional characteristics have a greater influence on the locational choice made by foreign firms, than national characteristics. This follows from this study in which we addressed the question how attractive the Dutch regions are for investments by foreign firms. We compared the number and types of foreign-owned firms in 238 regions in 23 European countries and quantitatively analyzed which regional characteristics affect the number of foreign-owned firms. This made it possible to conclude on to what extent the characteristics of the Dutch regions match the characteristics of regions with the most foreign-owned firms.

We found that the larger metropolitan areas and technologically specialised regions are the hot spots for knowledge-intensive foreign-owned firms within Europe. Such sharp regional differences can also be seen in the Netherlands where more than 70% of all foreign-owned firms, and more than 73% of those active in knowledge-intensive industries, were located in North Holland, South Holland and North Brabant in 2010, a concentration stronger than that of domestic firms. Therefore, giving priority to North Holland, South Holland and North Brabant, as outlined in the recent economic agendas of the Dutch Government (*Bedrijfslevennota* and *Ontwerp Structuurvisie Infrastructuur en Ruimte*), fits the reality of the spatial distribution of foreign-owned firms within the Netherlands.

Position of the three Dutch regions within Europe: sub top with less agglomeration force and less specialisation

Within Europe, the three Dutch regions, North Holland, South Holland and North Brabant, are not part of the ten European regions where most knowledge-intensive foreign-owned firms are located, but instead belong to the sub top. To obtain insights in what may cause this position, a large number of regional characteristics of the three Dutch regions were compared to those of the top European regions. This comparison showed that the Dutch regions do offer foreign firms a good business environment and a central location within the European market, but seem to lack agglomeration forces. Although the GDP per capita, population density and international export orientation of firms in these regions was higher than the European average, all three agglomeration indicators were found to be more limited than in the top regions.

The knowledge bases of the Dutch regions are well-developed, but have very different characteristics: North Holland and South Holland are specialized in soft and public knowledge and North Brabant in technological knowledge. North Holland and South Holland have a high

public R&D intensity, high university rankings, a large share of high-educated employees and a strong specialization in knowledge-intensive services, all comparable to the top regions in this 'soft and public knowledge' segment. The private R&D intensity and number of patents of North Brabant were found to be even higher than that of the top regions in technological knowledge. However, the level of specialisation in high-tech and medium high-tech manufacturing was considerably lower than that of the top European regions. This difference may explain the lower number of investments by foreign firms in knowledge-intensive manufacturing in North Brabant; these types of firms seem to prefer a location in a region highly specialised in this industry.

Catching up with the top regions would be a major task

Results show that the position of the Dutch regions in attracting future foreign direct investments is not very strong, at least compared to the European top regions. Foreign firms looking for a new location to invest often choose the same location as previous investors, further strengthening the position of the already strongest regions. The findings of this study confirmed this pattern for FDI within Europe: the number of foreign-owned firms was higher in the regions with a stronger economic position and these regions had the highest shares of investments by establishing a new subsidiary (so-called greenfield investments) since 2003. Of all kinds of FDI, greenfield investments contribute most to the host economy. Therefore, these investments further improve the economic strength of these regions, increasing their attractiveness for future investments.
As North Holland, South Holland and North Brabant were part of the sub top instead of the European top regions for most knowledge-intensive activities in 2010 and the share of greenfield investments since 2003 in these regions was also substantially lower than in the leading regions, they are unlikely to benefit from this process of cumulative causation. Consequently, the differences between the top European regions and the Dutch regions in attracting foreign investments are likely to increase in the future, rather than decrease.

Future position in FDI vulnerable due to large share of foreign-owned financial services

In 2010, a large share of the foreign-owned firms in the Netherlands were involved in financial services (31%). This outstanding position in foreign financial services could be highly sensitive to changes in the fiscal climate or recessions. Such firms are also attracted by the beneficial fiscal climate for multinationals and changes in this situation may trigger them to shift their activities to other countries, quickly lowering the number of foreign-owned firms in the Netherlands.

Strengthening the distinctive characteristics of Dutch regions

The Dutch regions were found to lack agglomeration force compared to the European top regions, but as improving regional agglomeration forces is very hard to accomplish, it may be better to aim at improving the distinctive character of the Dutch business environment. This study gives a first indication that, besides the economic factors mentioned above, sustaining the strong 'quality of living' may be important for the Amsterdam region, which mainly attracts investments in industrial activities that are sensitive to this factor. And, as 'quality of living' seems less relevant to attracting technological firms, North Brabant, which especially is an attractive location for such foreign firms, for instance, could focus on strengthening the specialisation in high and medium high-tech manufacturing.
Such a strategy of further strengthening the distinctive characteristics of Dutch regions does require a broader perspective than only that of the regional level. For instance, besides North Brabant, also South Holland has received a relatively high share of investments by foreign firms in medium high-tech manufacturing. A policy that has a too narrow regional focus, in this case, on only Brainport Eindhoven as the technological region of the Netherlands, may overlook the attractiveness of other regions (such as South Holland) for such technological investments.

A customised strategy based on realistic ambitions

For policymakers aiming to attract more FDI to the Netherlands, this study shows that customising the FDI strategy may prove to be more effective than aiming at catching up with other top regions. First, customising helps to formulate more specific policy goals and more realistic ambitions. This is important because the type of industrial activity and the mode of investment (greenfield or acquisition) affects the economic impact of an investment and, consequently, the vulnerability of the host economy to those investments. Second, a more customised strategy is likely to be more effective, because also the valuation of the regional characteristics by foreign firms was found to largely depend on their industrial activity. Consequently, designing a policy that aims to attract more foreign-owned firms, also requires a good understanding of the needs of specific industrial activities and of the extent to which these match with the characteristics of the Dutch regions. A 'one size fits all' strategy is not sufficient.

Introduction

Background

Over the last decades, the number of investments by firms in countries other than their own (so-called foreign direct investment (FDI)) has become one of the prominent features of the globalisation of economic activity, with growth rates higher than those of international trade flows and GDP (Casi and Resmini, 2011). This growth in FDI has been stimulated by the disappearance of economic barriers and the liberalisation of national economies, the operating of capital markets on a world-wide scale and the improved access to knowledge and talent on an international scale, fostered by improvements in information and communication, making national borders increasingly irrelevant (Hogenbirk, 2002). Consequently, the economic performance of regions and nations increasingly has become affected by foreign investments. This has also been the case for the Netherlands, which has an eminently open and internationally orientated economy, as shown by the fact that it ranks fifth in the world in exports and sixth in receiving FDI in 2010 (Ministry of Economic Affairs, 2010; UNCTAD, 2010). In 2010, almost 14,000 firms in the Netherlands were owned for more than 50% by a firm from another country.

Since the 1990s, most governments welcome investments by foreign firms. FDI implies that firms obtain control of (some) factors of production in countries other than their own. In the 1970s and 1980s, this implication led to a highly critical attitude of most governments towards FDI, but since the early 1990s, this has changed (Dunning, 1994). Governments increasingly regard inward FDI as an important potential contributor to national economic development. FDI is not only considered to be an important vehicle for transferring financial capital between the investor's home and host regions; such investments may also lead to a transfer of technologies, production processes, and know-how, especially in case of investments in knowledge-intensive activities (OECD, 2005). Furthermore, foreign firms have shown to be more productive and innovative than domestic firms and, therefore, their establishment is likely to lead to an increase in aggregated regional productivity and innovativeness (Rojas-Romagosa, 2006). In general, empirical studies of the effects of FDI on host economies also confirm that such investments mainly have a positive effect, at least in developed countries (see Box 1 for a more extended explanation of those effects).

The attitude of the Dutch Government towards inward foreign direct investments is similar to that of most governments worldwide. The most recent policy incentives of both the Ministry of Economic Affairs, Agriculture and Innovation (EL&I; *Bedrijfslevennota*) and the Ministry of Infrastructure and the Environment (I&M; *Ontwerp Structuurvisie Infrastructuur en Ruimte*) explicitly aim to attract foreign investments to the Netherlands and ensure that Dutch regions will enter the short lists of international firms planning to invest abroad. In order to achieve this, the Netherlands must be distinctive and, therefore, policy focuses on the nine industries in which the Netherlands historically excels (the so-called *top sectors*). Creating and maintaining an excellent (regional) business environment that is vital to foreign firms, is one of the main pillars for achieving these goals.

Since the 1990s, the interest of policymakers in the expected effects of FDI has slightly shifted. During the 1990s, Dutch policymakers were mainly interested in the expected effects of FDI on employment (see Wintjes, 2001). When a foreign firm establishes an entirely new enterprise in a country (a so-called greenfield investment), this creates new employment. In addition, both through greenfield investments and takeovers, FDI may also create additional employment at the local suppliers and customers of these firms. Although the employment effects of FDI are still appreciated, policymakers these days have become more interested in another potential effect of FDI: that of stimulating innovation. During the last decade, policymakers in Europe increasingly view innovation as crucial for future economic growth, and this view has also been adopted by Dutch policymakers[1].

As FDI is most likely to stimulate innovation and economic performance in the host region when foreign firms invest in knowledge-intensive activities, the Dutch Ministry of Economic Affairs, Agriculture and Innovation mainly focuses on attracting these types of investments. In their most recent policy strategy, the ministry states that the Dutch knowledge infrastructure may be strengthened by actively attracting knowledge-intensive foreign firms and talent (especially related to the top sectors). Therefore, targeted strategic acquisition aimed at leading foreign companies is one of the main aims of the industrial agenda (Ministry of EL&I; *Bedrijfslevennota*). This also fits the broader focus on the knowledge economy, recently formulated as the ambition 'to become one of the top five knowledge economies worldwide' (Ministry of EL&I Bedrijfslevennota, p. 3) and that in 2040, the Netherlands will still be among the top 10 most competitive countries in the world through an attractive business environment for knowledge-intensive, export-oriented companies (Ministry I&M *Ontwerp Structuurvisie Infrastructuur en Ruimte*, p. 7).

Box 1. Effects of FDI on host economy

A relevant question for policymakers aiming to attract (knowledge-intensive) FDI is: what are the expected economics benefits of FDI inflows for the host country? These effects are not the main focus of this study, but, acknowledging the policy relevance of this question, this box provides a short description of the main results of previous studies that did examine this question empirically.

FDI inflows may affect local economies through composition effects and spillover effects. Composition effects occur when the key characteristics of foreign and domestic firms differ. In that case, inward FDI leads to a change in the composition of the firms located in a region and, in this way, may affect a region's aggregated economic growth. Many empirical studies have confirmed this effect (for an overview of studies on productivity effects, see Rojas-Romagosa (2006)). Foreign firms, on average, are bigger, invest more and use more intermediate inputs per unit of labour than domestic firms. Furthermore, when foreign firms invest by acquiring a domestic firm, this is often the most productive domestic firm (so-called cherry picking), and they invest in sectors with a high average productivity. Because of these specific characteristics of foreign firms, an increase in the presence of such firms leads to a higher aggregated productivity within a region. In addition to productivity effects, new foreign firms have also been found to have a higher chance of survival than new domestic firms, due to the characteristics that are specific to foreign firms (see Mata and Portugal, 2002). Most studies do show that, after controlling for the firm-specific characteristics, foreign and domestic firms have the same level of productivity and change of survival. However, precisely the fact that foreign firms bring in a set of distinctive characteristics other than those of domestic firms, makes FDI inflows attractive to host economies (Rojas-Romagosa, 2006). In sum, due to inward FDI, the aggregated regional productivity and survival chances for firms are likely to increase.

Besides composition effects, inward FDI may also affect the host economy through spillover effects. In the literature, two channels through which foreign firms may increase the productivity or efficiency of domestic firms have been identified (Rojas-Romagosa, 2006). The first channel is that of horizontal spillovers, that is, spillovers of specific knowledge that are most likely to occur between firms active in the same industry (intra-industry spillovers). The mechanisms that allow such spillovers to occur are imitation (e.g. reverse engineering, copying innovations, learning to export), hiring of former employees of foreign firms by domestic firms, and competition effects. These last effects may be either positive or negative. The establishment of foreign firms in a region may stimulate domestic firms to become more productive, but it may also drive them out of the market. The second channel is vertical linkages, which are inter-industry spillovers that may occur through backward linkages (foreign firms buying inputs from domestic firms) or forward linkages (domestic firms buying outputs of foreign firms).

The review by Rojas-Romagosa (2006) of empirical studies testing both these spillover effects of FDI on the productivity of domestic firms shows that, generally, vertical spillovers have positive effects on this productivity, while horizontal spillovers have non-significant or negative effects. However, the overall impact of FDI on productivity would still be positive, because the positive vertical spillovers usually dominate the horizontal ones. These results suggest that foreign firms generally attempt to avoid knowledge spillovers to competitors (horizontal spillovers), but that there are incentives to transfer knowledge to suppliers in order to improve the quality and/or reduce the prices of the inputs they obtain from these local firms (vertical spillovers).

Furthermore, the studies also show that spillovers from foreign firms do not affect all local firms equally (Rojas-Romagosa, 2006). Both absorptive capacity (i.e. technological gap and human capital levels) and geographic proximity seem to affect the transmission of productivity spillovers. Related to this, empirical studies also consistently show that the effect between FDI and economic growth is positive for developed countries, while for developing countries the effect is much less clear (see also Beugelsdijk et al., 2008).

FDI-related spillovers to domestic firms were found to be most likely to occur when foreign firms are more embedded in their host country, that is, when these firms have linkages with domestic firms. The level to which foreign firms establish linkages with domestic firms depends on the strategy of these foreign firms (Beugelsdijk et al., 2008). Vertical investments, that is, investments made to gain access to region-specific resources

(resource-seeking behaviour), follow from a strategy of global integration. Such firms need those specific resources to further increase the success of the multinational firm as a whole and, therefore, have a relatively limited interest in creating linkages with domestic firms. Horizontal investments, however, require more local responsiveness. Selling products in a new geographical market often requires adaptation of these products to local needs and preferences. Therefore, such firms are more likely to establish linkages with local partners. Empirical tests also show that the growth effects of horizontal investments by foreign firms are larger than those of vertical investments (Beugelsdijk et al., 2008). Consequently, the impact of FDI on the host economy also depends on the investment motive.

A study by Ponfoort et al. (2007) partly confirms these results for FDI inflows in the Netherlands. Compared to average domestic firms, foreign-owned firms in the Netherlands have specific characteristics that are a precondition for good economic performance (e.g. more involvement in national and international networks, greater share of highly educated employees). Not only do foreign-owned firms have a higher employment growth than domestic firms, leading to direct economic effects, these firms are also more often active in industries that generate greater indirect employment effects. By outsourcing part of their activities, foreign firms also contribute to the growth of domestic firms.

However, the current attractiveness of Dutch regions to foreign firms investing in knowledge-intensive activities is unknown, as are the regional characteristics that should be sustained or improved to increase those investments in the future. Designing a policy that aims to attract such investments requires answers to these two questions and, therefore, further empirical insights are required.

Although the attractiveness of the Netherlands to FDI is known on an aggregated level, insights into the specific types of industries in which these firms are investing are lacking, and this also applies to the regional differences in investments within the Netherlands. Therefore, the degree to which the different Dutch regions are successful in attracting investments by foreign firms in knowledge-intensive activities is also unknown. Previous studies have suggested that knowledge expenditures by foreign subsidiaries in the Netherlands are limited (see Haveman and Donselaar, 2008; Erken and Ruiter, 2005). According to these studies, the Netherlands seems insufficiently attractive to foreign companies for carrying out research, especially when set against the openness of the Dutch economy (see also OECD, 2005). However, these studies examined the attractiveness of the Netherlands on a national level and, consequently, insights into regional differences in their attractiveness to FDI are lacking. Those insights would be important, as some Dutch regions are likely to be more attractive to foreign firms investing in knowledge-intensive activities than others, considering that conditions differ per region.

Furthermore, the literature on internationalisation emphasises that, although the economy continues to globalise, regional differences still play an important role in the locational choices of international firms (Cantwell and Janne, 1999). Porter (2000) described this as the 'global–local paradox': while resources, capital, technology, and other (immobile) input can be efficiently sourced from global markets and via corporate networks, other factors are also important, especially concentrations of highly specialised skills and knowledge, institutions, rivals, related businesses, and sophisticated customers in a particular region. Proximity in geographic, cultural, and institutional terms allows special access, special relationships, better information, powerful incentives, and other advantages in productivity and productivity growth, sources that are difficult to tap from a distance. According to Porter (2000), some regions will be more involved in the internationalisation process because they offer a unique combination of regional characteristics that attract foreign investment. So, in his view, paradoxically, regional differences become even more important with the increasing globalisation of the economy.

Moreover, a policy focused on improving the Dutch business environment to attract more foreign firms investing in knowledge-intensive activities requires an understanding of the regional characteristics that are appreciated by foreign firms. Knowledge of such characteristics would help policymakers to design policies that would enhance the attractiveness of a region to new investors (Hogenbirk and Narula, 2004). Moreover, it would indicate the extent to which the Dutch business environment matches locational demands of foreign firms and provide insight into which regional characteristics should be maintained or improved.

The regional characteristics necessary for attracting investments by foreign firms depends on the motive behind the investment (see Hogenbirk, 2002). Firms may

have different motives for their investments abroad. Traditionally, the main motives have mostly concerned the search for lower production costs or new geographic markets. However, with the increasing importance of knowledge as a production factor, access to new knowledge, skills and technologies has also become an important motivation for foreign investment (Dunning, 1998; Cantwell, 2009). Several empirical studies have provided evidence of this process by using information on the location of R&D facilities in research-intensive activities (e.g. Cantwell and Janne, 1999). This brings us to the question of how important the search for knowledge is to these firms wanting to invest in European regions, compared to their search for new markets.

Aim and research question

The Dutch Ministry of Economic Affairs, Agriculture and Innovation (2011)[2] wants to attract more foreign firms investing in knowledge-intensive activities. However, as explained above, empirical insights into the current attractiveness of the different Dutch regions and into the regional characteristics that drive the locational choices of such firms are largely lacking. The aim of this study is to provide those empirical insights, with an explicit focus on foreign firms investing in knowledge-intensive activities. We used data, on firm level, on the number of foreign-owned firms in 23 European countries, per region (NUTS2, which is the provincial level in the Netherlands), in 2010 , to answer the following questions:

1. How many and what type of (knowledge-intensive) foreign-owned firms were located in the Dutch regions compared to other European regions in 2010?
2. Which regional characteristics affect the number of (knowledge-intensive) foreign-owned firms in European regions?
3. To what extent do the characteristics of the Dutch regions match the characteristics of regions with the most (knowledge-intensive) foreign-owned firms?

Section 1.3 describes the main conclusions of the study. The first research question was answered by a comparison of the numbers and types of foreign-owned firms located in the 12 Dutch provinces, with those located in the 226 regions of 22 other European countries, in 2010 (see Box 2 for our precise definition of foreign-owned firms)[3]. This provided insights into the attractiveness of the Dutch regions as a location for foreign-owned firms involved in knowledge-intensive activities, compared to other European regions. Prior empirical studies have shown that foreign firms tend to choose the same region as other foreign firms have done before them. Therefore, the characteristics of the foreign-owned firms that, in 2010, were located in the Dutch regions would provide good insight into the type of investments that these regions would be likely to attract in future years.

To answer the second question, a regression analysis was conducted to determine which regional characteristics affected the number of foreign-owned firms per region, while controlling for differences on a national level[4]. This analysis provided insight into how foreign firms valued these different regional characteristics and, therefore, indicates the relative importance of the different motives that foreign firms may have had to invest in certain European regions (compare Chung and Alcácer, 2002; Alcácer and Chung, 2007). Finally, in a benchmark research, we examined the extent to which the regional characteristics of the Dutch regions would match the locational demands of foreign firms investing in knowledge-intensive activities, in a two-step process. First, we compared the characteristics of the regions with the European average, and with the characteristics of the ten regions with the largest share of (knowledge-intensive) foreign-owned firms. The comparison was limited to only those regional characteristics that, in the regression analysis, were found to be relevant to attracting foreign-owned firms in that specific activity. In this way, we gained further insight into the attractiveness of the business environment in the Dutch regions to investments by foreign firms, and were able to show which elements should be maintained and which would require further improvement. Second, we examined whether the number of foreign-owned firms located in the Dutch regions was similar to the expected number based on the regional market situation and knowledge base of each region. This expected number of firms resulted from the regression analyses. If the actual and expected numbers of firms would differ, this suggested that certain barriers were limiting the number of foreign-owned firms in those regions, while if the actual number of firms was higher than expected this suggested that certain characteristics had increased the attractiveness of a particular region. Because of a lack of data it was not possible to precisely determine those additional characteristics, but an overview is provided of the other possible relevant factors, paying specific attention to the role of the regional quality of living. Finally, the implications of these results for the policy aim of attracting more knowledge-intensive foreign-owned firms to the Netherlands is discussed.
Subsequent chapters provide further information about the analyses that underlie the conclusions discussed in this chapter.

Box 2 Definition of foreign firms investing in knowledge-intensive activities

The OECD (2005) defines an investment as a *foreign direct investment* (FDI) if the investing firm is located in a country different from that of the receiving firm and has a significant *influence* on the management of the receiving firm. Three types of FDI can be distinguished, depending on the percentage of ordinary shares or voting stock of the enterprise owned by the direct investor: a portfolio investment (less than 10%), an associate company (between 10 and 50%) and subsidiaries (more than 50%). This latter group of firms are considered to be under foreign 'control' which implies: 'the ability to appoint a majority of administrators empowered to direct an enterprise, to guide its activities and determine its strategy. (…) The notion of control allows all of a company's activities (including turnover, staff, and exports) to be attributed to the controlling investor and the country from which he comes.' (OECD, 2005, p.102). In the case of 'foreign influence' the financial aspect predominates, in the case of foreign control this is '…the "power to take decisions" and "decide corporate strategy" that comes first' (OECD, 2005, p.103).

This study was limited to those foreign investments that lead to foreign control, to provide insights into the attractiveness of Dutch regions as a location for foreign firms. Firms that invest in a firm in another country for less than 50% have been found to be mainly driven by financial motives (OECD, 2005); in these cases, economic success of the target firms appear to be important, rather than the locational characteristics. Firms that obtain foreign control are more likely to do so in order to gain access to new markets, to regions with lower production costs, or to access knowledge that is present in that region (see also Wintjes, 2001). Therefore, regional differences in such investments provide better insight into the regional characteristics that are valued by foreign firms investing abroad. This is also more interesting from a policy perspective, because it is easier to influence regional characteristics (at least up to a certain level) than the economic success of individual firms.

To determine whether a firm is under foreign control or not, we used the Amadeus data set on 2010, provided by Bureau van Dijk. This data set is not based on (public) announcements of FDI transactions but instead provides information on the ownership structure of all firms in Europe in 2010. The advantage of this data set is that it allowed us to compare the number of firms under foreign control against domestic firms in similar types of activities. Thus, we were able to get better insights into the specific characteristics of the spatial distribution of foreign firms across European regions. Furthermore, this database provides information on the location of all foreign-owned firms, while FDI databases are often limited to the years in which the investments took place without any information on the total FDI stock. Therefore, to determine the attractiveness of Dutch regions to foreign investments, we decided not to use information on FDI in specific years, but instead use information on the ownership structure of all firms in 2010. Foreign-owned firms were defined as those that, in 2010, were owned for at least 50% by a foreign enterprise (firms owned by private persons, families or non-profit organisations were excluded). Consequently, we used the term 'foreign-owned firms' and not 'FDI' in our results, to avoid any confusion about the definition adopted in this study.

Firms enter another country in two ways: through the establishment of new subsidiaries, which is called greenfield investment, or through the acquisition of domestic firms. Although these two modes of entry may have different effects on the host economy, we decided to aggregate both modes for most analyses. The locational choice of foreign firms investing in existing firms may be more constrained because potential acquisition targets may not be equally spread over all regions. Furthermore, greenfield investments are more likely to generate new employment in a region. However, acquisition and greenfield investments are simply two different modes of entering a region, and, therefore, often are each other's substitute. When given a choice, foreign firms may be more likely to choose acquisitions as their entry mode when potential acquisition targets are available in a region, but if such targets are lacking, they may decide to build new greenfield facilities (Chung and Alcácer, 2002). A second, and more important reason for including both modes of entry in the analysis was that previous studies have shown that foreign firms wanting to invest in knowledge-intensive activities are more likely to do so through acquisition, especially in more developed countries (Dunning, 1998). Therefore, limiting the analysis to greenfield investments would lead to an underestimation of the number of foreign-owned firms involved in these types of activities.

As greenfield investment or investment through acquisition may have different effects on the host economy, this study also provides some insights into the potential differences in the attractiveness of the Netherlands to both

types of investments. It was not possible to clearly distinguish between the two modes of entry, as the Amadeus data set did not provide information on the ownership structure of a firm from when it was first established. The database only provided information on the most recently reported ownership structure per firm (2010). Therefore, we selected the firms that were under foreign control in 2010 and that had been established no earlier than 2003. Thus, with a maximum age of seven years, these firms were likely to have been greenfield investments, because young firms generally are less interesting acquisition targets for foreign firms (with the possible exception of high-tech companies developing very specific products). Foreign firms are more likely to invest in firms that have proven to be successful, and it takes several years for a newly established firm to build a strong market position. Therefore, we use information on the firms that are owned for more than 50% by a firm from another country and that have been founded since 2003, to obtain insight in the differences in the spatial pattern of these greenfield investments, compared to that of all foreign-owned firms in knowledge-intensive activities.

This study has focused on foreign-owned firms involved in knowledge-intensive activities. Previous studies on this topic often defined these activities as research-intensive industries (see Chung and Alcácer, 2002). However, as argued by Porter (2000), many other industries may also undertake knowledge-intensive activities. Furthermore, the Dutch economy is characterised by a large share of services, which can also be considered as knowledge-intensive activities (see Raspe and Van Oort, 2008). To also obtain insight into the potential attractiveness of Dutch regions to foreign investment in knowledge-intensive services, this study adopted a broad definition of knowledge-intensive activities following the aggregation of industries, as made by Eurostat (2009). Based on the technology intensity, two types of manufacturing industries were distinguished (high technology and medium high technology) and three types of knowledge-intensive services: knowledge-intensive market services, high-tech knowledge-intensive services, and knowledge-intensive financial services. Table 1 provides a description of the related activities (see Appendix 2.2 for a list of NACE codes).

Table 1
Knowledge-intensive activities

Sector	Description
Knowledge-intensive manufacturing	
High-technology manufacturing	Manufacturing of pharmaceutical products and preparations, computer, electronic and optical products, air and spacecraft and related machinery
Medium high-tech manufacturing	Manufacturing of chemicals and chemical products, weapons and ammunition, electrical equipment, motor vehicles trailers and semi-trailers, railway locomotives, military fighting vehicles, transport equipment, medical and dental instruments and supplies
Knowledge-intensive services	
Knowledge-intensive market services	Water transport, air transport, legal and accounting activities, activities of head offices and management consultancies, architectural and engineering activities, advertising and market research and other scientific and technical activities, employment activities, security and investigation activities
Knowledge-intensive high-tech services	Motion picture, video and television programme production, broadcasting activities, telecommunication, computer programming, consultancy and related activities, information service activities, scientific research and development
Knowledge-intensive financial services	Financial service activities, insurance, reinsurance and pension funding (excl. compulsory and social security), activities auxiliary to financial and insurance activities

Source: Eurostat 2009

Results

Foreign-owned firms in the Netherlands

Compared to other European countries, the number of foreign-owned firms located in the Netherlands is quite high. A little over 3% of all the firms located in the Netherlands, in 2010, were owned for more than 50% by a firm from another country, compared to an average share of 2.3% for the whole European Union. Based on the distribution of all foreign-owned firms in Europe over the different countries, the Netherlands ranked fifth. By far most foreign-owned firms in Europe were located in the United Kingdom (32%), followed by Germany (15.6%), Italy (10%) and France (7%). The Netherlands had a share of 5% of the total number of foreign firms in Europe.

These foreign-owned firms in the Netherlands had several specific characteristics. On average, the Netherlands had a larger share of foreign-owned firms involved in knowledge-intensive activities than other European countries (55.5% and 38.4%, respectively). This larger share was mainly due to the fact that the Netherlands attracted more knowledge-intensive services (49.2% compared to the European average of 31.7%), while the share of foreign-owned firms in knowledge-intensive manufacturing was slightly smaller than the European average (6.3% compared to 6.7%). A similar comparison on a more detailed industry level showed that foreign-owned firms in the Netherlands were more often involved in knowledge-extensive distribution activities (26.8% compared to 20.4%) and financial services (31% compared to 9.3%). This very large share of foreign-owned financial services was also the reason that the Netherlands had a larger share of foreign firms involved in knowledge-intensive activities. In all other knowledge-intensive activities (high-tech and medium high-tech manufacturing, market services and high-tech services), the share of foreign-owned firms in the Netherlands was below the European average.

Another characteristic of the foreign-owned firms located in the Netherlands, in 2010, was that a larger number of investors originated from European and Asian countries than from the United States. Most investments in European countries were made by firms from other European countries (65.5% of all foreign-owned firms in Europe) and, in the Netherlands, this share was even larger (almost 70%). The second-largest group of investors originated from the United States (24.8%), which was also the case in the Netherlands, although the actual share was somewhat lower (21.2%). Over the last years, increasing attention has been paid to foreign direct investments from the fast-growing Asian countries of India and China. However, in 2010, the total number of European firms owned by an Asian firm was still quite limited (5.7%) and by far the most of these firms were owned by Japanese firms (2.3%). The number of firms with Indian or Chinese owners was still very limited (0.7% and 0.3%, respectively). Nevertheless, the position of the Netherlands in 2010 was relatively strong, with a larger number of firms owned by Asian companies (7.5%) and, more specifically, a relatively larger share of them owned by Chinese firms (0.6%).

A third specific characteristic of foreign-owned firms in the Netherlands was that the share of greenfield investments between 2003 and 2010 was smaller than in other European countries (see Box 2 on how greenfield investments have been defined in this study). Based on the distribution of all greenfield investments across Europe during this period, the Netherlands ranked ninth of all European countries. In addition to the United Kingdom, Germany, France and Italy, which were the four countries with most total foreign-owned firms within Europe, Spain, Poland, the Czech Republic and Ireland also attracted a larger share of greenfield investments than the Netherlands, during this period. This means that, at least since 2003, the Netherlands received less investments by foreign firms that would directly contribute to the host economy by increasing employment and production factors.

Spatial pattern of foreign-owned firms in Europe

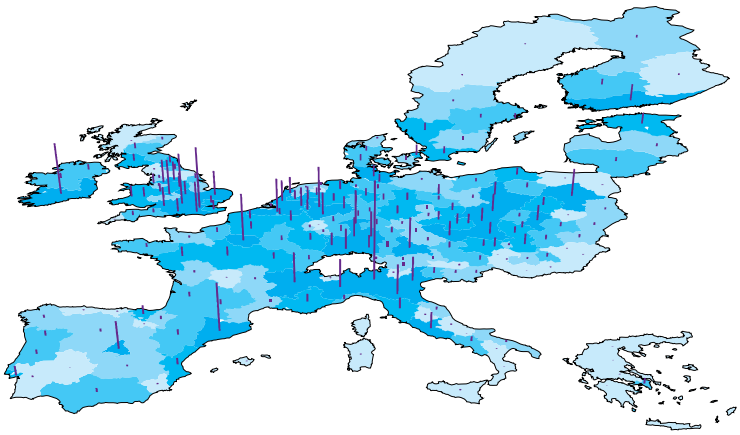
The importance of regional differences

Foreign-owned firms were found not to be evenly distributed across the 238 European regions. The spatial pattern was 'spiky'; some regions contained many foreign-owned firms, and many regions contained only a few. Most foreign-owned firms were located in the larger metropolitan areas within the western countries of Europe and the centrally located regions in Germany. Figures 1 and 2 show this spiky landscape for foreign-owned firms active in respectively high-tech and medium high-tech manufacturing and knowledge intensive services.

Within the different European countries, large regional differences in the number of foreign-owned firms were found to exist. The variation in the number of foreign-owned firms between the European regions was more related to differences at regional level than to national differences (62% and 38%, respectively). In other words, despite the large differences in the economic, institutional and cultural context of European countries, differences within countries were even more important in explaining the spatial distribution of foreign-owned firms across European regions. The relevance of regional differences was even larger for foreign-owned firms involved in more knowledge-intensive activities, except

Figure 1

Spatial pattern of foreign-owned firms in high-tech and medium high-tech manufacturing, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Note: The map shows the share of foreign-owned firms in high-tech and medium high-tech manufacturing per region (Europe = 100%), indicated by the colour of the region and the spike positioned at the centre of the region. The darker the region and the higher the spike, the higher the share of foreign-owned firms.

for financial services. The latter type of investment, in general, is mainly affected by the fiscal climate, something that tends to differ more on a national than regional level within Europe.

Within the Netherlands, foreign-owned firms were also found to be unevenly spread across the 12 regions. In 2010, more than 70% of all foreign-owned firms in the Netherlands were located in the three regions of North Holland (33.7%), South Holland (21.5%) and North Brabant (15.3%). For these three regions, the share of knowledge-intensive foreign-owned firms was even slightly larger (over 73% in total). The foreign-owned firms were also more concentrated than domestic firms in the Netherlands. In North Holland especially, the share of foreign-owned firms was much larger than that of domestic firms, with 34% and 19%, respectively. Nevertheless, none of these three Dutch regions belonged to the ten European regions with the highest number of foreign-owned firms in high-tech manufacturing, medium high-tech manufacturing, knowledge-intensive market services and high-tech services. North Holland, South Holland and North Brabant were found to be part of the sub-top of Europe, while the number of foreign-owned firms in other Dutch regions were below or comparable to the European average.

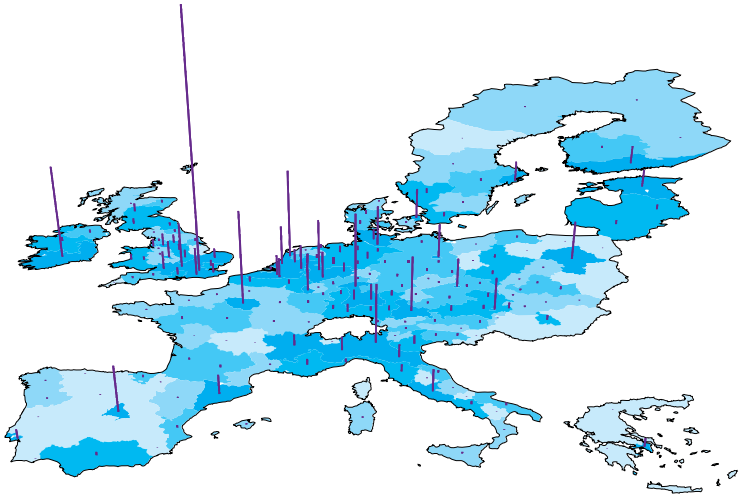
Spatial distribution depends on type of activity and country of origin of the investor

As shown in Figures 1 and 2, knowledge-intensive services were found to be mainly concentrated in the large urban areas or agglomerations of Europe, such as London, Paris and Milan, while firms in knowledge-intensive manufacturing were concentrated either in the same agglomerations (only high-tech manufacturing) or in the technologically specialised regions of Germany and northern Italy (both high-tech and medium high-tech manufacturing). The spatial distribution of foreign-owned firms involved in knowledge-intensive manufacturing and services across the Dutch regions showed a comparable pattern. The foreign-owned knowledge-intensive services were highly concentrated in North Holland, while those involved in knowledge-intensive manufacturing were more evenly distributed across the Netherlands, with slightly stronger concentrations in North Brabant and South Holland.

The spatial pattern of foreign-owned firms in Europe was found to not only depend on their industrial activities, but also on the country of origin of investors. Firms from non-European countries especially were more likely to invest in regions or countries to which they would have a certain cultural or historical link. For instance, most investments made by firms from the United States and India took place in the United Kingdom, and, up to 2010, foreign investment in Ireland was also more often by US

Figure 2

Spatial pattern of foreign-owned firms in knowledge-intensive market services, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Note: The map shows the share of foreign-owned firms in knowledge-intensive services per region (Europe = 100%), indicated by the colour of the region and the spike positioned at the centre of the region. The darker the region and the higher the spike, the higher the share of foreign-owned firms.

firms. Chinese firms, however, have no cultural or historical link with any of the European countries. These firms mainly invested in the centrally located German and Dutch regions. Also within the Netherlands, the spatial pattern changes when investments are shown according to the investors' home countries. The foreign-owned firms located in North Holland were mainly owned by firms from the United States, Japan and India, while in South Holland firms more often were owned by Chinese firms. Furthermore, non-European firms were found to mainly have subsidiaries in the western and central regions of Europe, while European firms also invested in northern, southern and eastern European regions.

Motives of foreign firms for investing in Europe

Dominance of leading regions

Non-European as well as European firms were found to mainly invest in the larger cities in western Europe, such as London and Paris. Although investments by firms from other European countries were more evenly distributed across Europe than those by non-European firms, the majority of intra-European investments were made in regions with a GDP per capita and R&D intensity of above the European average. More than 70% of these investing European firms was found to also originate from a region with a GDP per capita of above the European average. For R&D intensity (both public and private), this percentage was a little over 40% of all intra-European investments. These firms seemed to be mainly motivated by obtaining access to additional demand or knowledge.

The second-largest group of intra-European investments were conducted by firms that seemed to take advantage of their economically dominant position by investing in regions with a lower GDP per capita and R&D intensity. For GDP per capita, this was the case for 21.9% of all the foreign-owned firms within Europe and for R&D intensity the percentage was 30.1%. In Europe there seemed to be only a limited share of investments by firms that tried to compensate for the weakness of their home regions by seeking knowledge and additional markets in economically more developed regions. Only 4.3% of all foreign-owned firms in Europe was found to have an owner from a region with a GDP per capita below the European average. For R&D intensity, this was 15.3%.

The three Dutch regions where most foreign-owned firms were located in 2010 had a GDP per capita and R&D intensity of above the European average, but for the home regions of the European firms that invested in the Dutch regions, this was even higher. Although the R&D intensity in North Brabant was slightly higher than on average in the home regions of all European investors in North Brabant, this no longer would be the case if only foreign investments in knowledge-intensive manufacturing would be considered. In other words, especially firms from European regions with a very high

Table 2

Model estimations of the number of foreign-owned firms in European regions

	Total	Knowledge-intensive activities	High-tech industry	Medium high-tech industry	Knowledge-intensive market services	Knowledge-intensive high-tech services	Knowledge-intensive financial services
Regional market and knowledge base							
Market agglomerations	+++	+++	+++	++	+++	+++	+++
Market centrality	+++	+++	+++	+++	+++	+++	+++
Low costs	---	---	---	---	---	---	---
Soft and Public knowledge	+++	+++	+++	0	+++	+++	+++
Technological knowledge	-	0	+++	++	0	0	0
Control variables							
Capital city	+++	+++	0	0	+++	+++	+++
Size of the region (population)	+++	+++	+++	+++	+++	+++	+++

Note: The table shows the direction (positive or negative) and significance of the relationship between regional markets and knowledge factors and the number of foreign-owned firms in European regions (n=238). The five regional characteristics follow from a factor analysis (see Chapter 3):

- *Market agglomerations: high GDP per capita, high population density, presence of large international airport and a strong international export orientation of domestic firms*
- *Market centrality: within a 30 minute car drive for large numbers of people, and high GDP of the region weighted for the GDP of surrounding regions*
- *Low costs: high percentage of regional unemployment, low GDP per capita.*
- *Soft and public knowledge: presence of a high-ranking university, high public R&D intensity, large number of highly educated employees and large share of jobs in knowledge-intensive services*
- *Technological knowledge: large number of patents, high private R&D intensity, and large share of jobs in high-tech and medium high-tech manufacturing*

R&D intensity were found to have invested in knowledge-intensive manufacturing in North Brabant.

Knowledge is important, but market-seeking behaviour dominates

Although strategic asset-seeking behaviour, such as obtaining access to region-specific knowledge, is assumed to be an increasingly important motive for firms to invest abroad, most investments by foreign firms in Europe still seemed to be driven by a search for new markets to sell products and services. This would not only be the case for foreign-owned firms in general, but also for those that invested in knowledge-intensive manufacturing and services (see Table 2). Most foreign-owned firms were located in regions that had a strong local market situation and a strong international connectivity (the so-called market agglomerations), or they were located in the more central areas of Europe, which provide easy access to a large part of the European market. Investments made to lower production costs, seemed to be hardly relevant within Europe, as was shown by the fact that the number of foreign-owned firms was significantly lower in the southern and eastern European regions that have a low GDP per capita and high unemployment.

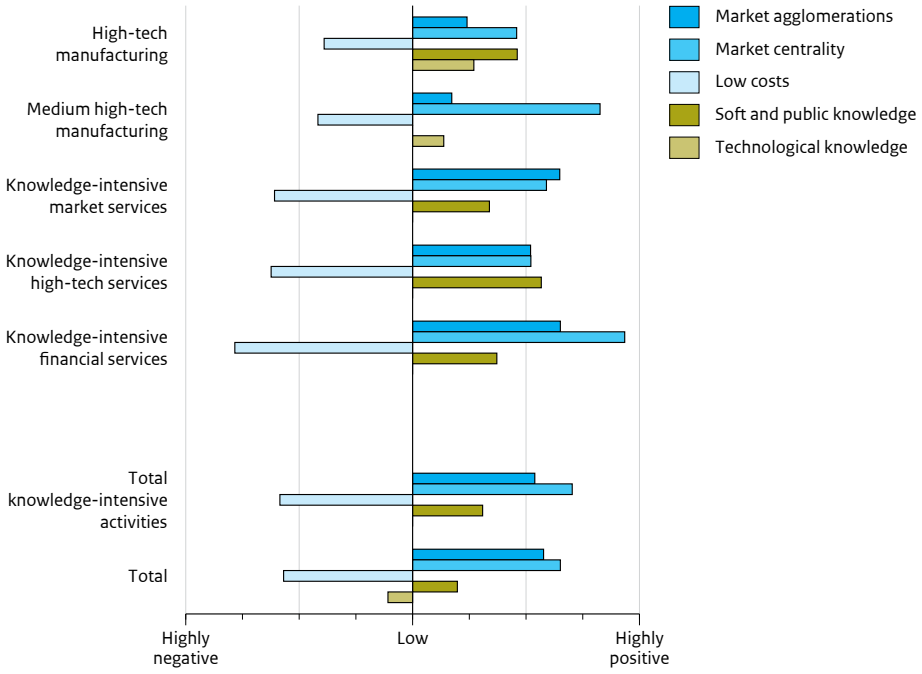
Nevertheless, in addition to the regional market situation, regional differences in the knowledge base also affected regional numbers of foreign-owned firms, suggesting that the search for knowledge was the motivation for at least some of the foreign firms investing in Europe (see Table 2). The distinction between regions with a soft and public knowledge base and those with a technological knowledge base showed that the attractiveness of such regions depends on the activities in which the foreign firms would be investing. Regions with a more technological knowledge base were attractive locations for firms investing in knowledge-intensive manufacturing, while regions with a soft and public knowledge base attracted investments in both knowledge-intensive services and high-tech manufacturing.

Although knowledge factors affected the number of foreign-owned firms in all knowledge-intensive activities, the search for knowledge was only the main motive of foreign firms investing in more research-based activities, such as high-tech manufacturing and high-tech services. As Figure 3 shows, market factors had a stronger effect than knowledge factors on the number of foreign-owned firms in other knowledge-intensive activities. This suggests that these firms were driven by a search for new markets rather than knowledge.

These results suggest that urbanised areas or agglomerations within Europe, especially, would offer a favourable business environment to foreign investments,

Figure 3

Effects of the five factors on total foreign-owned firms in Europe, 2010



Note: The figure shows the impacts of the five factors on the number of foreign-owned firms in 238 European regions, both in total and divided in knowledge-intensive activities. The impact (y axis) was measured by the standardised regression coefficient, making it possible to compare the strength of the effects of each factor.

at least to those active in knowledge-intensive services and high-tech manufacturing. Such regions offered a strong regional market, good international connectivity, and a more developed soft and public knowledge base. A location in such a region would be beneficial to foreign firms for several reasons. Foreign firms that enter a market are at a disadvantage, because domestic firms are better informed about the local market and regulations. While ownership advantages are highly important in dealing with this disadvantage, it also helps if firms are established in more urbanised regions, because such regions offer a large and more diverse local demand and specialised services that may help foreign firms to successfully enter the new market. Furthermore, for foreign firms, having good connections to the parent company and the subsidiaries in other countries is crucial, and, therefore, regions with a strong international orientation form more attractive locations. Finally, larger urban areas also offer a wide diversity of suppliers and specialised supporting services (e.g. research institutes, but also business and financial services), which not only assist foreign firms in dealing with country- or region-specific regulations, but may also offer useful 'generic' knowledge. These results confirm that the world increasingly consists of selected poles of attraction which are globally interconnected (Florida, 2005).

Regions with a more technological knowledge base, such as North Brabant in the Netherlands, were found to be attractive locations only for some of the foreign firms investing in high-tech manufacturing and those investing in medium high-tech manufacturing. These firms search for (additional) highly specialised technological knowledge. That such a location would only be attractive to a selective group of firms was also shown by the fact that the number of foreign-owned firms in medium high-tech manufacturing was more affected by the market centrality, rather than by the technological knowledge base. Most of these firms seemed to prefer a location from which they could easily distribute their products to the European market.

Based on these results can be concluded that policymakers who aim to attract FDI should take into consideration which type of investment they would want to attract, because this affects which regional

characteristics should be maintained or stimulated. The degree to which regional characteristics are valued by foreign firms was found to largely depend on their industrial activity. Even firms investing in high-tech and medium high-tech manufacturing would have somewhat different locational requirements: although both activities could be located in technologically specialised regions, firms in high-tech manufacturing also favour more urbanised regions with a strong public and soft knowledge base, while those in medium high-tech manufacturing appeared to attach more value to centrally located regions. Consequently, designing a policy to attract more foreign-owned firms, requires a good understanding of the needs of specific industries and of the extent to which these match the characteristics of regions. This is also the case for the Netherlands; as the Dutch regions have rather varied regional characteristics, they are likely to attract different types of foreign investment.

Benchmark for Dutch regional characteristics

Dutch regions lack agglomeration forces

A comparison of regional characteristics between the ten European regions with the highest numbers of foreign-owned firms of Europe in 2010, and the three main Dutch regions, North Holland, South Holland and North Brabant, showed that the Dutch regions would offer foreign firms a good business environment, but seemed to lack agglomeration forces. With respect to the market situation, these three regions would have a good central location within the European market, but the GDP per capita, population densities and international export orientation of local firms was more limited than in the regions where especially most foreign-owned knowledge-intensive services were located. These last regions were found to be mainly large metropolitan areas, such as London, Paris, and Milan, which would have a large regional market as well as offer easy international access to other large metropolitan areas.

Similar to most of the European regions with most foreign-owned firms, the three Dutch regions were highly specialised in either technological knowledge or soft and public knowledge. North Holland and South Holland both had a soft and public knowledge base comparable to the regions in the south-east of England (only Inner London had a much higher score), while North Brabant had a well-developed technological knowledge base, comparable to regions in Germany and northern Italy. However, a comparison of the different regional characteristics that would underlie the soft and public knowledge base and the technological knowledge base did show that the level of specialisation of the Dutch regions was lower than that of the European regions with most foreign-owned firms. Although in North Holland and South Holland the share of employees working in knowledge-intensive services was much higher than the European average, Inner London had a much stronger specialisation in this field. For North Brabant, the difference was even larger. Although the firms in high-tech and medium high-tech manufacturing located in North Brabant clearly had invested greatly in research and development, as was shown by the very high number of patents and business R&D intensity, the relative share of employees working in this industry was much smaller in North Brabant than in the Italian and German regions. In other words, the industrial structure of North Brabant was less specialised in high-tech and medium high-tech manufacturing, while the results of this study suggest that foreign firms are more likely to invest in regions with a strong specialisation.

Market and knowledge not the only important factors

The number of knowledge-intensive foreign-owned firms located in the three Dutch regions was in keeping with the expected number, based on their market situation and knowledge base, except for medium high-tech manufacturing in North Brabant and knowledge-intensive services in North Holland[5]. The number of foreign-owned firms in these activities was less than could be expected, although the regions were specialised in these activities. Other factors than the regional market situation and knowledge base seemed to limit such foreign investments in these regions.

Often the quality of living of a region is assumed an important factor for attracting foreign investments. Indeed, a preliminary analysis of the effect of quality of living on the number of foreign-owned firms in European regions confirmed the relevance of such differences (see Table 3 for an overview of the results). However, it is unlikely that the quality of living could explain the lower numbers of foreign-owned firms in North Holland and North Brabant. The region of Amsterdam was found to have a high quality of living compared to other European regions (6th of all the European regions in the Mercer ranking, see Appendix 4.5) and, therefore, this would have been an unlikely barrier to foreign investments. None of the cities in North Brabant have been included in the Mercer ranking, but, in general, the quality of living in North Brabant could very well be lower than in Amsterdam, at least due to a lower number of specialised consumer services. Nevertheless, it is still unlikely that this factor would explain the lower number of foreign-owned firms in medium high-tech manufacturing in North Brabant, because the analysis showed that the spatial distribution of these firms was not affected by regional differences in quality of living (see Table 3).

Table 3

Model estimations of the effect of regional quality of living on the number of foreign-owned firms in 37 European regions, in total, and per knowledge-intensive activity

	Total	Knowledge intensive activities	High-tech industry	Medium high-tech industry	Knowledge-intensive market services	Knowledge-intensive high-tech services	Knowledge-intensive financial services
Quality of living	+	+++	++	0	+++	+	0
Control variables							
Capital city	+++	+++	0	0	+++	+++	+++
Size of the region (population)	+++	+++	+++	+++	+++	+++	+++

Note: The table shows the direction (positive or negative) and significance of the relationship between regional market and knowledge factors and the number of foreign-owned firms in European regions (n=37). The quality of living was calculated using Mercer scores for 37 European cities, based on a wide range of criteria. The region with the highest total score received the highest number (37), while the region with the lowest total score received the lowest number (1), see Appendix 3.7.

Another possible reason for the lower number of foreign-owned firms in both regions may have been firm-specific preferences and regional image. As for all firms, firm-specific preferences play an important role in the locational decisions of foreign firms. Because of a lack of information about all potential locations and the high uncertainty surrounding foreign investment, a firm's locational choice is hardly ever a completely rational decision. Firms tend to rely on the locational choices of other firms, especially large ones, as these are assumed to have made well-informed decisions, or they choose regions in which many other firms from the same country are located. Therefore, FDI patterns tend to be highly path dependent, with past inflows influencing current and future flows (Nachum, 2000; Belderbos and Carree, 2002). Although North Holland and North Brabant were found to offer an attractive market situation and knowledge base, the number of foreign-owned firms was higher in other European regions, which increases the likelihood that future foreign investments may also be drawn towards those other regions.

The empirical results from this study suggest that the regional dissimilarities in the number of foreign-owned firms within Europe are likely to further increase, and that the Dutch regions are unlikely to catch up with the top European regions. Investments between European countries mostly were found to have taken place in economically strong regions, and firms from outside of Europe were also most likely to invest in those regions. Furthermore, over recent years, those regions attracted the largest shares of greenfield investments, which further strengthened their economic positions. As the analyses in this study have shown that the economic strength of a region is an important attraction factor for foreign firms, these regions would be likely to also attract most future foreign direct investments in Europe. These findings, combined with the fact that new foreign firms are most likely to invest in those regions where most foreign-owned firms are already located, indicate that the pattern of foreign-owned firms within Europe is characterised by cumulative causation. This mechanism would increase the regional dissimilarities in foreign-owned firms across European regions. Although North Holland, South Holland and North Brabant were found to have a well-developed regional market situation and knowledge base, it is not very likely that these three regions will benefit from this process of cumulative causation. Not only were the three regions, for most knowledge-intensive activities, in 2010 not among the European regions with the largest shares of foreign-owned firms, they also had a smaller share of greenfield investments in those activities (since 2003). Consequently, it is likely that the differences between the top European regions and the Dutch regions in attracting foreign investments will increase in the future.

Policy discussion

The empirical insights of this study, as described in the previous section, raise several questions about the aim and design of policy that is focused on attracting more FDI in knowledge-intensive activities to the Netherlands.

The pattern of European FDI is highly path dependent and, consequently, leading regions are becoming even stronger. Up to 2010, the Dutch regions did not belong to the ten European regions that had attracted most FDI. Some characteristics of the foreign-owned firms located in the Netherlands suggest that it is unlikely that Dutch regions will catch up with those leading regions in the

coming years. In fact, the foreign-owned firms in the Netherlands were found to have two distinctive characteristics that indicate a relative vulnerability of Dutch regions to their future FDI position, which, therefore, may become even weaker in the future. The first reason for this assumption is that most foreign firms were found to have invested in financial services in the Netherlands. For such firms, the Netherlands is an attractive location for the financial and administrative headquarters, from a fiscal point of view (Van den Berg et al., 2008). However, such activities are likely to be highly footloose. Institutional changes, in the Netherlands or elsewhere, affecting the favourable fiscal climate of the Netherlands are likely to cause multinationals to shift their activities to other countries, as the location of their financial and administrative headquarters could have a large financial impact on these firms. Therefore, the future attractiveness of the Netherlands to such foreign-owned firms can only be partly controlled by the national government.

The second characteristic of foreign-owned firms in the Netherlands that would suggest a relatively vulnerable position for attracting FDI, is the smaller share of greenfield investments in this country between 2003 and 2010, compared to other European countries. Although during the last decade investments by foreign firms, and especially those in knowledge-intensive activities, increasingly occurred through mergers and acquisitions (M&A), several other European countries, among which the United Kingdom, Germany and Italy, did attract large shares of greenfield investments. This means that, compared to these countries, the Netherlands, at least since 2003, experienced fewer investments by the type of foreign firms that would directly contribute to the host economy by increasing employment and production factors. Therefore, the gap between the Netherlands and those countries in attractiveness to FDI is likely to increase even further. The analyses in this study have shown that especially economically strong regions are attractive locations for foreign investments, and greenfield investments directly contribute to the strength of the host economy. Furthermore, since 2003, FDI may even have negatively affected the economy of the Dutch regions, because, at least in some cases, investments through M&A could have led to a shift of resources from host to home regions, or to one of the other subsidiaries of the foreign owner, and, in this way, may have lowered the economic potential of the host region.

Consequently, an important question that should be addressed by policymakers is whether catching up with the top European regions in inward FDI would be the best option for the future economic development of the Dutch regions. Instead, it may be better to be more selective in the type of FDI one wants to attract, and, related to this, make the business environment of the Dutch regions more distinctive from that of other European regions. In general, but also in this case, this would require policymakers, when trying to attract more FDI, to be more precise about which economic effects they would like to achieve. The economic impact of different types of FDI on the host economy tend to differ, because this depends on the motives of the investor (Beugelsdijk et al., 2008). Greenfield investments will create new employment in a region, but the level of spillover effects depends on the level of interaction between the foreign and the domestic firms. The more firms become rooted in a region, the less likely they would be to shift their activities elsewhere, although in general foreign firms are always more footloose than domestic firms. The potential economic effects of investments that are motivated by a search for region-specific resources such as knowledge are ambiguous. Such investments could increase the regional knowledge stock because the foreign firm would bring in new knowledge and create linkages to the knowledge stock of its home region. But these types of investments could also cause region-specific knowledge to quickly spread to other regions through the network of multinational subsidiaries. This would reduce the competitive strength of (the firms in) the host region (Chung and Alcacer, 2002). In addition, the uncertainty about the effects of knowledge-seeking foreign investments on the host economy is increased by the fact that most foreign firms investing in knowledge-intensive activities do so by acquiring a domestic firm. Such investments do not necessarily lead to an increase in regional employment, while the control of the firm's resources shifts to the parent firm located abroad. Considerations of the parent companies may be very different from those of the previous owners of these acquired firms. Therefore, unexpected major changes may occur, such as a relocation or closure of (part of) the company. As most foreign firms acquire successful domestic firms, such changes may have a negative impact on the regional economy. Therefore, designing a policy aimed at attracting FDI to stimulate the (regional) economy requires a good understanding of the motives of different investors, because this largely determines the impact of their investments. And those differences in effects show that it is important for policymakers to be selective about which FDI one wants to attract.

With respect to regional characteristics that should be sustained or improved in order to attract more FDI to a region, it may be important for Dutch policymakers to be more selective. Compared to the top European regions, the Dutch regions lack agglomerative force due to a lower level of urbanisation (mass and density). As improving agglomeration force is hard to accomplish, a policy aimed

at creating a business environment that distinguishes the Dutch regions from other European regions may be a more realistic strategy. One possible way to do this is by ensuring that the quality of living that characterises Amsterdam is maintained. Increasing the level of regional urbanisation would be difficult, but the current high level of amenities in this region also functions as an important attraction factor for foreign firms. This study suggests that for regions with a more technological profile, such as North Brabant, improving the quality of living would be less relevant, at least for attracting FDI in medium high-tech manufacturing. Instead, further improving the specialisation in knowledge-intensive manufacturing in this region may be more important. However, it should be acknowledged that, besides North Brabant, South Holland was also found to have a substantial share of foreign-owned firms in high-tech and medium high-tech manufacturing. When policymakers only would consider North Brabant as an interesting location for investments by foreign firms in technological activities, this could frustrate the attractiveness of the South Holland region to such investments. Instead, further insight would be required in the specific types of investments that both regions have been attracting, and in what has made South Holland, which was not found to have a technological profile, attractive to such FDI.

Finally, this study shows that policymakers who aim to attract investments by foreign firms, should consider that locational preferences of foreign firms are largely related to regional characteristics rather than differences between countries. Therefore, in addition to national and firm-specific policies, regional economic policy is also likely to successfully attract foreign direct investments. This study provides empirical insights into which regional characteristics affect the attractiveness of regions to investments by foreign firms and suggests which of these characteristics should be sustained or improved, depending on the type of investment policymakers would want to attract to the Netherlands. In this way, the study contributes to the formulation of a more customised strategy for FDI in the Netherlands, based on realistic ambitions.

Notes

1 This view has been officially recognised in the Lisbon strategy (2000) in which policymakers from all over the European Union agreed to become 'the most competitive and dynamic knowledge-based economy in the world' (EU, 2000). This strategy has been further elaborated in several summits (Barcelona, 2002; Göteborg, 2001), reviewed and adjusted (High Level Group by Wim Kok in 2004) and finally reformulated in a new 'EU 2020' strategy (2010).

2 See also Ministry of Economic Affairs (2010) for the perspective of policies on attracting foreign investments.

3 The countries that are included in the analysis are the EU Member States of 2004, except for Cyprus and Malta, because the number of investments by foreign firms in these two small countries was too limited.

4 We chose the NUTS2 level as the regional level, because this was the lowest spatial scale for which detailed regional characteristics necessary for this analysis were available on all countries in the European union. The 23 selected countries consist of 254 NUTS2 regions. However, a number of NUTS2 regions were excluded because they were located too far away from Europe and, therefore, were unlikely to have been an alternative location for foreign firms investing in Europe: ES63, ES64 (parts of Spain and Morocco), FR91, FR92, FR93, FR94 (the French islands east of Africa, French Guiana), PT20 and PT30 (Madeira, the Azores), ES70 (Canary Islands). Furthermore, we had to aggregate the 12 NUTS2 regions in Belgium to the NUTS 1 level (3 regions) due to a lack of data on the regional characteristics in Belgium on NUTS2 level. Therefore, the total number of regions in our analysis came to 238.

5 Using the results of the regression analysis, the number of foreign-owned firms as predicted by the model has been calculated (this prediction is based on the characteristics of the regional market situation and knowledge base). This predicted number of firms is compared to the actual number of foreign-owned firms located in a region. to determine whether a region attracts more or less firms than could be expected based on the regional market situation and knowledge base.

FULL RESULTS

The locational choice of foreign-owned firms: motives and determinants

1.1 Introduction

Firms may have various motives for investing abroad, such as low-cost factors, avoiding taxes, selling products or services in new markets, or accessing new technology or knowledge (Chung and Alcácer, 2002). The value that these firms attach to various regional characteristics depends on the motives behind their locational choice. While low labour costs may be their main motive if they wish to reduce their production costs, this is unlikely to apply to firms searching for access to knowledge. Instead, these last firms may be more likely to choose a region with high labour costs because organisations in which knowledge plays an important role are likely to pay higher wages. Therefore, a good understanding of the spatial pattern of foreign-owned firms in Europe requires insights into the different motives behind these locational choices and an acknowledgement of the heterogeneity between firms making those choices.

This chapter describes the different motives of firms investing abroad and the related differences in values attached to regional characteristics using the insights from theoretical views and prior empirical studies.

The central questions in this chapter are:
What are the different motives of firms for investing abroad and which regional characteristics are likely to affect their choice of location?
Section 1.2 describes the different motives that firms may have for investing abroad. Subsequently, Section 1.3 explains how views on foreign direct investment (FDI) have changed over the last decades, both with respect to the increasing importance of regional differences and the growth in investments driven by knowledge-seeking behaviour. Section 1.4 provides an overview of the different regional characteristics that may affect locational choices of firms investing abroad, and indicates how we measured these characteristics in our empirical analysis of the spatial distribution of foreign-owned firms across Europe.

1.2 Motives of firms for investing abroad

Over the past decades, decisions by firms to invest abroad and the related implications for host countries have been studied from different theoretical perspectives (Dunning, 1994). Initially, internationalisation was mainly studied on a national level, following insights gained from the product life-cycle theory that was developed by Vernon (1966). This theory describes the different phases of product development and the related changes in the internationalisation of those products and their production. During the growth phase products are gradually exported to regions all over the world. In the phase of standardisation, production may shift away from its point of origin, towards countries with lower production costs. In general, this model provides a good description of the internationalisation process of

traditional industrial goods for which the production is characterised by standardisation and scale economies (Van Rietbergen et al., 1990). However, the different phases of the model apply less well to both services and more knowledge-intensive industrial products, because of the limited possibilities of standardisation in those cases. Consequently, interactive learning processes and the higher level of uncertainty about future developments related to both market and technology – typical characteristics of the introduction phase of the product lifecycle – are not only important in the first phase but remain important in the development of services and knowledge-intensive products.

During the 1980s, Dunning introduced the Ownership Location and Internalisation (OLI) paradigm which may be used for understanding the internationalisation of services and less standardised products (Van Rietbergen et al., 1990). In his paradigm, Dunning brought together different theoretical perspectives on foreign direct investments (FDI), which caused the paradigm to also be known as the 'eclectic paradigm of international production'. During the 1970s and 1980s, most theories on FDI focused on firm-specific characteristics, trying to answer questions related to the types of firms that were investing abroad and why they were doing so. Since the work by Vernon, the characteristics of locations selected by these firms have received much less attention, but Dunning reintroduced this element through his work. Dunning emphasises that a good understanding of FDI requires insights into the ownership, locational and internalisation advantages of the investment. He compares these three components of FDI to a three-legged stool. Each leg is supportive of the others, and the stool is only functional if the three legs are evenly balanced (Dunning, 1998, p. 45).

Ownership (O) advantages may explain why a firm decides to invest abroad. Foreign firms have to deal with the 'liability of foreignness', which means that they are at a disadvantage, because domestic firms are better informed about the local market and regulations. Ownership advantages are factors that are unique to a firm or its nationality and which may help it to compete with domestic firms. These advantages may consist of property rights or intangible assets (e.g. innovative efforts, marketing systems, or intangible knowledge), or the ability to coordinate multiple locations to benefit from cost-minimising advantages (Hogenbirk, 2002).

How a firm invests abroad depends on the internalisation (I) advantages. It has to decide whether to sell its advantages to firms in foreign countries through export or licensing, or to internalise the exploitation of the advantage within the hierarchy of the firm using FDI. The choice depends on the transaction costs involved. Internalisation is costly because it is more demanding for management to control activities at multiple business locations in various countries. Exporting and licensing, however, require finding, maintaining and enforcing an external relationship to perform the same function in the international market (Hogenbirk, 2002). Furthermore, these firms risk loosing their unique strength to a licensee or sales agent. Because of the bounded rationality and related high uncertainty of investments abroad, most firms choose internalisation.

Firms use their ownership advantages in conjunction with the location (L) advantages, that is, the natural and created assets that cannot easily be replicated by firms in other regions (Narula and Dunning, 2000). Various types of location characteristics may attract FDI to a region: natural and created resource endowments (labour, energy, materials and components), market size, import controls, infrastructure (transportation, communication, business location), economic factors (stability, exchange rates, regional integration), incentives (subsidies, taxes), and societal factors (jurisdiction, bureaucracy).

Central to this study are the characteristics of the spatial pattern of foreign-owned firms in Europe. Addressing this issue requires insight into the regional characteristics valued by firms that invest abroad. The locational advantages that matter the most, as clarified by the OLI paradigm, depend on a particular firm's motive for investing abroad. Therefore, it is necessary to obtain further insight into the various motives these firms may have. Following the work by Dunning (1994; 1998), commonly, four types of motives can be distinguished; these firms seek either certain markets, resources, efficiency or strategic assets, respectively in the literature indicated as market-, resource-, efficiency- or strategic assets seeking (Hogenbirk, 2002; Brienen et al., 2010).

Market- and resource-seeking motives are the most important in FDI. Firms that invest in a foreign region with the intention of supplying goods or services to that country's markets are motivated by market-seeking behaviour. This is a form of horizontal investment whereby a market is supplied by a local affiliate of the firm (Brienen et al., 2010). The search for resources most often involves vertical investment. In such a case, firms invest abroad because they want to acquire specific resources at lower costs than in their home region, or to gain privileged access to these resources. Such firms may be interested in physical resources, such as minerals, raw materials or agricultural products, but also in production factors, such as labour, technological expertise, knowledge or management skills.

Efficiency seeking and strategic assets seeking are two further specifications of resource-seeking FDI. When firms invest in order to rationalise their activities in such a way that they can benefit from economies of scale and scope or risk diversification, this investment is motivated by their search for efficiency. Differences in production costs between regions may stimulate firms to split their activities geographically. For instance, a firm may decide to limit itself to only one distribution centre in Europe instead of having distribution centres in European countries, or a multinational firm may locate its financial centre in a country that is offering the most beneficial tax regime. Firms driven by the search for strategic assets invest abroad mainly to acquire assets that will strengthen their long-term global innovatory or production competitiveness, for example, if acquisitions would open up new markets, create R&D synergies, scale economies in production, result in increasing market power, lower transaction costs or enable risk spreading (Hogenbirk, 2002).

Depending on their motive for FDI, firms value certain regional characteristics differently. If firms invest abroad from a market-seeking motive, they mainly prefer locations with a large potential demand. In case of an efficiency-seeking motive, good accessibility to several bordering regions may be an attraction factor. Firms driven by resource-seeking motives prefer regions where resources are either cheap, abundantly available or of high quality. In this case, especially important are regional differences in the availability of relatively immobile assets, such as raw materials, and also cheap or skilled labour and region-specific knowledge. Although the search for strategic assets is also driven by local availability of these assets, firms that invest from this motive search for host regions that will allow them to acquire the types of assets that will strengthen their long-term competitiveness. Firms searching for strategic assets tend to enter the region by acquiring a local competitor or supplier, because this provides them with direct access to new markets or new knowledge (Dunning, 1998).

With respect to the first three motives for FDI – markets, efficiency and resources – firms take advantage of locally available resources and capabilities. In other words, they are driven by asset-exploiting motives. In contrast, the search for strategic assets is more likely to be characterised by asset augmentation. In the latter case, firms combine their own resources or those in their home countries with local resources and capabilities abroad. This may lead to an upgrade for both resources and capabilities, and, therefore, would be potentially beneficial to both the investing firm and the host region (Hogenbirk, 2002).

Kuemmerle (1999) has linked these two types of investment strategies to the characteristics of the home regions of these firms by distinguishing between so-called home-base exploiting (HBE) and home-base augmenting (HBA) activities of multinationals. HBE activities are in line with the earlier mentioned product life-cycle (PLC) theory by Vernon (1966), as the purpose is to exploit existing firm-specific advantages by marketing a product in a foreign country after it already has been exploited for a certain period of time in the home country. In case of technological activities, the HBE strategy mainly consists of adapting the technology developed by the parent firm to the preferences of the market in the host region (Erken and Kleijn, 2010). When a firm adopts an HBE strategy, its subsidiaries have a mainly supportive role. Along this strategy, a firm only exploits its ownership advantages, without trying to improve them through external investment operations (Le Bas and Sierra, 2002).

In case of home-base augmenting (HBA) activities, firms aim to augment their knowledge base by tapping into local knowledge sources through cooperative agreements and research alliances with local firms (Cantwell and Piscitello 2005). In these situations, new products and processes are not only created in a centralised R&D laboratory in the home country and then transferred to foreign R&D laboratories where just some adaptation has been done, but also are created in R&D laboratories located in various regions with region-specific resources and capabilities that match the specialisation of the R&D laboratory in the home country. By tapping into local knowledge sources, newly created knowledge is transferred to the parent company and other foreign affiliates, resulting in an increase in competitiveness of the multinational firm as a whole.

According to Patel and Vega (1999), Le Bas and Sierra (2002) and Chung and Alcácer (2002), knowledge-seeking activities can be further distinguished based on strength of the knowledge base of the investing firm or its home region. In the case of HBA, investing firms are likely to be strong in a specific field of technology and to seek complementary assets in foreign countries or regions with similar or related technological specialisations. However, firms that are weak in a certain field of technology or that come from regions where this is lacking may also invest in regions with a strong knowledge base, thus obtaining access to that technology. These firms are called technology seekers.

Insight into the various motives of firms that are seeking knowledge abroad is important to policymakers of host regions. While home-base augmenting activities may lead to an increase of the region's knowledge base,

investments by weak firms may not be beneficial to such a region and may cause a quick replication of its uniqueness, thus reducing its international competiveness (Chung and Alcácer, 2002).

The literature described above seems to suggest that a firm's motive for investing abroad is static, that is, that the initial reasons for investing do not change over time. However, this is incorrect, as internationalisation of firms can be best described as a stepwise process (Wintjes, 2001). In his 'theory of corporate behaviour in space', Håkanson (1979) distinguishes between different phases of internationalisation; from exporting to using foreign sales agents, to establishing sales offices, distribution facilities, and, finally, a distribution office may be turned into a production facility (Van Rietbergen et al., 1990). Once a subsidiary is established, the initial focus of activities at that location may also shift from HBE to HBA (Pelegrín and Bolancé, 2008).

1.3 FDI: increasing importance of regions and knowledge-seeking activities

Since the 1990s, the focus in the literature on FDI has changed in two ways. Increasingly, attention has been paid to the relevance of the regions where firms invests, and knowledge seeking has become more important as a motive for FDI (Dunning, 1998; Cantwell, 2009). Since the work by Vernon (1966), most FDI studies have focused on firm-specific aspects of FDI. In the 1990s, location regained acknowledgement as a relevant aspect of FDI, but the current focus is on *sub-national* instead of national level. Paradoxically, this revival of locational advantages and focus on the regional level is highly related to the increasing global interconnectedness of economic activity. Porter (2000) has called this the 'global-local paradox'. As we explain in this section, this paradox follows from the fact that more and more modern economies are 'directly based on the production, distribution and use of knowledge and information' (OECD, 1999).

Because of the globalisation of economic activities, firms operate more easily in areas where they can take advantage of strategic assets. In a first stage, rapidly falling international transportation costs allowed goods to be manufactured far away from the point of consumption. In a second, more recent stage, rapidly falling international communication and coordination costs have ended the need to keep manufacturing stages in close proximity to each other.

Consequently, many processes that were previously considered as non-tradable, nowadays can be offshored (Baldwin, 2006; Blinder, 2006). Particularly the processes of knowledge production and distribution have become more globalised during the past two decades. Not only has the share of knowledge-intensive products in world exports risen sharply (Narula and Zafei, 2004), but multinationals also increasingly locate their knowledge-intensive activities abroad and, therefore, further away from their headquarters in the home region (Criscuolo et al., 2005[1]). Although the share of foreign affiliates in total business R&D is still not very high, it is increasing rapidly (Gersbach and Schmutzler 2008). Multinationals increasingly conduct R&D at their subsidiaries abroad.[2]

Although the playing field is increasingly expanding to a global level, this does not imply that multinationals establish subsidiaries 'just anywhere'. The lowering of transportation and communication costs have stimulated the globalisation of the economy, while economic activities are attracted more and more to regional concentrations of people and firms (World Bank, 2008). In other words, although firms have become increasingly mobile in their location choice, this has increased their spatial concentration. Regional differences have become increasingly important because the modern knowledge economy is characterised by customisation and innovation. Customisation requires a high level of interaction with customers. Moreover, firms' innovation efforts, generally, do not proceed in isolation, but are strongly supported by various external sources of knowledge, such as public research centres, universities, competitors, customers, suppliers, industry associations, and an adequate education system and science base. In other words, customisation and innovation are interactive processes that are both surrounded by high levels of uncertainty. Such processes are easier to coordinate and control when the organisations involved are located in close proximity to each other. Consequently, there is an increasing tendency of firms to agglomerate in regions with high concentrations of people and firms. Especially foreign firms, which in general are more mobile than domestic firms because they are less regionally embedded and thus having less existing business and personal linkages, are likely to choose locations for their subsidiaries that are near potential customers or relevant knowledge sources.

According to Dunning (1998), this increasing importance to FDI of regional differences and the search for knowledge, also imply that, besides traditional locational advantages such as market size, and resource availability such as in particular types of labour, other regional characteristics increasingly affect the locational choice of firms investing abroad. Table 1.1 summarises which

Table 1.1

Variables that influenced the locational choices of firms investing abroad, in the 1970s and 1990s

Type of FDI	In the 1970s	In the 1990s
A. Resource seeking	1. Availability, price and quality of national resources 2. Infrastructure to enable resources to be exploited, and products arising from them to be exported 3. Government restrictions on FDI and/or capital and dividend remissions 4. Investments incentives	1. As in the 1970's, but local opportunities for upgrading quality of resources and the processing and transportation of their output is a more important locational incentive 2. Availability of local partners to jointly promote knowledge and/or capital-intensive resources exploitations
B. Market seeking	1. Mainly domestic, and occasionally (e.g. in Europe) adjacent regional markets 2. Real wage costs; material costs 3. Transport costs; traffic and non-traffic trade barriers 4. As A3 above, but also (where relevant) privileged access to import licenses	1. Mostly large and growing domestic markets, and adjacent regional markets (e.g. NAFTA, EU etc.) 2. Availability and price of skilled and professional labor 3. Presence and competitiveness of related firms, e.g. leading industrial suppliers 4. Quality of national and local infrastructure, and institutional competence 5. Less spatially related market distortions, but increased role of agglomerative spatial economies and local service support facilities 6. Macroeconomic and macro-organizational policies as pursued by host governments 7. Increased need for presence close to users in knowledge intensive sectors 8. Growing importance of promotional activities by regional or local development agencies
C. Efficiency seeking	1. Mainly production cost related (e.g. labor, materials, machinery, etc) 2. Freedom to engage in trade in intermediate and final products 3. Presence of agglomerative economies, e.g. export processing zones 4. Investment incentives e.g. tax breaks, accelerated depreciation, grants, subsidized land	1. As in the 1970s, but more emphasis placed on B2, 3, 4, 5 and 7 above, especially for knowledge-intensive and integrated MNE activities, e.g. R&D and some office functions 2. Increased role of governments in removing obstacles to restructuring economic activity, and facilitating the upgrading of human resources by appropriate educational and training programs 3. Availability of specialized spatial clusters, e.g. science and industrial parks, service support systems etc; and of specialized factor inputs. Opportunities for new initiatives by investing firms; an entrepreneurial environment, and one which encourages competitiveness enhancing cooperation within and between firms
D. Strategic Asset Seeking	1. Availability of knowledge related assets and markets necessary to protect or enhance ownership specific advantages of investing firms – and the right price 2. Institutional and other variables influencing ease or difficulty at which such assets can be acquired by foreign firms	1. As in the 1970s, but growing geographical dispersion of knowledge-based assets, and need of firms to harness such assets from foreign locations, makes this a more important motive for FDI 2. The price and the availability of 'synergistic' assets to foreign investors 3. Opportunities offered (often by particular subnational spatial units) for exchange of localized tacit knowledge, ideas and interactive learning 4. Access to different cultures, institutions and systems, and different consumer demands and preferences

Source: Dunning, 1998

locational advantages were considered relevant to locational choices by firms investing abroad in the 1970s, and which advantages were added during the 1990s, according to theoretical and empirical studies.

The table shows two important changes. These are the changing role of spatial transaction costs due to the liberalisation of cross-border markets and the changing characteristics of economic activity. This has lead to a further dispersal of market-seeking FDI, while stimulating further spatial concentrations of firms active in similar or

related activities. Co-location of firms seemed to be increasing, as this would provide firms with access to specialised labour markets or suppliers, localised support facilities, shared service centres, distribution networks or customised demand patterns (Dunning, 1998). In other words, the global dispersion of activities and the increasing significance of local clusters were occurring at the same time. The world was found to become increasingly 'spiky' (Florida, 2005), that is, selected poles of attraction were becoming more globally interconnected.

Another important change is that foreign firms driven by a search for strategic assets were found to increasingly invest in regions from which they could acquire knowledge-facilitating assets and capabilities. Because the competitiveness of firms is becoming more and more dependent on their abilities to access such new knowledge and capabilities (Le Bas and Sierra, 2002), they are searching for new and complementary knowledge on a global scale. With the increasing importance of strategic asset-acquiring investments, the locational needs of corporations have shifted from access to markets or natural resources, to obtaining knowledge-intensive assets and learning experiences, which augment their existing ownership-specific advantages. In developing countries, much FDI is still prompted by traditional market-seeking motives (e.g. in China) or by the desire to take advantage of lower labour costs, or availability and price of natural resources.

Changes in the organisation of many multinationals also illustrate these trends. Multinationals have become less hierarchically organised. Instead of mainly functioning as local market centres, their subsidiaries increasingly pursue 'asset-seeking' or 'asset-augmenting' activities (Dunning, 1998). Multinationals set up subsidiaries with specialised activities in regions where resources and capabilities match the specialisation of the subsidiary. Those resources and capabilities are accessed through relationships with local actors (Cantwell, 2009). Consequently, firms increasingly consider the location as an element of competitive advantage (Nohria and Ghoshal, 1997; Porter, 2000; Cantwell and Mudambi, 2005; Nachum and Zaheer, 2005).

1.4 Locational determinants of foreign-owned firms

This Section describes how the different regional characteristics that may affect locational choices of firms investing abroad were measured in our empirical analysis of the spatial distribution of foreign-owned firms across Europe. Our analysis has focused on the regional level. The regional level, both theoretically and empirically, has shown to be the appropriate level for delimiting the boundaries of knowledge-intensive capabilities and expertise (Cantwell and Piscitello, 2005), and to be an important milieu for the competitive-enhancing activities of highly mobile foreign investors (Dunning 2000). Furthermore, an explicit focus has been directed at foreign-owned firms involved in knowledge-intensive activities, to obtain insights into what characterises the European regions where most of these firms are located.

Following the literature on FDI as described in the previous sections, we made a distinction between the regional characteristics that were traditionally considered to be relevant for the locational choice of foreign firms, and characteristics assumed to be important to those seeking region-specific knowledge. Subsection 1.4.1 describes how we measured the traditional locational determinants and Subsection 1.4.2 does the same for the locational determinants of knowledge seeking behaviour. In addition to these regional characteristics, we included several control variables in the empirical analysis. These variables are presented in Subsection 1.4.3.

1.4.1 Traditional locational determinants

As explained in Section 1.2, firms may invest abroad because they are looking for *new markets* to sell their goods or services and, therefore, they are most likely to invest in regions that offer good market opportunities. Such market-seeking behaviour may be driven by regional differences in market demand and access to surrounding markets (Chung and Alcácer, 2002). Most prior empirical studies used GDP per capita to reflect regional differences in the attractiveness of the host region as a market (Kumar, 2001; Le Bas and Sierra, 2002; Pelegrín and Bolancé, 2008). Regions that are characterised by a high GDP per capita are considered to have a high potential demand for goods and services. In such a region, foreign firms may also benefit from economies of scale, making the region even more attractive to investors (Hogenbirk, 2002). Furthermore, the larger the host market, the greater the need for adaptation of goods and services to local preferences (Erken and Kleijn, 2010).

In addition to GDP per capita, at the regional level, often a spatially weighted GDP indicator is included in empirical analyses, because most firms do not limit their supply of goods and services to one region but also deliver to adjacent regions. Therefore, we included both GDP per capita and spatially weighted GDP in our analysis, to obtain insights into the relevance of differences in regional demand underlying the spatial pattern of foreign-owned firms in Europe.[3]

Another motive that firms may have for investing in a certain region is their search for efficiency. In those cases, firms are more likely to locate in a region from which they can easily export their products to many other European regions. Particularly in the case of a small country such as the Netherlands, it may be expected that foreign firms use it as an export hub to the rest of Europe. In such cases, a region's major transport networks are an important indicator of market access and, therefore, determine the attractiveness of a region (Wheeler and Mody, 1992). To provide insights into regional differences in accessibility, we included two indicators: accessibility by car (the size of the population that can be reached within 30 minutes by car) and proximity to a (major) airport. Furthermore, we also included indicators related to the export orientation of firms within a region. Regions may have a well-established export network from which foreign firms may take advantage.

Foreign firms may also be driven by resource-seeking motives, such as those related to labour or lower production costs. Prior studies have often used two indicators of regional differences in the labour market: population density and unemployment. Population density has been used to proxy the available workforce in the region (see Hogenbirk, 2002). The higher the population density, the more labour and the more diverse the labour market. Population density is also an indicator of the diversity of market demand and supplier availability and, therefore, may also be considered an indicator of urbanisation economies (see also Subsection 1.4.2). We also included regional unemployment levels as an indication of the availability of a large relatively unskilled workforce and, therefore, of low labour costs. The effect of unemployment has a degree of uncertainty because it may also indicate low local demand and, therefore, foreign firms may be less likely to invest in those regions. However, due to a lack of data on income levels in European regions, more direct indicators of the role of low labour costs were not available.

1.4.2 Locational determinants of knowledge-seeking behaviour and spatial concentration

Especially in developed countries, such as those in Europe, foreign firms increasingly invest with a strategic asset-seeking motivation, and, more specifically, knowledge-seeking arguments. Consequently, regional differences in the availability of knowledge may also be underlying the regional differences in the number of foreign-owned firms, especially in firms investing in knowledge-intensive activities. R&D intensity is often used as an indicator of the stock of technological knowledge in a country or region. Several studies have found a positive effect from R&D intensity on the location of foreign technological activity (Florida, 1997; Chung and Alcácer, 2002; Erken and Kleijn, 2010). Regional differences in R&D intensity are an indicator of regional differences in potential (technological) knowledge bases. However, foreign investors may also consider it an indicator of what could be the 'place to be', indicating the regions with framework conditions for research in place and with an innovative climate that is likely to be excellent (Erken and Kleijn, 2010). Therefore, we measured the amount of investments in research and development (R&D) as a percentage of the GDP in every region.

Following prior studies, we have made a distinction between private R&D expenditures (investments by firms) and public R&D expenditures (investments made by the government, including the higher education sector) (see Cantwell and Piscitello, 2005). Although both indicators provide insights into the regional differences in active investments made into creating new knowledge, private and public organisations are driven by different incentives, which may have implications for the accessibility of (the results from) those R&D investments for foreign-owned firms. Private companies invest in R&D to improve their competitive position and, therefore, they want to avoid that newly generated knowledge spills over to other companies. In contrast, public organisations that invest in R&D are more willing to make such new knowledge available to other organisations in the region. Consequently, foreign-owned firms may be more likely to invest in regions with higher public R&D investments.

In addition to information on R&D, the amount of patents often also is used as an indication of the stock of technological knowledge in a region (Chung and Alcacer, 2002; Le Bas and Sierra, 2002; Cantwell and Piscitello, 2005; Patel and Vega, 1999; Belderbos, 2001; Allred and Park, 2007). Patents are used to protect inventions and, therefore, the number of patents granted to people living within a region is an indication of the number of people working on the development of new products and processes. Therefore, patent numbers may indicate regional differences in innovative activity. However, similar to the use of patents in private R&D investments, it is important to keep in mind that they are also used by large companies to prevent new adjustments to products or processes from falling into the hands of competitors that have not invested in any of these changes and improvements themselves. Therefore, a high number of patents may also indicate that firms in the region have a strong knowledge base but that this knowledge would not be accessible to foreign firms. We used the number of patents regionally granted per 1,000 employees in high-tech and medium high-tech manufacturing as an indicator of the knowledge intensity of a region.

The advantage of using R&D investments and patents as indicators, is the fact that data on both is readily available on all European regions. An important disadvantage, however, is that their numbers vary across industries and firms (Belderbos et al., 2009). In general, both R&D investments and patents are mainly an indicator of the knowledge produced by mostly science-based manufacturers such as electronics and pharmaceutical firms. As this study was also intended to examine the spatial pattern of foreign-owned firms active in knowledge-intensive services, we included indicators of the 'soft' knowledge base of a region, that is, the presence of universities and the percentage of people in the region with a higher education or who work in jobs that require such an education level.

In the literature, universities are considered to play an important role in affecting the knowledge stock of a region (Florax and Folmer, 1992). Belderbos et al. (2009) found that host countries' academic research strengths influence global R&D location decisions by multinational firms. Since differences in quality between universities may affect the locational choice of foreign firms, we looked at the ranking of universities per region (with the best university having the highest score). Regions without universities received a score of zero.
Generally speaking, in addition to the presence of universities, the number of higher educated people also matter. Human capital is considered one of the drivers of economic growth and a factor in attracting foreign firms. Florida (1997), for example, using results from a survey among 207 foreign-owned, stand-alone businesses in the United States, concludes that human capital is the central feature of activities and objectives of R&D laboratories. However, other studies also show the relevance of human capital in attracting FDI in general. Cantwell and Piscitello (2005), for instance, find that the regional educational base constitutes a significant pull factor for foreign-owned firms, measured in the number of students in higher education and the total number of students in each region. Therefore, we also included a measure of the percentage of people, per region, with a completed tertiary education or who have jobs that require such an educational level.

As explained in Section 1.3, in addition to the fact that the search for knowledge has become a more important motive to invest abroad, in the trend in FDI, the co-location of firms is also of increasing importance. The increasing globalisation may lead to a further dispersion of the activities conducted by multinational firms, while agglomeration forces lead to a further concentration of these activities in particular regions and countries (Head et al., 1994; Cantwell and Janne, 1999; Cantwell and Iammarino, 2000; Dunning, 2000; Pelegrín and Bolancé, 2008). This increasing concentration would be driven by so-called agglomeration economies, that is, by the benefits that follow from the spatial concentration of the population and economic activities. Because of this co-location, transaction costs associated with overcoming geographic distance, such as transport and communication costs, would be lower, and because firms can only take advantage of these economies at limited distances, firms and labour tend to concentrate in certain regions, which, in turn, also attract foreign firms (McCann and Folta, 2008).

In the literature on agglomeration economies, a distinction is made between urbanisation and localisation economies. Urbanisation economies emerge because of the co-location of firms from different industries, which reduces transportation costs, creates a large and diversified pool of resources (e.g. labour) and access to a broad range of customers and suppliers (Combes and Duranton, 2006). Localisation economies emerge because of the co-location of firms within the same industry. Following the early work by Marshall (1920), spatial concentration of similar types of firms is assumed to lead to the development of a specialised labour market, specialised suppliers and technological and knowledge spillovers specific to that industry, a situation from which local firms may benefit (Harrison et al., 1996).
In the literature on FDI, several authors have also addressed the question of the extent to which agglomeration economies affect the spatial pattern of foreign-owned firms. Besides urbanisation and localisation economies, these studies also suggest that foreign firms may be attracted to regions where other foreign firms, especially those from the same country, are concentrated. This may be due to an imitation effect, in which already established firms are assumed to have made a conscious locational choice – especially in the case of large firms, but could also be caused by the fact that those regions offer specific facilities to firms from that country, such as an American or Japanese school for the employees' children. Most empirical studies confirm the relevance of the agglomeration of foreign-owned firms. Head et al. (1994), for instance, find that Japanese investors prefer to site their plants in areas where previous Japanese investments in the same industry were concentrated, above concentrations of US establishments. This is in line with more recent empirical findings by Cantwell and Piscitello (2005), who analysed the patenting activities of multinational firms in Europe at the regional level, and concluded that a specialisation in a particular industry is a significant location determinant, essentially due to the presence of other foreign-owned firms already located there. Brienen et al. (2010) show that Chinese and Indian firms that invest in Europe are more likely to do so in regions where Chinese or Indian communities already are present.

The results of spatial concentrations of domestic firms are less clear. While Head et al. (1994) and Pelegrín and Bolancé (2008) find that the presence of similar industrial activity is the most important agglomeration force, Cantwell and Piscitello (2005) find the concentration of domestic firms active in the same industry to have a negative effect. The authors postulate that this might be caused by a 'competitive deterrence effect' (Cantwell and Piscitello, 2005, p. 8). A very strong and long standing industry in a region, often dominated by a few major local firms, may raise the entry barriers for foreign newcomers, 'both in terms of bidding for local resources and in terms of the (lack of) availability of potential local technological spillovers' (p.11). The study by Hogenbirk (2002) on the spatial distribution of foreign firms in the Netherlands shows similar results. While foreign firms are more likely to choose those regions where other foreign-owned firms are located, they seem to avoid the regions where many local firms are concentrated.

To obtain further insights into the extent to which the spatial pattern of foreign-owned firms in Europe is affected by agglomeration economies, we used several indicators. First, we used two variables to measure the level of specialisation of the industrial structure of the region. The first variable measures the share of jobs in high-tech and medium high-tech manufacturing compared to the share of jobs in these industries in Europe. Regions with a score higher than one (1) have an industry structure in which the share of high-tech and medium high-tech manufacturing is above the European average, while regions with a score below one (1) have a share that is lower than average. The second variable measures the same for the share of jobs in knowledge-intensive services (KIS). Using these two variables, we estimated the extent to which foreign firms were located in regions specialised in their types of activities. To measure the relevance of urbanisation economies, we used the population density of every region. In our assumption, the higher the population density, the more foreign firms would be likely to benefit from urbanisation economies in those regions.

1.4.3 Control variables

Although regional differences are increasingly likely to affect the locational choices of foreign firms, differences between countries are still relevant. Especially institutional and cultural differences, and in most European countries also taxes, are more likely to differ between countries than between regions. Wheeler and Mody (1992) argue that the level of corporate taxation and different types of geopolitical considerations affect international investment location decisions. Traditionally, in the early days of globalisation, a lot of protectionism existed and tariff barriers were raised to keep newcomers off the market (Culem, 1988). When, in the 1990s, the attitude of national governments towards inward FDI changed in a positive way, this resulted in a fiscal competition between governments to attract FDI (Dunning, 1998). Nevertheless, several recent studies have shown that the effects of this competition should not be exaggerated (for an overview, see Jensen, 2006). Especially the generation of a more general, 'market-friendly' business climate would lead to systematically higher levels of inward FDI. Economic and political stability plays an important role (Hogenbirk, 2002), but also language barriers and even elements such as the level of 'tolerance' (attitude towards foreigners) have been mentioned as a relevant factor in trying to explain why some countries attract more FDI than others (Florida, 1997). Language barriers may also matter. The United Kingdom, for instance, may be more likely to attract investments by US firms because of this.
In other words, regional differences in the number of foreign-owned firms may partly be due to country-specific characteristics. However, the main focus of this study is on regional characteristics and, therefore, we only controlled for national differences using 20 country dummies, which indicate whether particular NUTS2 regions belong to a certain country or not. These variables were included in all models to avoid the results being affected by differences on a national level. The Netherlands was used as reference category and therefore not included in the model.

In addition to these control variables on national level, we also included two control variables on a regional level. The first variable indicates whether the capital city of a country is located within a particular region or not. Foreign firms tend to prefer a location near the political centre of a country, which in most cases is the capital city (Glaeser and Gottlieb, 2009). The second variable is the population size of every region, which was included to correct for regional differences in size between NUTS2 regions. We included this variable to correct for a so-called dartboard effect: all things being equal, more investments will take place in larger regions (see Chung and Alcácer, 2002; Hogenbirk, 2002).

Table 1.2 summarises the descriptive statistics of the traditional locational determinants of market- and resource-seeking behaviour, knowledge-seeking behaviour, agglomeration economies and the control variables on a regional level. Appendix 1.1 lists these variables, in detail, and their sources and years of coverage. All variables were measured at NUTS2 level for 238 regions in 23 European countries. These variables were included as independent variables in the models that were used for estimating the number of foreign-owned firms per European region. As explained in Box 2,

Table 1.2
Descriptive statistics of regional characteristics (n = 238)

	Min	Max	Mean	Std. Dev.
GDP per capita	3,195.17	71,193.75	19,866.61	9,691.04
GDP weighted	5,118.87	39,860.14	16,825.34	6,784.30
Accessibility by road	1.39	217.21	95.34	59.31
Proximity to (major) airport	0.00	3.00	1.39	0.92
Int. export orientation total	0.01	1.83	0.26	0.26
Population density	3.30	8,798.95	350.86	859.11
Unemployed percentage	1.51	26.08	8.67	5.22
Business R&D intensity	0.00	5.30	0.86	0.94
Public R&D intensity	0.00	1.80	0.52	0.39
# of patents per 1,000 high-tech and medium high-tech manufacturing employees	0.00	26.52	3.14	3.66
Highly educated population	11.98	54.45	31.34	7.93
University ranking	0.00	159.00	33.56	51.91
Specialisation in high-tech and medium high-tech manufacturing	0.03	2.90	0.93	0.52
Specialisation in knowledge-intensive services	0.41	2.00	0.96	0.29
Control variables				
Capital city (0/1)	0.00	1.00	0.08	0.27
Population size	25,956	11,074,346	1,883,732	1,503,629

the Amadeus dataset used for determining the number of foreign-owned firms per region does not report the actual date of an investment by a foreign firm, but only provides information on the ownership structure of firms in 2008. Consequently, the values of the independent variables may be affected by investments of foreign firms. To reduce any problems with endogeneity that may follow from this, all independent variables described in this section have been measured by the average score for the period between 1999 and 2002 (or for one of these years, if data was unavailable for the whole period). Most foreign direct investments have taken place since 2000 (UNCTAD, 2010) and, therefore, the effect of investments by foreign firms on regional characteristics is expected to have been limited between 1999-2002.

1.5 Outline of the study

The next chapter provides a detailed description of the spatial pattern of foreign-owned firms in 238 European regions. To obtain further insights into whether firms with different motives to invest abroad also concentrate in different European regions, we described the spatial pattern for different knowledge-intensive industries, separately. The chapter also provides a more in-depth analysis of the types of firms that invest in Dutch regions, with regard to the question of what characterises the foreign-owned firms located in the Netherlands compared to those located in other European regions, both with respect to the industries in which these firms are active and their respective countries of origin?

In Chapter 3, we empirically examined the effect of the regional characteristics described in Section 1.4 on the number of foreign-owned firms in European regions. Furthermore, we examined the characteristics of the regions where most foreign-owned firms were located and the extent to which the Dutch regions would fit to those characteristics.

Notes

1 See also Cantwell and Janne (1999), Cantwell and Molero (2003), Dunning and Narula (1995), Kuemmerle (1999), Patel and Vega (1999) and Pearce (1999).
2 According to UNCTAD (2005), almost 16% of the R&D expenditure of firms in 2003 occurred in their subsidiaries abroad, up from 10% a decade earlier. See also Carlsson (2006), Cantwell and Piscitello (2000), Cantwell and Iammarino (2001) and Audretsch (2000).
3 Appendix 1.1 shows how the different variables that are discussed in this section have been calculated.

TWO

Spatial pattern of foreign-owned firms in Europe

2.1 Introduction

During the last two decades, foreign direct investment (FDI) flows have increased substantially (UNCTAD, 2010)[1]. Empirical studies on the national level have shown that this increase mainly took place in developed countries, although in recent years the amount of FDI in developing countries has been growing (Te Velde, 2006). Until now, insight into the relevance of regional differences in FDI within developed countries have been limited. The few existing empirical studies suggest that the national averages hide the existence of large differences between regions within Europe (e.g. Cantwell and Piscitello, 2005; Pelegrín and Bolancé, 2008; Basile et al., 2009; Siedschlag et al., 2010). One of the few studies that provide a detailed examination of regional differences in FDI within the Netherlands shows that the number and types of investments differ between regions (Hogenbirk, 2002). However, the data used in that study were only available on the Netherlands and, therefore, could not provide any insights into the relative position of these Dutch regions within Europe. Furthermore, the analysis was based on data on FDI during the 1990s and the spatial pattern of FDI may have changed since, due to the fast growth in FDI over the last decade. Consequently, detailed insights into the current distribution of foreign-owned firms over European regions and, more specific, within the Netherlands, both in general and for knowledge-intensive activities, are lacking. This chapter fills this gap by answering the question: *How many and what types of (knowledge-intensive) foreign-owned firms were located in the Dutch regions Netherlands in 2010, compared to other European regions?*

In recent years, empirical studies on FDI increasingly have shown that different types of FDI can have different effects on the economy of the host region and, therefore, that a distinction between the different types is important (Te Velde, 2006). For this report, we distinguished between foreign-owned firms active in different types of (knowledge-intensive) industries and between greenfield investments (investments since 2003) and the total number of foreign-owned firms in 2010. As explained in Chapter 2, investments by foreign firms are more and more driven by a search for strategic assets and especially knowledge. To obtain insights into the relevance of such investment motives in the Dutch regions, we distinguished between foreign-owned firms active in knowledge-extensive and knowledge-intensive industries (see Chapter 1 for a further explanation of the reason why this distinction was made). Furthermore, our data allowed us to examine the spatial pattern of foreign-owned firms active in both knowledge-intensive manufacturing and services. Prior studies on regional differences in knowledge-intensive FDI could not provide insight into the spatial distribution of knowledge-intensive services, because most of these studies used data on patents granted to multinationals (e.g. Cantwell and Piscitello, 2005), which would exclude the service firms, as they very rarely apply for patents.

In addition to differences in types of investment activities, differences between the total number of foreign-owned firms and the recent greenfield investments also provide interesting information to policymakers. Firms invest abroad either in the form of greenfield investments, that is, establishing an entirely new enterprise in another country, or through a merger or acquisition (M&A) with a domestic firm. Greenfield investments are assumed to bring the greatest benefits as foreign firms bring additional resources and capabilities to a certain region (UNCTAD, 2010). Investment through M&A only leads to a shift in control from the former, domestic owner to the investor. Although such an investment may indirectly continue to have positive effects on the economy in the host region, it also involves higher risks to the host region, because the investor may shift resources from the host region to their home region (Te Velde, 2006).

Section 2.2 explains how foreign-owned firms have been defined for this study and how we have distinguished between the different types of activities, and between greenfield investments and total number of foreign-owned firms, using the Amadeus data set by Bureau van Dijk. Section 2.3 describes the spatial pattern of foreign-owned firms in the 23 European countries included in this study. To obtain insights into whether the national averages indeed hide large regional differences within countries, the spatial pattern on the national level was studied first, as described in Subsection 2.3.1. This section focuses on the differences between European countries with respect to the different types of foreign-owned firms (in both industry and size) and the origins of those firms (home country). Subsequently, attention is focused on the regional level to obtain insights into the relevance of regional differences within European countries and, more specific, the relative position of the different Dutch regions (Subsection 2.3.2). Section 2.4 focuses specifically on the foreign-owned firms within the Netherlands. This section provides a comparison between the spatial distribution of foreign-owned and Dutch firms over the 12 provinces, and gives a more detailed description of the characteristics of the home regions of foreign firms located in the Netherlands.

2.2 Definition and types of foreign-owned firms

2.2.1 Definition of foreign-owned firms

The OECD (2005) defines an investment as a foreign direct investment (FDI) if the investing firm is located in a country different from that of the receiving firm and has a significant and lasting influence on the management of the receiving firm. Commonly, three types of FDIs are distinguished, using information on the percentage of ordinary shares or voting stock of the enterprise that is owned by the direct investor: a portfolio investment (less than 10%), an associate company (between 10 and 50%) and a subsidiary (more than 50%). This last group of firms is considered to be under foreign 'control', which the OECD defines as: 'the ability to appoint a majority of administrators empowered to direct an enterprise, to guide its activities and determine its strategy. (...) The notion of control allows all of a company's activities (including turnover, staff, and exports) to be attributed to the controlling investor and the country from which he comes' (OECD, 2005, p.102). Whereas in the case of foreign 'influence' the financial aspect predominates, in the case of foreign control "...it is the 'power to take decisions' and 'decide corporate strategy' that comes first" (OECD, 2005, p.103).

In this study, a firm is considered to be foreign-owned when it is under foreign control, meaning that a firm is owned for at least 50% by a firm from another country. The aim of this study is to provide insights into the attractiveness of Dutch regions as a location for foreign firms and, therefore, we were only interested in those firms which locational choices were driven by the potential for gaining access to the region. Firms that invest in another country by acquiring a minority share (less than 50%) in a domestic firm, are more likely to be driven by financial motives (OECD, 2005); what matters is the economic success of target firms and not the characteristics of the firm's location. Firms that obtain control over a foreign firm are more likely to make such an investment to gain access to new markets, to regions with lower costs of production or to access certain knowledge present in a particular firm and/or its region (see also Wintjes, 2001). The number of firms under foreign control is also interesting from a policy perspective, because the investing firm is more likely to have actively compared conditions between different regions, instead of only having been attracted by a specific well-performing firm.

The data set that was used in this study for information on regional differences in foreign-owned firms is the Amadeus data set provided by Bureau van Dijk. Contrary to most other data sets that provide information on FDI in Europe, the Amadeus data set does not use public announcements of FDI transactions but instead provides information on the ownership structure of all firms in Europe (see Appendix 2.1 for further information on the firms included in the dataset). Therefore, this data set allowed us to select firms that were owned by a firm from another country for at least 50%, and allowed us to compare the spatial pattern of those firms in Europe

Table 2.1
Knowledge-intensive activities

Industry	Description
Knowledge-intensive manufacturing	
High-tech manufacturing	Manufacturing of pharmaceutical products and preparations, and computer, electronic and optical products, aircrafts, spacecrafts and related machinery
Medium high-tech manufacturing	Manufacturing of chemicals and chemical products, weapons and ammunition, electrical equipment, motor vehicles, trailers and semi-trailers, railway locomotives, military fighting vehicles, transport equipment, medical and dental instruments and supplies
Knowledge-intensive services	
Knowledge-intensive market services	Water transport, air transport, legal and accounting activities, activities of head offices and management consultancies, architectural and engineering activities, advertising and market research, and scientific and technical activities, employment activities, security and investigation activities
Knowledge-intensive high-tech services	Production of motion pictures, videos and television programmes, broadcasting activities, telecommunication, computer programming, consultancy and related activities, information service activities, scientific research and development
Knowledge-intensive financial services	Financial service activities, insurance, reinsurance and pension funding (excl. compulsory social security), support for financial and insurance activities

Source: Eurostat, 2009

against that of firms under domestic control involved in similar types of activities, in 2010. Furthermore, the database provided information on the location of all firms that were foreign-owned, whereas FDI databases often are limited to the few years in which investments were entered into, without any information on the total FDI stock. Therefore, to determine the attractiveness of the Dutch regions to investments by foreign firms, we decided not to use information on specific years of FDI, but instead used information on the ownership structure for all firms in 2010.

2.2.2 Different types of foreign-owned firms

For this study, we distinguished between different types of foreign-owned firms, in two ways: between the types of activities of these firms and between recent greenfield investments and total number of foreign-owned firms. With respect to the different types of activities, the main distinction is that between knowledge-extensive and knowledge-intensive activities. Using this distinction made it possible to obtain insights into the relative importance of knowledge seeking motives for firms to invest in European countries other than their own, and, more specific, in the Netherlands.

Previous studies on FDI in knowledge-intensive activities often defined these activities as research-intensive (see Chung and Alcácer, 2002). However, as argued by Porter (2000), there are many more industries that could engage in knowledge-intensive activities. Furthermore, the Dutch economy is characterised by a large share of services, which may also be considered as knowledge-intensive activities (see Raspe and Van Oort 2006). To also obtain insights into the potential attractiveness of Dutch regions to foreign-owned firms active in knowledge-intensive services, this study used a broad definition of knowledge-intensive activities. We adopted the definition by Eurostat, which distinguishes between different types of activities using insights into the technology intensity of industries. Two groups of manufacturing industries are distinguished (high technology and medium high technology) and three types of knowledge-intensive services: knowledge-intensive market services, knowledge intensive high-tech services, and knowledge-intensive financial services. Table 2.1 provides a description of the different industries that are considered knowledge-intensive. All firms in the Amadeus data set have a NACE code that indicates their industrial activity. We used those NACE codes for categorising different types of knowledge-intensive and knowledge-extensive activities. Appendix 2.2 shows a list of NACE codes per activity, and the percentage of foreign-owned firms in Europe and the Netherlands that is engaged in those separate activities.

The second way in which we distinguished between different types of foreign-owned firms is between greenfield investments established between 2003 and 2010 and total number of foreign-owned firms in 2010. Greenfield investments are more likely to contribute to the host regions than mergers and acquisitions (M&As), at least in a direct way (see Box 1). Nevertheless, the huge growth in FDI during the last two decades has been mainly caused by an increase in FDI from M&A (UNCTAD, 2010). Furthermore, previous studies have shown that foreign firms investing in knowledge-intensive activities

are more likely to do so through acquisitions, especially in developed countries (Dunning, 1998; Milelli and Hay, 2008). Therefore, limiting the analysis to greenfield investments would lead to an underestimation of the number of foreign-owned firms in these types of activities.

The use of the Amadeus data limits the possibilities for distinguishing between greenfield investments and M&As, because the dataset only contains information on the most recently reported ownership structure of each firm. Consequently, it does not indicate any changes in percentages of foreign ownership of any firm since it was first established. However, considering the potential difference in the effect of greenfield and M&A investments, it is important to determine whether Dutch regions are more attractive to foreign firms investing in newly established enterprises or to those that enter the market through M&A. Therefore, we selected firms that had been founded since 2003 and that were owned by a foreign firm for more than 50% at the end of 2010. These firms are quite young (maximum of five years old) and, therefore, are more likely to have been greenfield investments, because young firms generally are less attractive acquisition targets for foreign firms (with the possible exception of high-tech companies developing very specific products). Foreign firms are more likely to invest in firms that have proven their success and have built a strong market position – something that takes a certain number of years. As it was not possible for us to identify the M&A investments, we only were able to compare the spatial pattern of all foreign-owned firms against that of firms most likely to have been greenfield investments between 2003 and 2010. Following this definition, almost 34% of all the foreign-owned firms located in Europe in 2010 are likely to have been established as a greenfield since 2003.

2.3 Spatial pattern of foreign-owned firms in Europe

This section describes the spatial pattern of foreign-owned firms on both national and regional levels, to determine whether this pattern on the national level hides the relevance of regional differences within the 23 European countries that were included in this study. Subsection 2.3.1 focuses on this spatial pattern on a country level. In addition to describing differences in the number of these firms, it also pays attention to differences in the types of industries in which these firms are active, their sizes, and differences between the home regions of their parent firms. Subsection 2.3.2 describes the regional differences of the spatial pattern of foreign-owned firms within Europe, with specific attention for the position of the Dutch regions. In addition to describing the spatial pattern for all foreign-owned firms in Europe, a distinction is also made between the five types of knowledge-intensive industries (as described in Appendix 2.2), and the home countries of these foreign-owned firms.

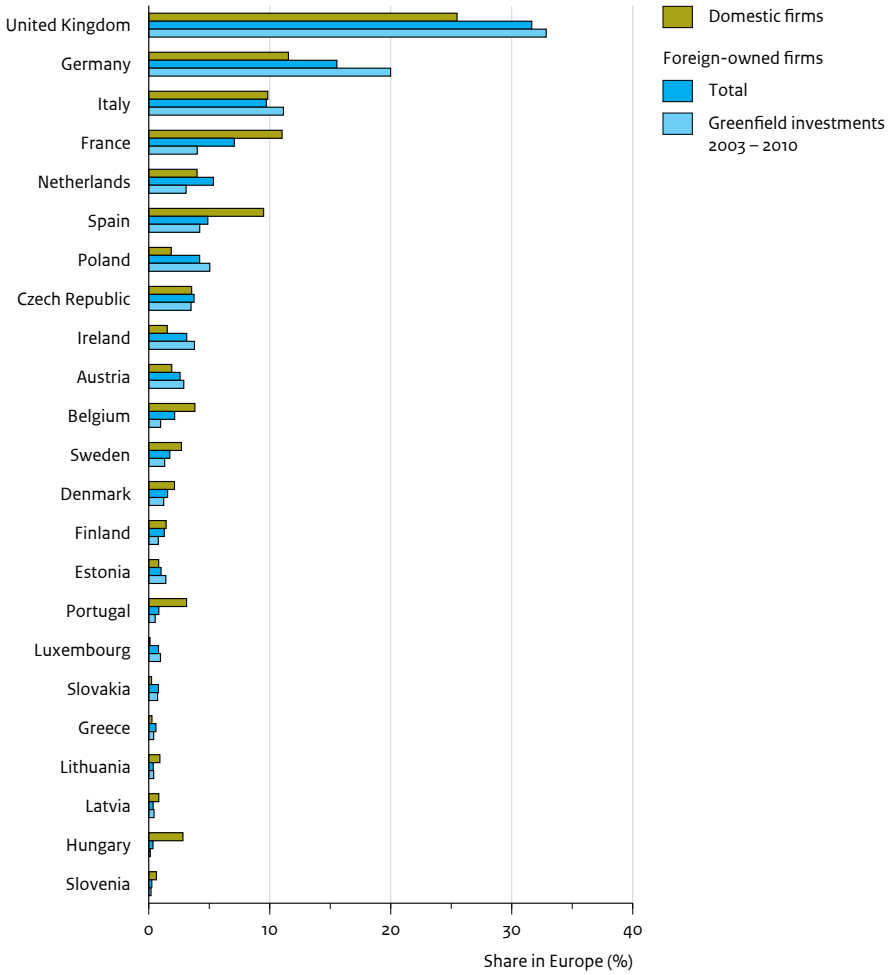
2.3.1 Spatial pattern of foreign-owned firms on a national level

Figure 2.1 shows a division of all firms that were under more than 50% foreign ownership in 2010 (total foreign-owned), the same group of firms but limited to those that were founded since 2003 (here called greenfield investments), and all other firms which were not foreign-owned or with a less than 50% foreign ownership, in all 23 European countries included in our data set. This figure clearly shows the dominant position of the United Kingdom in Europe. About 32% of all foreign-owned European firms were found to be located in the United Kingdom, while the share of the second country, Germany, was almost half of that (15.6%). After Italy (10%) and France (7%), the Netherlands ranked fifth with a share of 5%.[2]

When greenfield investments are separated out, the United Kingdom was found to have an even larger share. However, especially Germany had a large share of such greenfield investments, compared to its share of all foreign-owned firms (15.6% of total foreign-owned firms and 20% of greenfield investments). In Italy, Poland, Ireland, Austria, Estonia and Luxembourg, the share of greenfield investments was also larger than the share of total foreign-owned firms. In all other countries, including the Netherlands, the share of greenfield investments was smaller than that of total foreign-owned firms. With respect to greenfield investments between 2003 and 2010, the Netherlands ranked ninth within Europe. In other words, compared to other European countries, the Netherlands was less attractive as a location for foreign firms that were investing by establishing new firms, between 2003 and 2010.

To identify the European countries that had a relatively large number of foreign-owned firms, it was necessary to control for the sizes of the national economies. One way of doing this was by comparing the distribution of foreign-owned firms and domestic firms over the 23 countries. Therefore, the shares of domestic firms were also included in Figure 2.1. The shares of foreign-owned firms (both total and greenfield investments) were larger than those of domestic firms, in the United Kingdom and Germany. Although these two countries would have the largest shares of domestic firms in Europe, they attracted even more foreign-owned firms. Poland, Ireland, Austria,

Figure 2.1
Foreign-owned and domestic firms in Europe, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Greece and the Baltic States show a similar pattern. In the Scandinavian countries, as well as in France, Spain, Belgium, Sweden and Portugal, the share of domestic firms in the European total was much larger than of foreign-owned firms. In the Netherlands, the share of foreign-owned firms in total was larger than the share of domestic firms, but the share of greenfield investments in recent years was smaller.

Table 2.2 divides the foreign-owned firms and the domestically owned firms by type of industrial activity, for each of the 23 European countries. A distinction was made between knowledge-intensive manufacturing, knowledge-intensive services and all other knowledge-extensive industries. More than 38.4% of all foreign-owned firms in Europe were found to be active in knowledge-intensive activities, 6.7% of which in knowledge-intensive manufacturing and 31.7% in knowledge-intensive services. The share of knowledge-intensive industries differed per European country. In the Netherlands, Luxembourg, Ireland, Germany and Denmark, the share of foreign-owned firms that were active in knowledge-intensive industries was 40% or larger. In most of these countries, this was due to a larger share of knowledge-intensive services. The division of the greenfield investments between 2003 and 2010 into the three types of industrial activities showed a similar pattern as that of the total foreign-owned firms, although the share of knowledge-intensive services was even higher, especially in Luxembourg, the Netherlands and, to some extent, also in Denmark (see Appendix 2.4).

Table 2.2

Shares of foreign and domestic firms per European country, divided according to industrial activity (100% = total number of foreign-owned and domestic firms per country)

	Number of firms		Knowledge-intensive manufacturing		Knowledge-intensive services		Knowledge-extensive industries	
	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic
Total EU	237,650	10,123,519	6.7	2.1	31.7	28.1	61.6	69.9
Netherlands	13,692	423,030	6.3	1.7	49.2	59.4	44.5	39.0
Austria	6,629	197,468	4.2	1.6	27.7	20.8	68.1	77.6
Belgium	5,459	402,877	7.4	1.3	29.2	32.2	63.4	66.5
Czech Rep.	9,348	375,457	7.0	2.3	19.3	22.4	73.7	75.4
Germany	39,772	1,217,637	7.6	3.5	37.5	34.8	54.8	61.7
Denmark	3,857	205,770	5.6	1.5	35.9	53.5	58.5	45.1
Estonia	2,392	70,700	3.7	0.7	26.0	26.8	70.3	72.4
Spain	12,502	1,025,565	7.5	1.6	24.3	17.6	68.2	80.7
Finland	3,284	153,766	6.6	1.9	25.4	31.9	68.0	66.3
France	18,085	1,185,096	8.1	1.5	28.8	25.0	63.1	73.5
Greece	1,519	27,048	3.6	3.4	23.8	14.2	72.6	82.4
Hungary	889	304,041	8.5	2.0	21.8	31.6	69.6	66.5
Ireland	7,600	148,671	5.9	2.7	45.4	28.8	48.7	68.5
Italy	23,188	978,961	8.2	4.3	24.9	17.2	66.9	78.4
Lithuania	961	92,729	3.3	0.8	15.4	22.5	81.3	76.6
Luxembourg	2,020	8,833	1.0	0.8	61.7	31.3	37.3	67.9
Latvia	922	83,426	2.7	0.7	19.3	19.5	78.0	79.8
Poland	10,566	159,093	8.8	3.9	20.5	18.7	70.8	77.3
Portugal	2,128	339,524	7.7	1.2	20.7	17.5	71.6	81.3
Sweden	3,879	263,879	6.3	2.1	33.6	36.8	60.1	61.1
Slovenia	646	69,018	7.7	2.0	16.9	30.7	75.4	67.2
Slovakia	2,037	22,689	8.2	3.3	16.7	20.7	75.0	76.0
United Kingdom	66,275	2,368,241	5.6	1.2	32.5	29.3	61.9	69.5

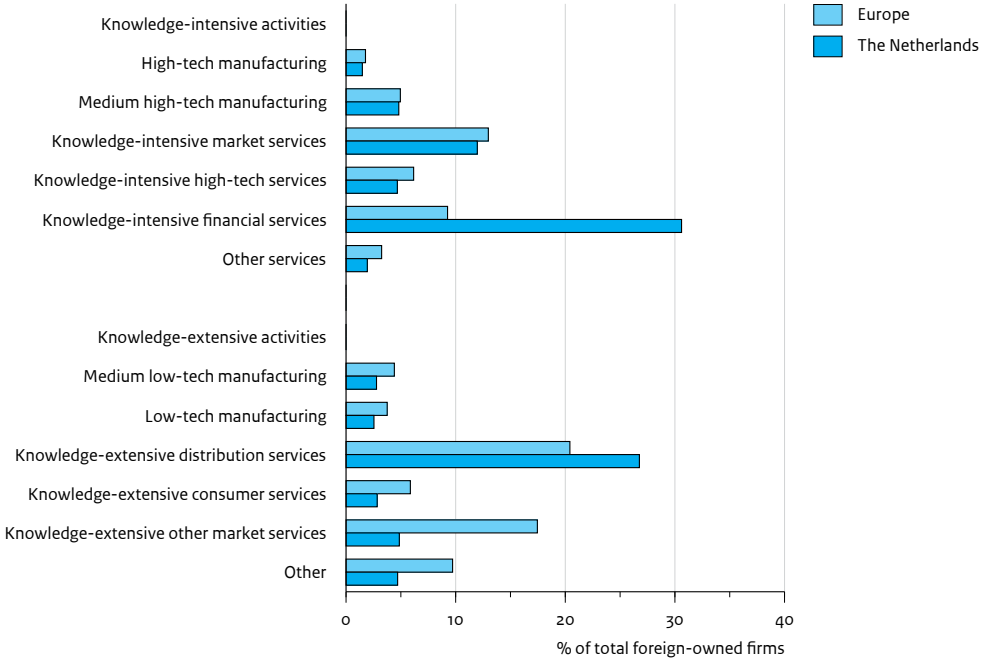
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

When we compare the distribution over the three types of activities of the foreign-owned firms with that of the domestic firms, it becomes clear that generally speaking foreign-owned firms in Europe are active more often in knowledge-intensive manufacturing than domestic firms. In most countries, the share of foreign-owned firms active in knowledge-intensive services is also higher than, or comparable to that of domestic firms. However, the Netherlands as well as the Scandinavian countries, Hungary and Lithuania, are exceptions to this pattern. In these countries, the share of domestic firms involved in knowledge-intensive services was found to be substantially larger than that of foreign-owned firms. In other words, contrary to most other European countries, foreign-owned firms in the Netherlands were involved more often in knowledge-extensive activities than domestic firms.

To obtain more detailed insights into the specific characteristics of the industrial composition of foreign-owned firms in the Netherlands, foreign-owned firms in Europe and the Netherlands were divided over several more specific industries (both knowledge-intensive and knowledge-extensive industries). Figure 2.2 shows that the large share of foreign-owned knowledge-intensive industries in the Netherlands was mainly due to a much larger share of financial services than the European average. In all other knowledge-intensive activities, the share of the Netherlands was even a bit below the European average.

With respect to knowledge-extensive activities, most foreign-owned firms in Europe were found to be active in distribution, such as wholesale trade, warehousing and support activities for transportation, or market services with a lower knowledge-intensity, such as real estate, business and administration supporting activities. In the

Figure 2.2
Share of foreign-owned firms per industry, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Netherlands, the share of foreign-owned firms active in distribution was far above the European average, while the share of lower knowledge-intensive market services was below average. In sum, by far most foreign-owned firms in the Netherlands were active in financial services (30.6%) and distribution (26.8%).

Table 2.3 shows the size distribution of all the foreign-owned firms and the domestic firms, on a European scale and for the 23 countries separately (see Appendix 2.1 for an explanation of the different size categories). In all countries, the largest share of foreign-owned firms would be small or medium-sized. However, compared to the European average, the Netherlands, as well as Belgium and Luxembourg, had a much larger share of very large foreign-owned firms. The United Kingdom, in contrast, had a relatively large share of small firms.

Compared to all foreign-owned firms, greenfield investments, between 2003 and 2010, more often were small firms (see Appendix 2.4). This is not very surprising as greenfield investments often evolve over time. Initially, a firm invests in the establishment of a sales of marketing office, which may slowly grow into a production facility or R&D centre (Wintjes, 2001). Furthermore, these results were in line with the more general development according to which economies of scale had become less significant as key drivers of competitive advantage. More specifically for foreign investors this resulted in an increase of the number of small establishments per firms, each enabling the multinational firm to obtain access to access to many different regions and countries and thereby offering different kinds of knowledge and capabilities (Le Bas and Sierra, 2002).

A comparison between the size distributions of the foreign-owned firms shows that although most foreign-owned firms were small or medium-sized, the share of small firms was much smaller for foreign-owned firms than for domestic firms. This was the case in all European countries. Generally speaking, foreign-owned firms were larger than domestic firms, in all European countries.

To obtain a more detailed understanding of what may explain the relatively large share of large firms in the size distribution of foreign-owned firms in the Netherlands, we further divided their size distribution for the Netherlands and the United Kingdom, according to their industrial activities (see Figure 2.3). We compared the Netherlands to the United Kingdom, because the latter

Table 2.3

Shares of foreign and domestic firms per European country divided according to firm size (100% = total number of foreign-owned and domestic firms per country)

	Small		Medium		Large		Very Large	
	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic
Total EU	43.3	81.5	30.9	15.4	19.1	2.6	6.6	0.5
Netherlands	36.2	74.9	32.5	21.2	19.4	2.9	11.9	1.0
Austria	54.9	84.4	31.3	13.2	11.4	2.0	2.5	0.4
Belgium	19.2	86.0	33.6	11.1	33.7	2.4	13.4	0.5
Czech Rep.	45.3	81.7	34.5	16.1	17.1	2.0	3.1	0.2
Germany	49.9	76.0	27.7	19.7	16.3	3.4	6.1	0.8
Denmark	34.3	81.9	35.5	14.9	22.3	2.6	7.9	0.6
Estonia	49.9	88.8	37.6	10.0	11.4	1.2	1.1	0.1
Spain	29.6	73.3	35.6	23.2	26.9	3.0	7.9	0.4
Finland	25.6	82.0	42.7	14.7	25.1	2.7	6.6	0.5
France	19.8	77.6	40.0	18.8	30.9	3.0	9.3	0.6
Greece	15.5	30.7	48.4	57.3	29.0	9.9	7.2	2.0
Hungary	16.5	91.7	42.7	7.2	31.3	1.0	9.4	0.1
Ireland	47.3	85.1	25.0	11.3	17.9	2.6	9.9	1.0
Italy	41.8	70.0	39.6	25.8	14.9	3.7	3.6	0.5
Lithuania	24.7	82.5	48.8	15.7	23.9	1.6	2.6	0.1
Luxembourg	35.3	62.1	27.6	22.7	25.3	11.2	11.8	4.1
Latvia	28.6	87.1	51.4	11.6	18.0	1.2	2.0	0.1
Poland	32.9	64.6	40.5	29.1	22.0	5.5	4.7	0.8
Portugal	25.8	84.3	40.0	13.8	27.9	1.7	6.2	0.2
Sweden	20.0	78.3	38.6	17.4	31.2	3.5	10.2	0.7
Slovenia	48.3	94.0	37.8	4.9	11.8	0.9	2.2	0.2
Slovakia	25.3	49.0	49.2	41.9	20.8	7.6	4.7	1.4
United Kingdom	57.5	93.1	21.2	4.8	15.2	1.6	6.1	0.5

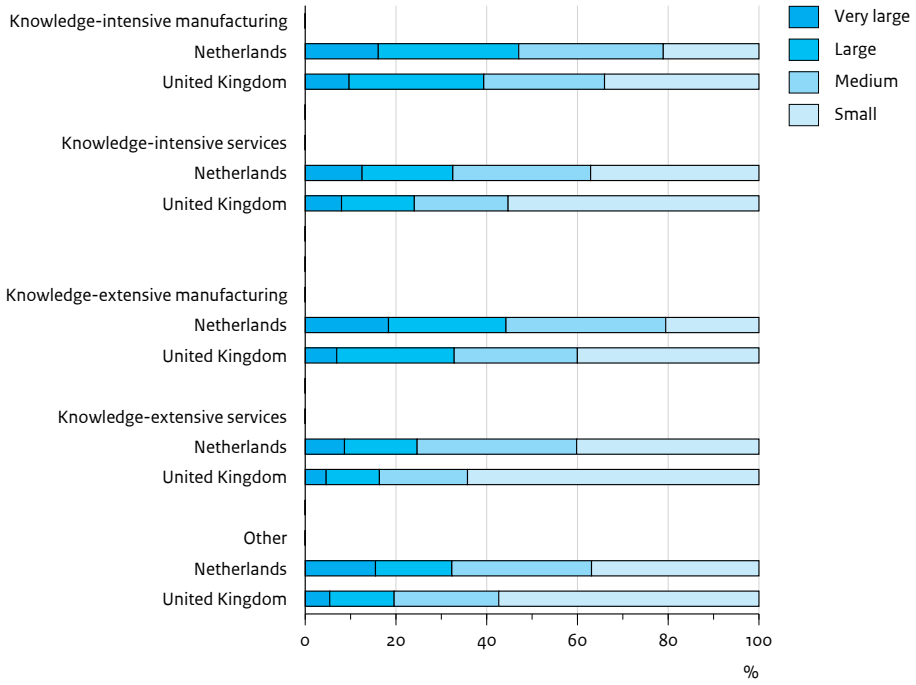
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

had a much larger share of small firms than the European average. The results show that the difference in firm size distribution between both countries holds for every industrial activity. In other words, foreign-owned firms in the Netherlands were larger than the same group of firms in the United Kingdom, irrespective of their industrial activity.

Figure 2.4 shows the continents from which the owners originated of the foreign-owned firms in the 23 European countries included in the analysis. This figure clearly shows that most firms investing in Europe originated from another European country (65.5%), followed by firms from North America (the United States and Canada, (24.8%)) and, at quite some distance, Asia (5.7%). With respect to their home regions, there was hardly a difference between all foreign-owned firms and the more recent greenfield investments. The investments in the Netherlands did differ somewhat from the European average. The foreign-owned firms in the Netherlands were shown to be more often established by firms from other European countries (almost 70%), slightly less often from North America (21.2%) and more often from Asia (7.5%).

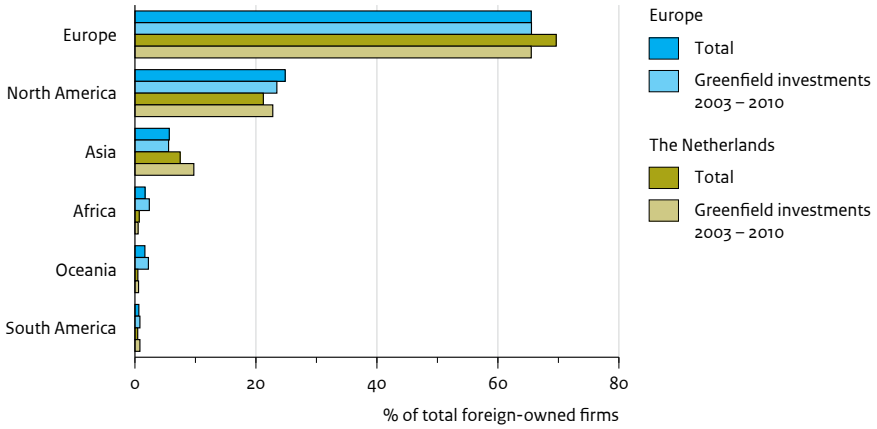
In Figure 2.5, the origins of foreign firms investing in Europe and in the Netherlands have been further divided according to country. From the European firms that invested in other European countries, most came from the Netherlands (8.1%), followed by Germany (7.6%), France (6.8%), Switzerland (6.4%) and the United Kingdom (6.4%). This shows that, although most foreign-owned firms would be located in the United Kingdom, firms originating from that country did not invest as often in other European countries as firms from the Netherlands. Almost 20% of all foreign-owned firms in Europe were owned by a firm from the United States. The Asian firms investing in Europe mainly came from Japan (2.3%), India (0.3%), and China (0.2%). The origins of the

Figure 2.3
Size distribution of foreign-owned firms per industry, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

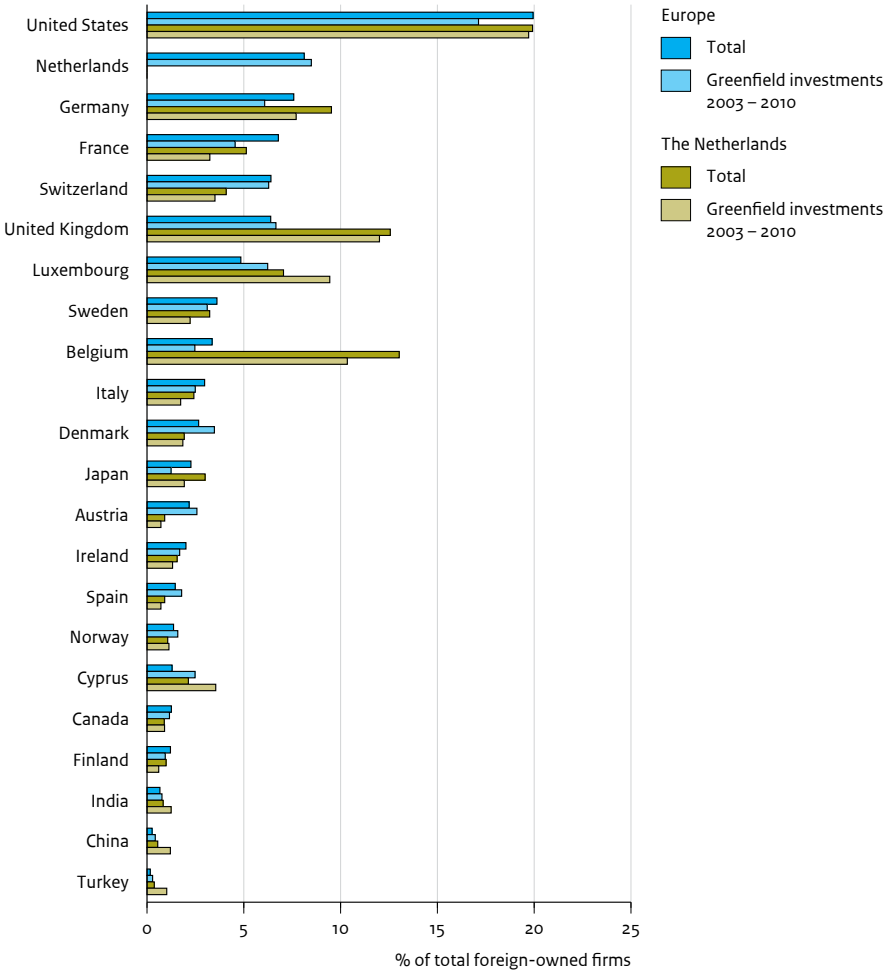
Figure 2.4
Home region of foreign-owned firms per continent, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Note: In this figure, the total number of foreign-owned firms is lower, because information on owners' countries of origin is lacking for 18.4% of all foreign-owned European firms mentioned in the Amadeus data set.

Figure 2.5
Home region of foreign-owned firms per country, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Note: In this figure, the total number of foreign-owned firms is lower, because information on the owners' countries of origin is lacking for 18.4% of all European foreign-owned firms mentioned in the Amadeus dataset.

foreign firms that entered the market through greenfield investments since 2003 were largely comparable to those of all foreign-owned firms.

The origins of foreign-owned firms in the Netherlands did differ from those in Europe as a whole. Although most firms that invested in the Netherlands also came from the United States (19.9%), the percentage of firms that came from Belgium (13%), the United Kingdom (12.6%), Germany (9.5%) and Luxemburg (7.0%) was much higher than the European average. Traditionally, firms from these countries invested a lot in the Netherlands and the relevance of European investors has only increased with the progressing integration of the European Union (Hogenbirk, 2002). The share of firms from Asian countries was also larger in the Netherlands. With respect to greenfield investments, especially the higher percentage of firms from Luxembourg (9.4%) and Cyprus (3.5%) stood out. This was mainly due to the attractiveness of the Netherlands for financial services, as is further explained in Subsection 2.3.2. Also the percentage of firms from India and China that had invested in greenfield development since 2003 was relatively large in the Netherlands, although the actual number of Indian-owned and Chinese-owned firms was still quite limited.

2.3.2 Spatial pattern of foreign-owned firms on a regional level

This section provides a detailed description of the spatial pattern of foreign-owned firms in the 23 European countries included in this study on a regional level; for all foreign-owned firms, for each of the five types of knowledge-intensive industries distinguished in this study (see Appendix 2.2), and for firms owned by a firm from another European country, the United States, Japan and China. The last three countries are the home regions of the largest groups of investors from outside Europe. For each of these groups of firms, information is provided about spatial patterns, on country level (bar chart), regional level (map of Europe), including a top 10 of European regions where most of these firms are located. These three figures are given for all foreign-owned firms as well as greenfield investments since 2003 in these industries.

Total foreign-owned firms

As mentioned in Subsection 2.3.1, most European foreign-owned firms were found to be located in the United Kingdom, followed at quite some distance by Germany and Italy. Figure 2.6 clearly shows that large regional differences were underlying those country averages. The noticeable position of the United Kingdom largely followed from a high concentration of foreign-owned firms in a few regions: the largest share of these firms was found in Inner London, where 11.4% of all foreign-owned firms in Europe was located. But also adjacent regions, Outer London (2.9%) and the Buckinghamshire/Oxfordshire region (2.1%), belonged to the top 10. Another UK region that ranked high on the list was West Midlands where the city of Birmingham is located (number 13), and several of the UK regions surrounding the Greater London region also were found to host an above average percentage of foreign-owned firms (East Anglia, where the University of Cambridge is located, Essex, Surrey and Bedfordshire/Hertfordshire).

The spatial pattern within Germany was found to be quite comparable to that of the United Kingdom, as foreign-owned firms there also were mainly concentrated in a few regions. However, in Germany, the foreign-owned firms were not concentrated in a number of neighbouring regions, but instead they were concentrated within several regions spread across the country. High concentrations of foreign-owned firms could be found in the two top 10 regions of Frankfurt (2.1%) and Düsseldorf (2.0%), as well as in Munich, which although not part of the top 10, did belong to the higher classification on the map. Both Italy and France also had a strong concentration of foreign-owned firms in a few regions. In Italy, most of these firms were located in Lombardia (3.6%), which is the region surrounding Milan, and in France in the capital city of Paris (3.55%). Other top 10 regions were south-east Ireland, the region where Dublin is located, Warsaw and Prague. The regions that had the largest share of foreign-owned firms in the Netherlands, were North Holland (1.8%) and South Holland (1.1%). Neither region belonged to the top 10; North Holland was 12th and South Holland 21st on the list.

Figure 2.6 also shows the spatial pattern of greenfield investments since 2003, on a regional level. This pattern differs to some extent from that of all foreign-owned firms. As mentioned in Subsection 2.3.1, the share of greenfield investments in these recent years was found to be somewhat larger in the United Kingdom and Germany. In the former, these types of investments were concentrated in Inner London (13.9%) and Outer London (3.0%), while in Germany, many of these investments also took place in the regions of Frankfurt, Düsseldorf and Munich (here appearing in the top 10) but also in Berlin (which ranked 8th for greenfield investments and 18th for total foreign-owned firms). With respect to greenfield investments, Paris and the Buckinghamshire/Oxfordshire region did not belong to the top 10. Also North Holland and South Holland had a smaller share of recent greenfield investments compared to the total share of foreign investments. North Holland ranked 19th for greenfield investments and 12th for the share of total foreign-owned firms. South Holland ranked 36th for is greenfield investments and 21th for the share of total foreign-owned firms.

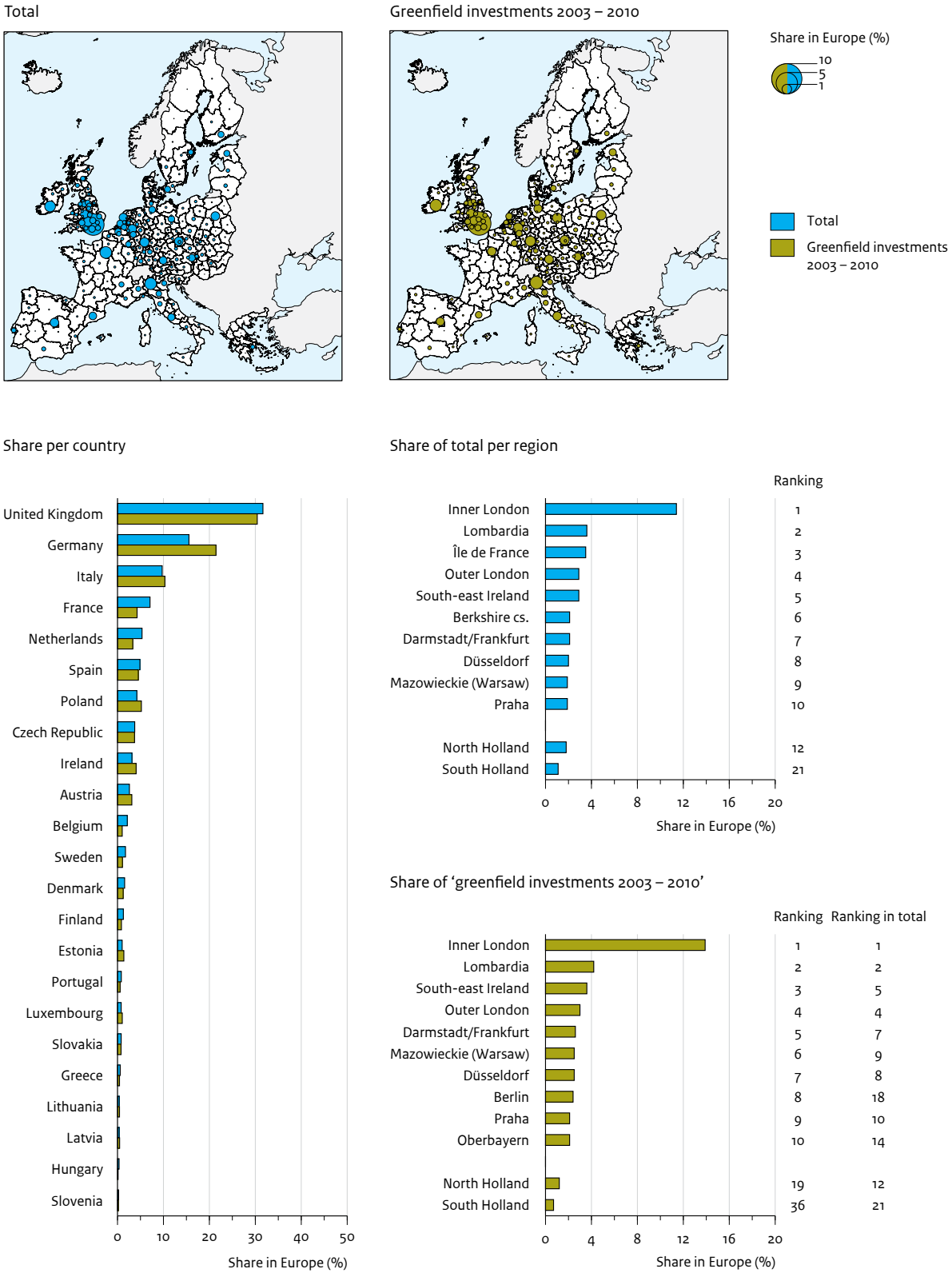
Foreign-owned firms in high-tech manufacturing

High-tech manufacturing concerns firms that mostly are active in the pharmaceutical, computer, electronic and optical industries, with a few firms active in air and spacecraft manufacturing and related activities (see Appendix 2.2 for the share of firms per industry). Most foreign-owned firms active in high-tech manufacturing were found to be located in the United Kingdom and Germany (see Figure 2.7). Compared to the spatial pattern of all foreign-owned firms, the difference between the United Kingdom and Germany was smaller for high-tech manufacturing. Furthermore, with respect to greenfield investments since 2003, the share of these firms located in Germany was larger than in the United Kingdom. In the Netherlands, the share of foreign-owned firms in this industry was smaller than for the total foreign-owned firms (4.8% and 5.3%, respectively). Poland had a large share of greenfield investments in this industry compared to their share of total foreign-owned firms.

Although, at country level, the United Kingdom had the largest share of foreign-owned firms in high-tech manufacturing in Europe, the two regions with the largest share of such firms were not located in the United

Figure 2.6

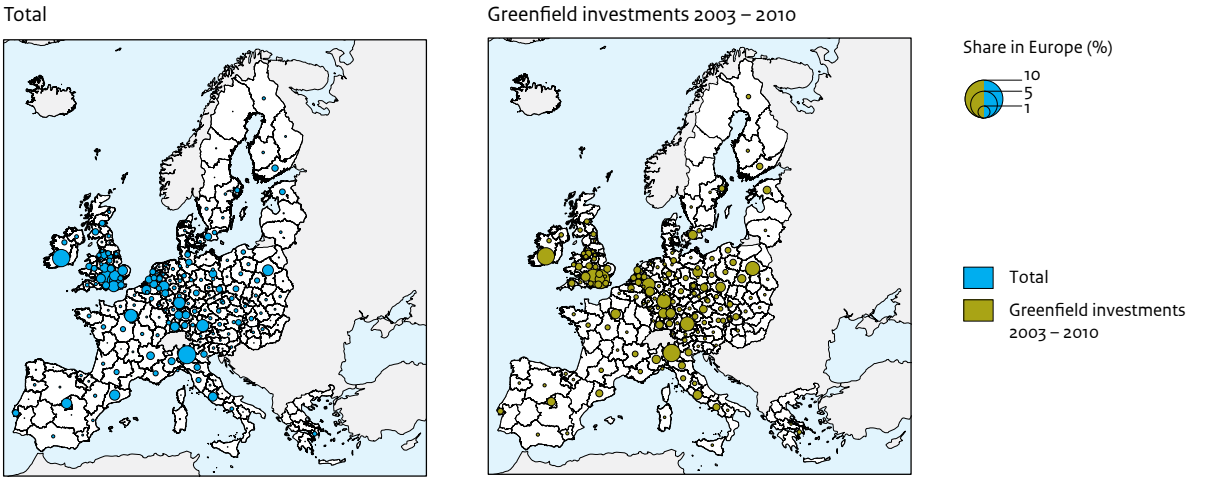
Factsheet of spatial pattern of all foreign-owned firms in Europe, 2010

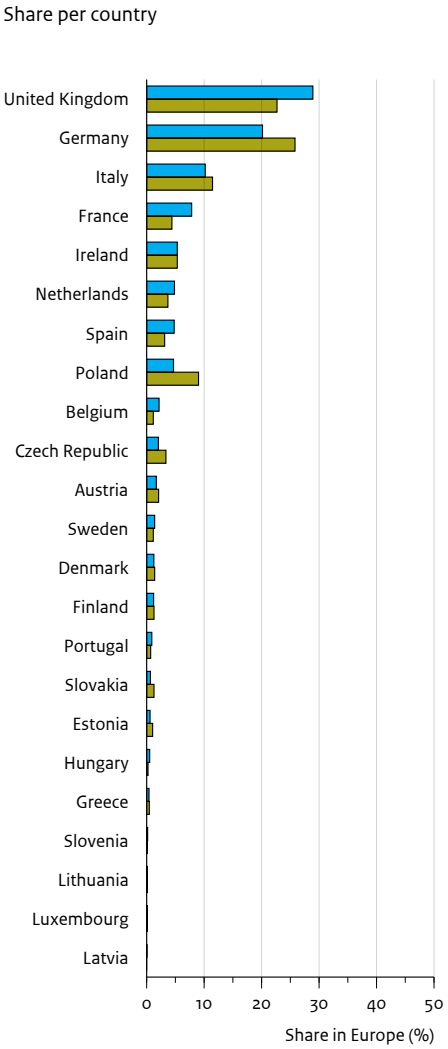


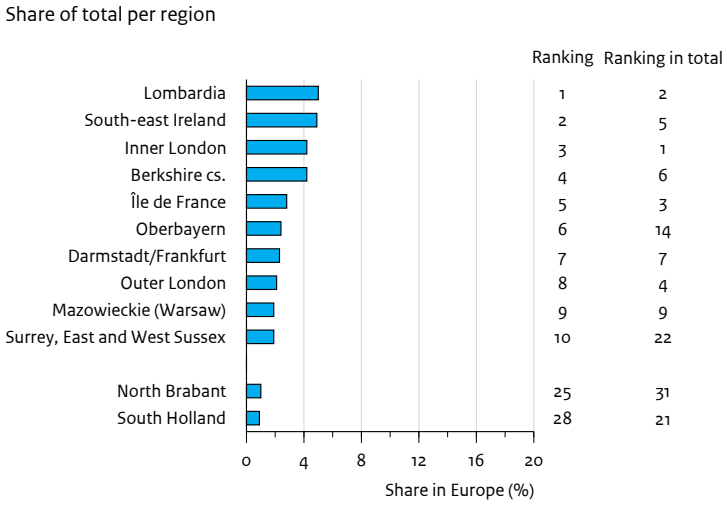
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

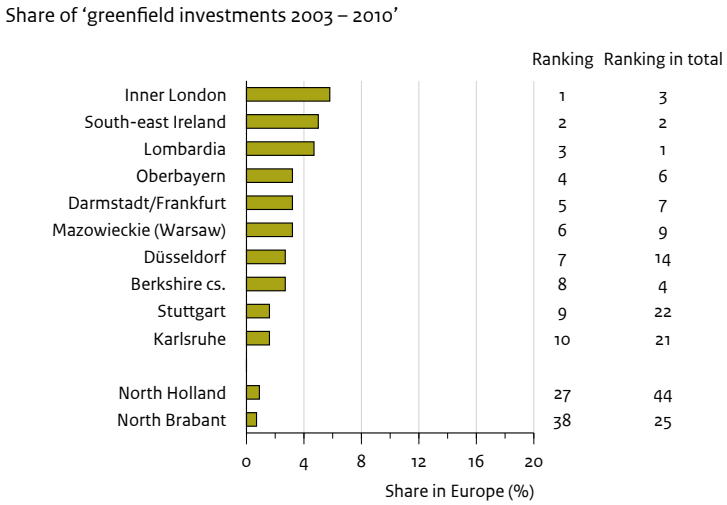
Figure 2.7

Factsheet of spatial pattern of foreign-owned firms in high-tech manufacturing, 2010









Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Kingdom. Lombardia had the largest share (5.0%), followed by south-east Ireland (4.9%). Nevertheless, the Greater London region (4.2% for both Inner and Outer London) and surrounding regions Buckinghamshire/ Oxfordshire and Surrey, all belonged to the top 10 of regions with the largest shares of these firms in Europe. Furthermore, several other regions near London had a large share of these activities (East Anglia, Gloucestershire, and Bedfordshire/Hertfordshire), although they did not belong to the top 10.

Similar to the spatial pattern of total foreign-owned firms, Frankfurt, Munich, Paris and Warsaw again all belonged to the top 10. Within the Netherlands, however, the spatial pattern of foreign-owned firms in high-tech manufacturing differed from that of all foreign-owned firms. Not North Holland, but North Brabant had the largest share of FDI in high-tech manufacturing. Within Europe, North Brabant ranked 25th in this category (0.9%).

As Figure 2.7 shows, the spatial pattern of greenfield investments between 2003 and 2010 in high-tech manufacturing showed a somewhat different top 10, with Inner London having the largest share (5.8%), south-east Dublin being the second region (5.0%), and Lombardia ranking third (4.7%). Despite the larger share in Inner London, other UK regions were not part of the top 10 when only greenfield investments in high-tech manufacturing would be taken into account. Consequently, the relevance of the United Kingdom as a whole was also lower in relation to these types of investments.

In Italy, not only Lombardia was found to have a large share of greenfield investments in high-tech manufacturing, but this also applied to neighbouring region Piemonte (Turin), as shown on the map. German regions especially were well represented in the top 10 of greenfield investments in high-tech manufacturing; five of the top 10 regions were located in Germany. The map with greenfield investments also shows that, besides these five top regions, other regions in Germany also had an above average share of greenfield investments in this industry. In Poland, both Warsaw and the south-eastern region of Dolnoslaskie had quite a large share of greenfield investments in this industry. This was also true for several other eastern European countries, such as the Czech Republic and Hungary.

Foreign-owned firms in medium high-tech manufacturing

The medium high-tech manufacturing industry consists of firms that are mainly active in the chemical industry, the manufacturing of electrical equipment, machinery, motor vehicles and medical and dental instruments and supplies (see Appendix 2.2). Compared to the spatial pattern of all foreign-owned firms and those in high-tech manufacturing, the foreign-owned firms in medium high-tech manufacturing were more evenly spread across Europe (see Figure 2.8). More specifically, the differences between the United Kingdom, Germany and Italy were smaller, in both total foreign-owned firms and greenfield investments. The United Kingdom had the largest share of the total number of foreign-owned firms, while in Germany greenfield investments in these activities held the largest share. For Poland, similar to their share in foreign-owned firms in high-tech manufacturing, also had a relatively large share of greenfield investments in medium high-tech manufacturing.

The spatial pattern on a regional level showed that foreign-owned firms in medium high-tech manufacturing tended to be concentrated in the northern regions of Italy (Figure 2.8). Lombardia was found to be the core region with a share of 4.8% of all foreign-owned firms in this industry in Europe, surrounded by Emilia-Romagna (1.6%), Veneto and Piemonte (Turin). Again, Inner London was included in the list of top 10 regions in the United Kingdom, together with West Midlands and Buckinghamshire/Oxfordshire. The only top 10 region in medium high-tech manufacturing in Germany was Düsseldorf, but in line with the pattern for total foreign-owned firms and specifically those in high-tech manufacturing, Cologne, Frankfurt, Stuttgart and Munich were classified as top regions on the map. Other top 10 regions were the Spanish region of Cataluna, where Barcelona is located, Vlaams Gewest in Belgium and south-east Ireland. The Dutch regions did not have very large shares of foreign-owned firms in this field of activity. The two Dutch regions with the largest shares were South Holland and North Brabant, with 1.1% and 0.9%, respectively.

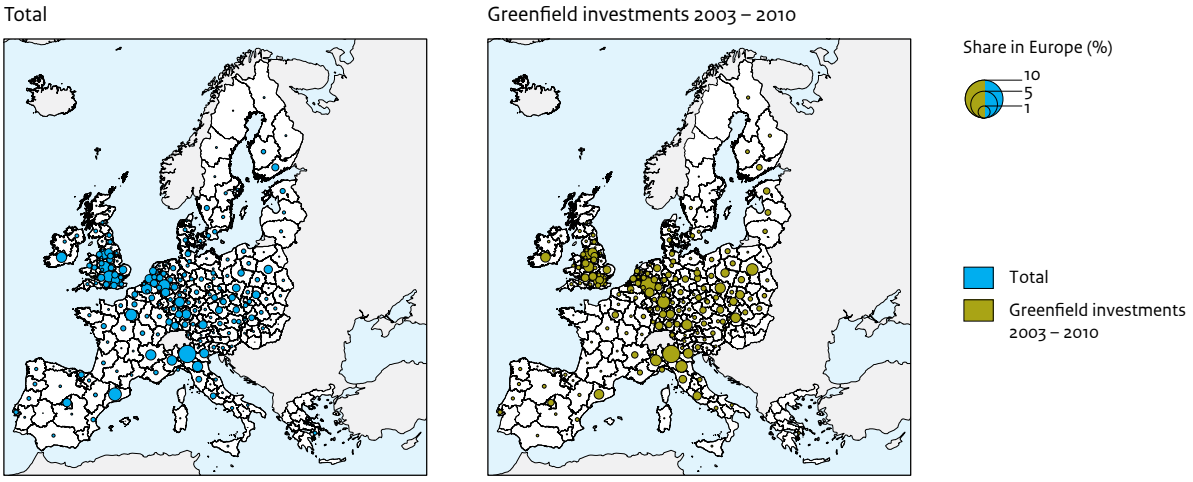
As shown in Figure 2.8, Lombardia was also found to be the front runner in Europe, with respect to greenfield investments in medium high-tech manufacturing. This top 10 list shows that, besides Emilia-Romagna, also the neighbouring region of Piemonte (Turin) had a large share of these types of investments. Included in this list of 10 were the three German regions of Düsseldorf, Frankfurt and Munich, with a large share of greenfield investments in this type of activity, as were two regions in Poland: Warsaw and Dolnoslaskie. The shares of this type of greenfield investment in the Dutch regions were even lower than for all foreign-owned firms in this industry.

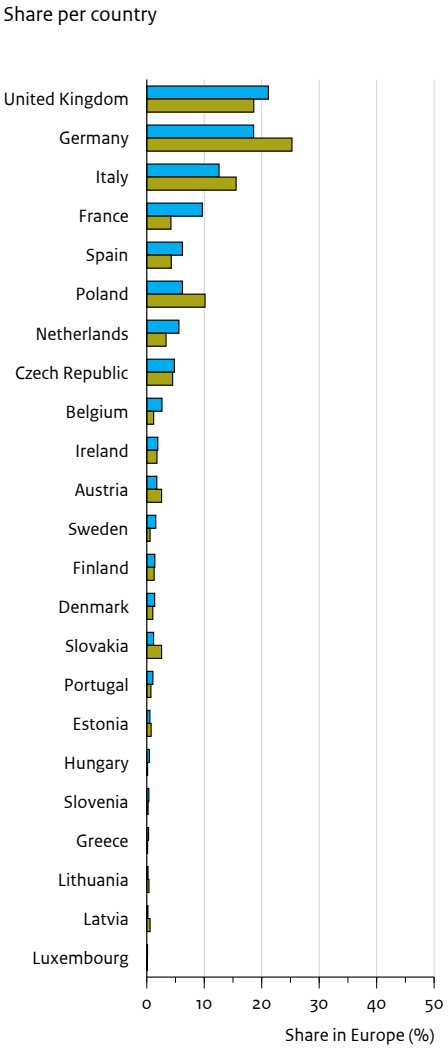
Foreign-owned knowledge-intensive market services

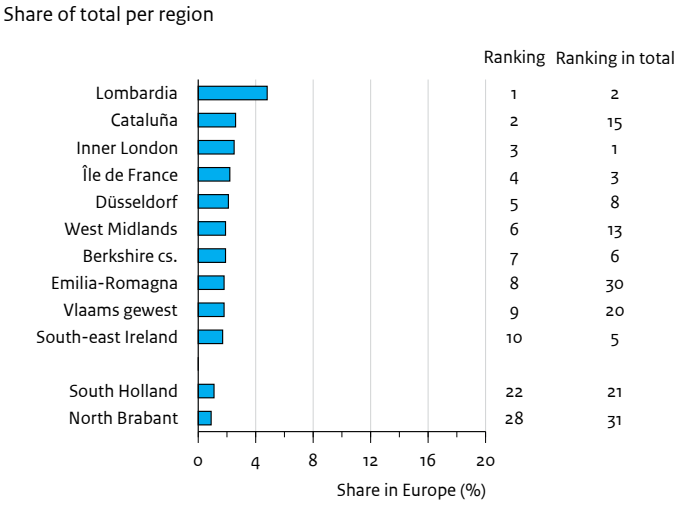
Most foreign-owned knowledge-intensive market services were found to be active in management consultancy and head office activities. Also included in

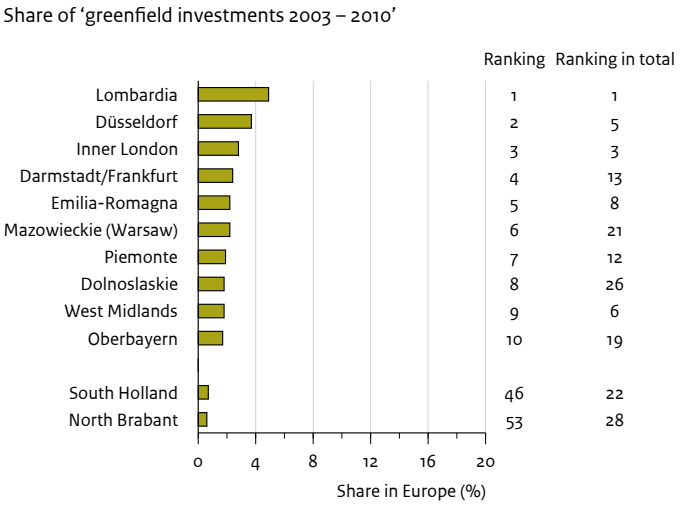
Figure 2.8

Factsheet of spatial pattern of foreign-owned firms in medium high-tech manufacturing, 2010









Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

knowledge-intensive market services are water and air transport, legal and accounting activities, architectural and engineering activities, advertising and market research, security and investigation, employment activities and other professional, scientific and technical activities (see Appendix 2.2). Contrary to the spatial pattern of foreign-owned firms in high-tech and medium high-tech manufacturing, the largest share of foreign-owned firms in knowledge-intensive market services was not located in the United Kingdom, but in Germany, which had 35.3% of these firms (see Figure 2.9). In the United Kingdom, with the second largest share, this was found to be only 14.5%. With respect to greenfield investments, the dominance of Germany was even larger. Since 2003, 41.7% of all European greenfield investments in knowledge-intensive market services have taken place in Germany. Similar to the pattern for firms in high-tech and medium high-tech manufacturing, the share of foreign greenfield investments in knowledge-intense market services in France, the Netherlands, Spain and Belgium, was smaller than that of total foreign-owned firms in these countries.

The map of the regional distribution of knowledge-intensive market services in Europe shown in Figure 2.9 shows that these firms mainly were concentrated in the more urbanised regions. Again, Inner London, Frankfurt, Lombardia, Paris and Dusseldorf had large shares of foreign-owned firms active in this field. Some other regions, such as Hamburg, Madrid and Berlin, which did not have large shares of foreign-owned firms in high-tech and medium high-tech manufacturing, appeared in the top 10 of knowledge-intensive services,. There was one notable exception to this spatial pattern in urban regions: Luxembourg. In the Netherlands, North Holland, the region where Amsterdam is located, had the largest share of foreign-owned firms active in these services (1.9%).

Greenfield investments in knowledge-intensive market services were also concentrated in Germany: five of the top 10 regions were found to be German (Frankfurt, Dusseldorf, Munich, Hamburg and Berlin). In addition to these German urban regions, many of such investments occurred in Inner London, Luxembourg, Vienna, and Warsaw.

Foreign-owned knowledge-intensive high-tech services

Foreign-owned firms in knowledge-intensive high-tech services were mainly active in computer programming, consultancy and related activities, but also in activities relating to broadcasting, cinema, television and sound recording, and scientific research and development activities (see Appendix 2.2). Of the foreign-owned high-tech services, by far the most were located in the United Kingdom (Figure 2.10). Almost 37% of the total of foreign-owned firms active in this field in Europe. Again, Germany, Italy and France were in successive positions. Although the Netherlands had the fifth largest share of foreign-owned firms in total, it ranked sixth behind Spain with respect to high-tech services. The United Kingdom and Germany were found to attract an even larger share of greenfield investments in this area, while Italy, France, Spain and the Netherlands all had a smaller share of greenfield investments than of all foreign-owned firms in this area.

The spatial pattern within Europe again was found to be characterised by large regional differences in the shares of foreign-owned firms in high-tech services (see Figure 2.10). Inner London had by far the largest share of foreign-owned firms in this activity. This region attracted 14.2% of all foreign-owned firms investing in high-tech services within Europe, while the region with the second largest share only attracted 4.5%. The regions with the second and third largest shares of foreign-owned firms in high-tech services both are adjacent to Inner London: Buckinghamshire/Oxfordshire and Outer London. The other regions in the top 10 were mainly large urban areas, such as Lombardia, Paris, Madrid, Munich, Dublin, Frankfurt, and Lazio (where Rome is located). In the Netherlands, North Holland again had the largest share of foreign-owned firms in high-tech services (ranking 13th within Europe, with 1.9%).

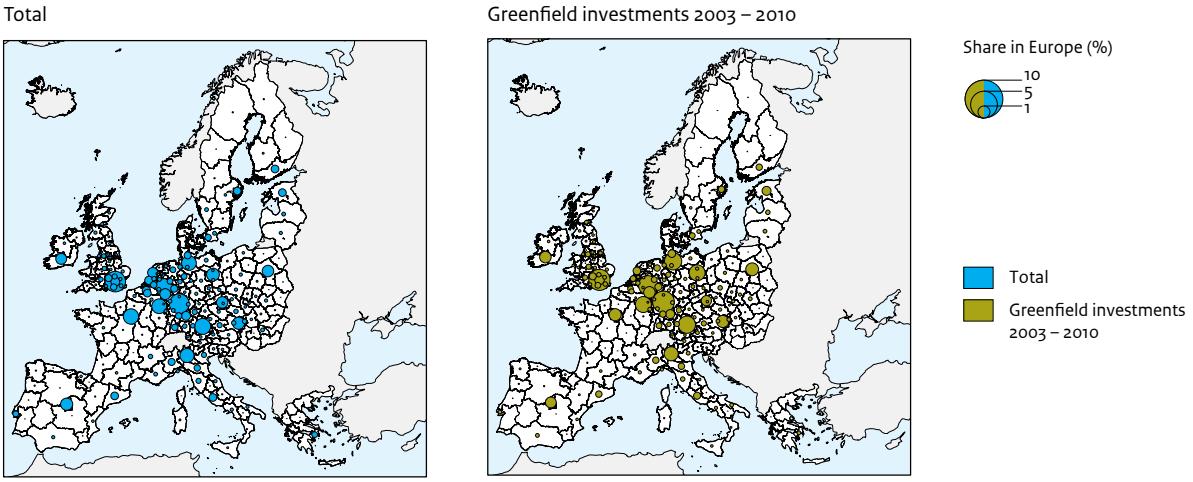
Inner London's dominant position in attracting FDI in high-tech services was found to be even larger with respect to greenfield investments (see Figure 2.10). This region had a share of 16.9% of greenfield investments in these activities, again followed by neighbouring regions Outer London (5.4%) and Buckinghamshire/Oxfordshire (4.3%). The German regions of Munich and Frankfurt also had a large share of greenfield investments in high-tech services. Madrid was not part of the top 10 in greenfield investments, while Warsaw joined the top 10 of foreign greenfield investments in high-tech services. The Dutch regions again had a smaller share of greenfield investments than of total foreign-owned firms in high-tech services.

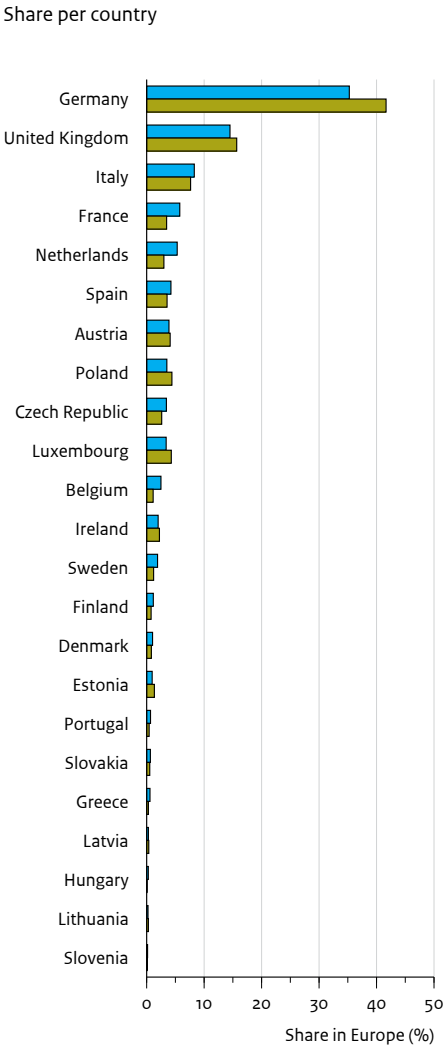
Foreign-owned firms in knowledge-intensive financial services

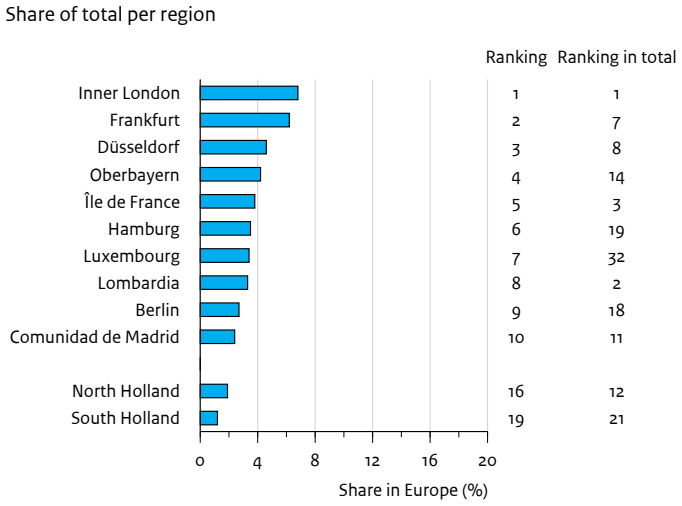
The Amadeus data set does not include any information on insurance, reinsurance and pension fund companies (see Appendix 2.1 'additional rules'). Therefore, the category of knowledge-intensive financial services used in this report mainly consisted of firms active in financial services, such as holding companies and auxiliary activities (see Appendix 2.2). Here, also, the United Kingdom had the largest share of foreign-owned firms, but the rest of the top 3 was quite different from the situation in the other knowledge-intensive activities (see Figure 2.11). Not Germany, France or Italy appeared in this

Figure 2.9

Factsheet of spatial pattern of foreign-owned firms in knowledge-intensive market services, 2010



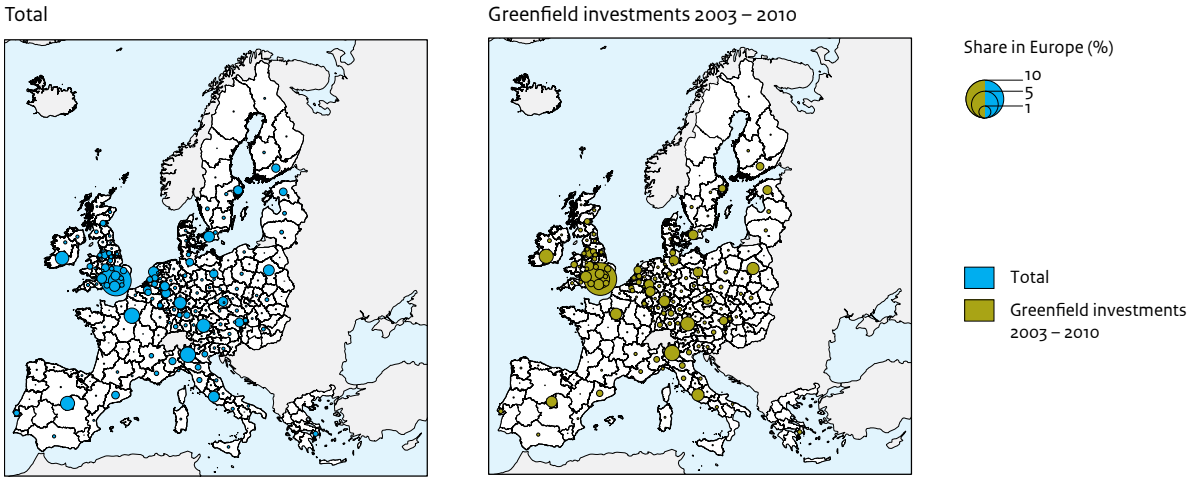


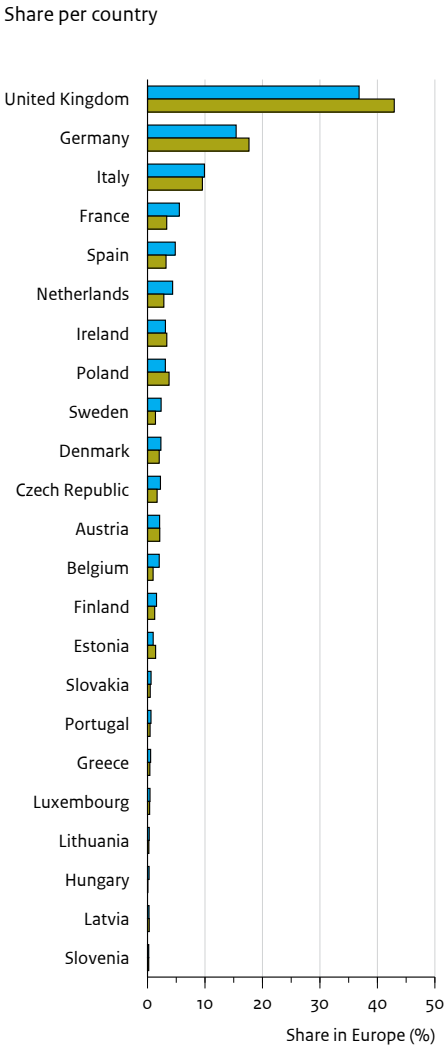


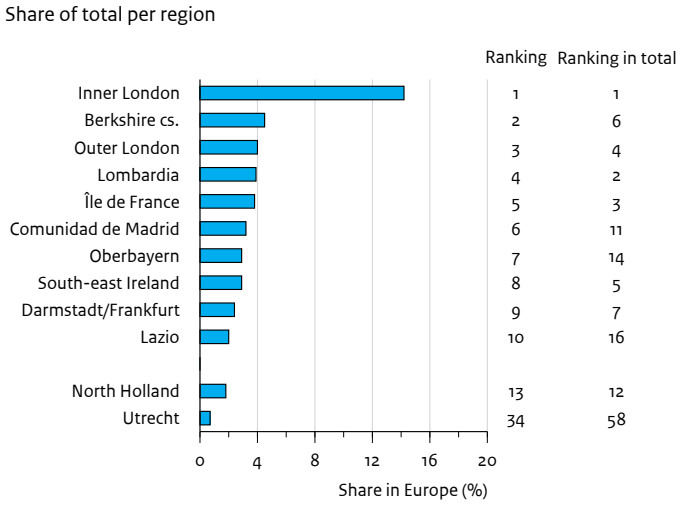
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Figure 2.10

Factsheet of spatial pattern of foreign-owned firms in knowledge-intensive high-tech services, 2010



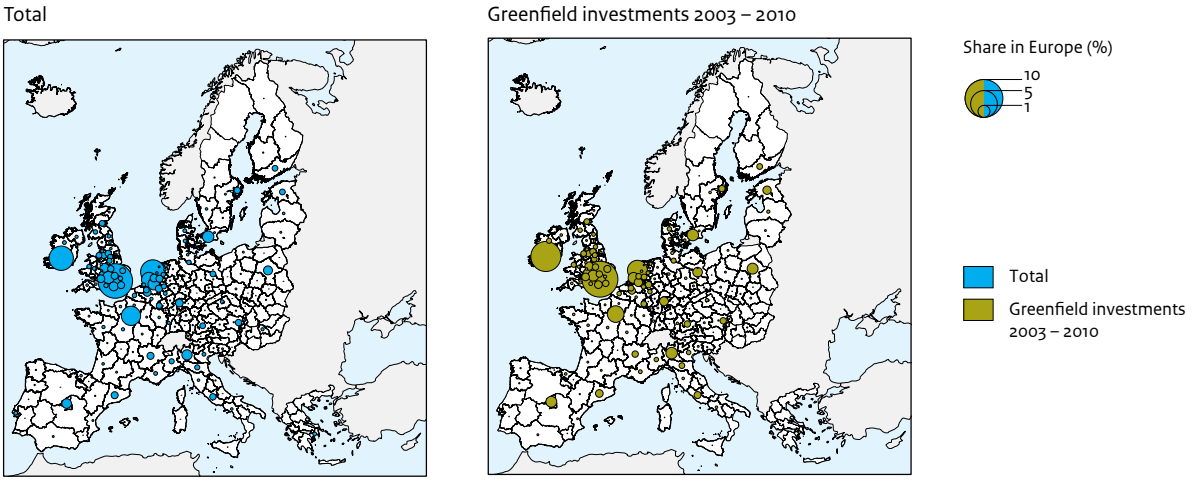


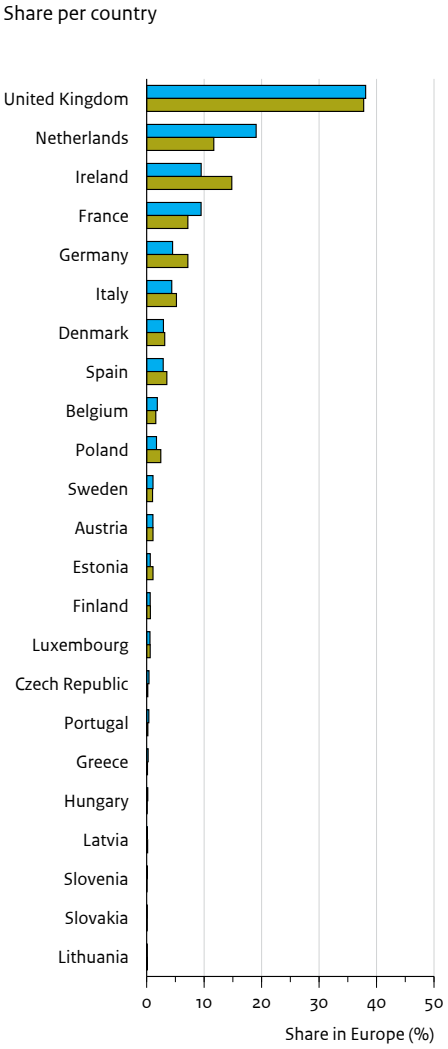


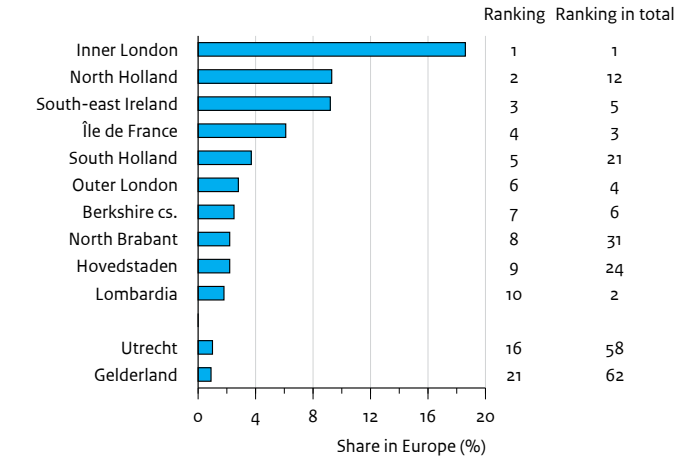
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Figure 2.11

Factsheet of spatial pattern of foreign-owned firms in knowledge-intensive financial services, 2010







Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

short list, but the Netherlands and Ireland took up the second and third positions.

Foreign-owned firms in financial services were found to be very unevenly distributed across Europe (see Figure 2.11). With a share of almost 20% of all foreign-owned firms in financial services within Europe, Inner London attracted by far the most of these investments. However, the region of North Holland in the Netherlands ranked second, with a share of 9.3%. Furthermore, also the Dutch regions of South Holland and North Brabant had shares large enough to reach the top 10 in Europe. Other regions in this top 10 also belonged to the top 10 on FDI in other knowledge-intensive activities, except for the Danish region of Hovedsteden, where Copenhagen is located.

With respect to greenfield investments in financial services, North Holland and South Holland were found to be in the top 10, although the shares of both regions were a bit smaller than in total foreign-owned financial services (6.2% and 2.1%, respectively). Most greenfield investments in financial services took place in Inner London and south-east Ireland (Dublin). When foreign greenfield investments only are considered, Warsaw was included in the top 10 again.

Clearly, the Netherlands was found to have a unique position within Europe, with respect to attracting FDI in financial services. Although the share of foreign-owned firms in the Dutch regions was not large enough for a position in the European top 10 of all other knowledge-intensive activities, three of the these regions had a very large share of foreign-owned financial services. This position was mainly due to the Netherlands being an attractive location for multinational firms, from a fiscal point of view, due to an extensive network of bilateral tax agreements, participation exemptions and advanced tax rulings (Van den Berg et al., 2008). Appendix 2.5 provides a more detailed description of this attractiveness of the Netherlands to FDI in financial services.

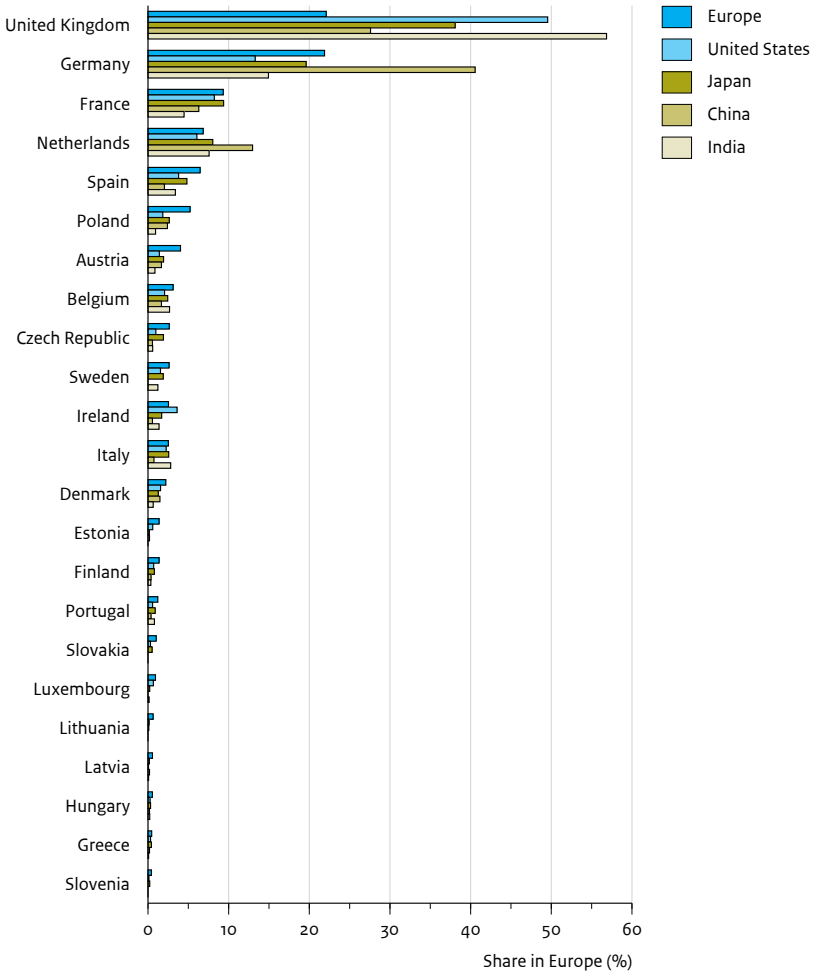
Spatial pattern of foreign-owned firms divided per home country

Most of the firms that had invested in the 238 European regions included in this study originated from a European country themselves (65.5%). The second and third largest groups of investors came from the United States and Japan (19.9% and 2.3%, respectively). Although the number of foreign-owned firms from China and India was still very limited in 2010 (0.26% and 0.66%, respectively), outward FDI from both countries has quickly been growing and has attracted much interest from policymakers (see Brienen et al., 2010). Therefore, we also included the spatial pattern of firms with an owner from these countries, to obtain insight into whether the locational preferences of foreign firms from these countries would differ. Figure 2.12 shows the shares of firms with an owner from Europe, the United States, Japan and China, spread across 23 European countries.

The resulting pattern indicated the different locational preferences. Although the largest shares of firms from the United States, Japan and India by far were located in the United Kingdom, the largest share of Chinese firms could be found in Germany and the share of European investors in the United Kingdom and Germany was roughly similar (22.1% and 21.9%, respectively). The large share of Indian firms in the United Kingdom is likely to be due to the historical links between the two countries. Firms from the United States seemed to prefer English speaking countries, as both the United Kingdom and Ireland were found to have a relatively large share of US investors. Chinese firms, contrastingly, seemed to prefer a location in Germany above one in the United Kingdom, although the second largest share of Chinese firms was still located in the United Kingdom. Furthermore, the share of Chinese firms located in the Netherlands was also relatively large, compared to the investors from the other countries. Nevertheless, the number of Chinese firms in Europe in 2010 was still quite limited (about 500) and, therefore, the absolute number of Chinese firms was still lower than that of the other three countries. The firms from the United States and the Asian countries seemed to be less interested in investing in eastern Europe, compared to European firms. Especially in Poland, the share of foreign-owned European firms was about twice as large as that of firms from outside Europe. In the three Scandinavian countries, the share of European firms was also larger. The Netherlands had quite a large share of Japanese firms and a relatively small share of firms from China.

Figures 2.13, 2.14, 2.15, 2.16 and 2.17 show both a map of the regional distribution of foreign-owned firms, and a graph indicating the ten European regions with the largest shares of foreign-owned firms originating from Europe, the United States, Japan, China and India. Of the top 10 regions with the largest shares of each category of foreign-owned firms, in all cases, the largest share of these firms was located in the Inner London region. Although, at country level, most Chinese firms were located in Germany, regionally speaking Inner London still attracted most investors from this country. However, investors from India, the United States and to a lesser extent from Japan did have a stronger preference for this region. Almost 25% of all Indian firms and almost 20% of all US firms in Europe were located in this region, compared to 16.4% of all Japanese firms, about 10% of all Chinese firms and less than 8% of the investing European firms. Both the maps and the graphs of the top 10 regions

Figure 2.12
Distribution of foreign-owned firms per country, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

with the largest share of Chinese firms also show a strong preference of these firms for Germany and the Netherlands. Seven of the ten regions with the largest share of Chinese firms were located in these countries.

In addition to Inner London, also Frankfurt, North Holland, Paris, Dusseldorf and Madrid were found to be regions with large shares of investors from European countries as well as from at least three of the four countries outside Europe. North Holland had the largest share of firms from the United States, Japan and India, while the largest share of Chinese firms in the Netherlands was located in South Holland.

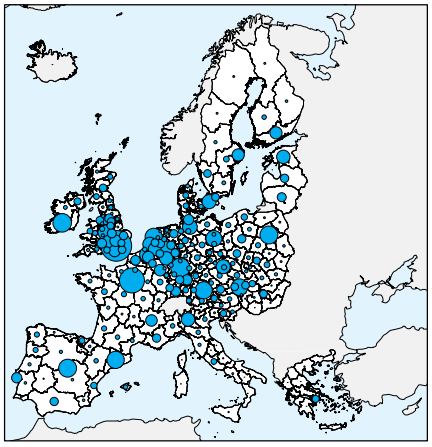
Firms from Europe, the United States, Japan, China and India clearly preferred different European regions. In general, firms from the United States, Japan and India seemed to prefer the United Kingdom, and the larger cities in western Europe, while Chinese firms tended to invest more often in central Europe (Germany and the Netherlands). Regions in the south, east and north of Europe more often attracted investors from other European countries.

The differences between the spatial patterns of European, US, Japanese, Indian and especially Chinese firms in Europe may have been due to differences in the individual firms' motives for investing in Europe. Other empirical studies on Chinese firms investing in Europe have shown that most of these firms were driven by

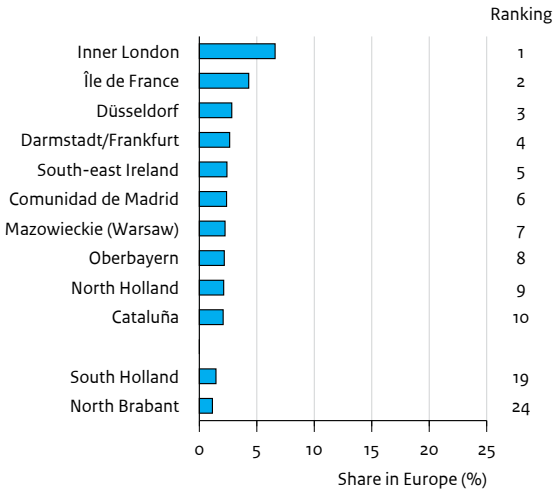
Figure 2.13

Spatial pattern of foreign-owned firms from Europe, 2010

Spatial pattern



The 10 regions with the largest shares

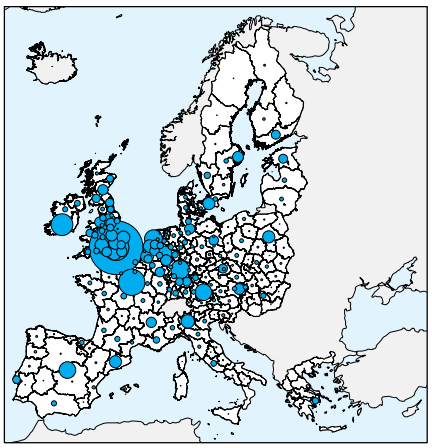


Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

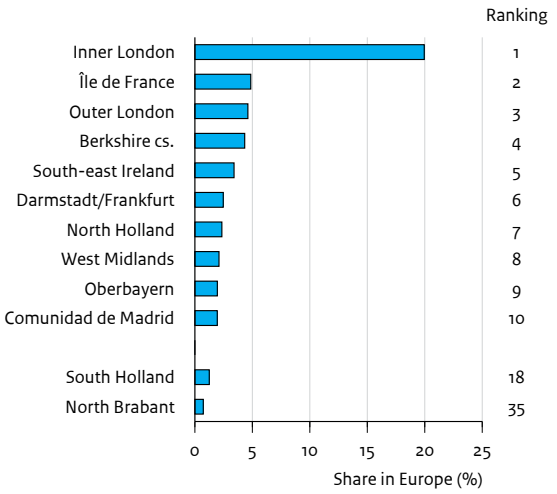
Figure 2.14

Spatial pattern of foreign-owned firms from the United States, 2010

Spatial pattern



The 10 regions with the largest shares

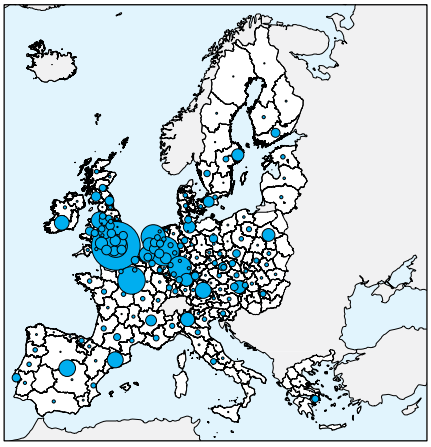


Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Figure 2.15

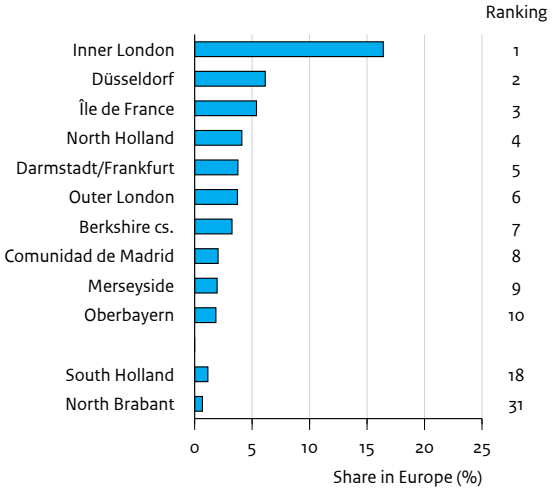
Spatial pattern of foreign-owned firms from Japan, 2010

Spatial pattern



Share in Europe (%)

The 10 regions with the largest shares

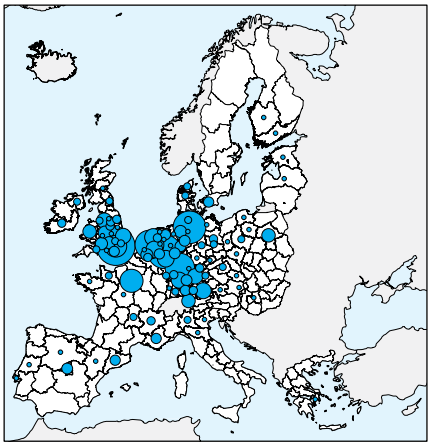


Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Figure 2.16

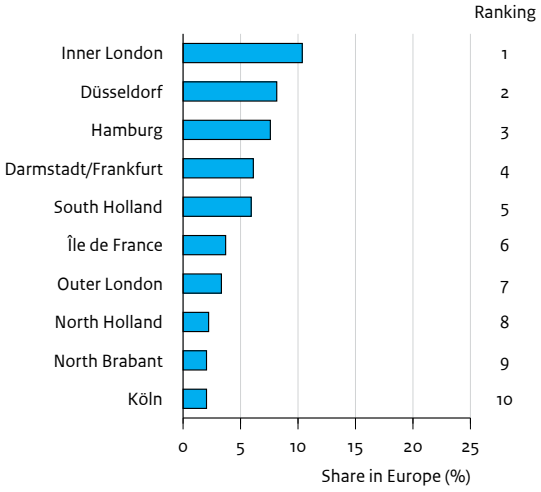
Spatial pattern of foreign-owned firms from China, 2010

Spatial pattern



Share in Europe (%)

The 10 regions with the largest shares

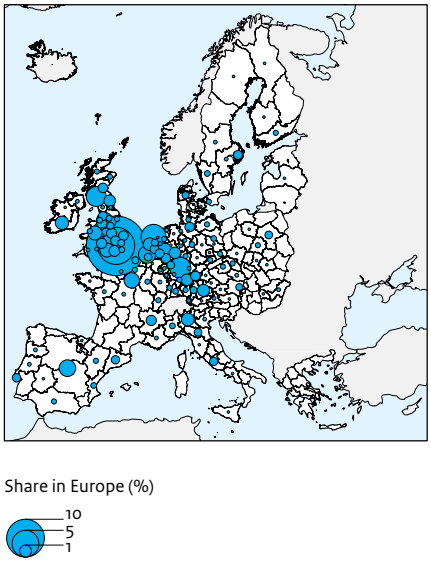


Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

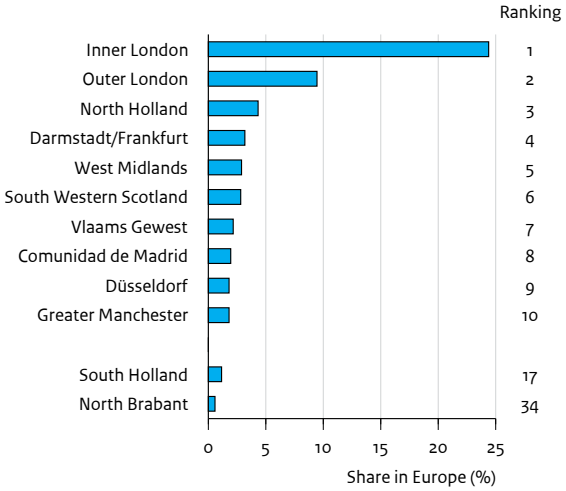
Figure 2.17

Spatial pattern of foreign-owned firms from India, 2010

Spatial pattern



The 10 regions with the largest shares



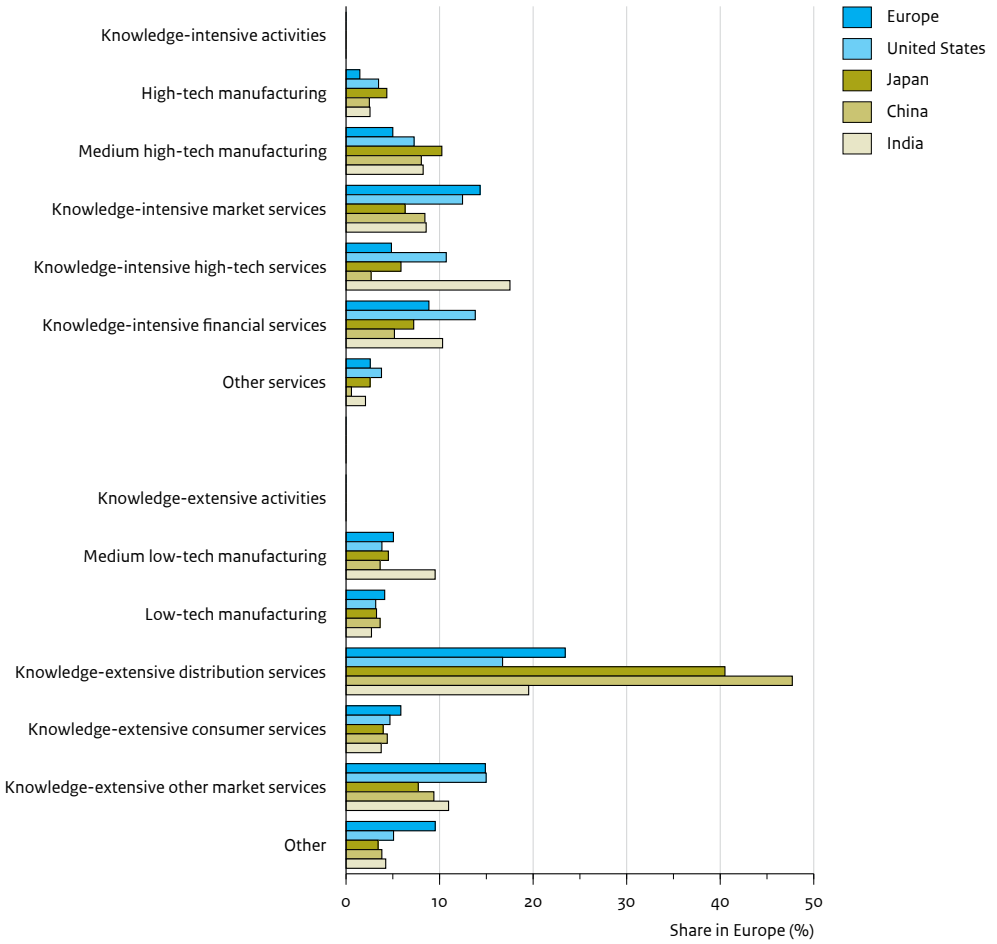
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

market-seeking motives (Brienen et al., 2010). Furthermore, while firms from the United States and Japan have been investing in Europe for several decades, most Chinese and Indian firms have only recently entered the European market (Hogenbirk, 2002; Brienen et al., 2010). As investing abroad is an evolutionary process starting with a relatively small investment that may develop into a production plant or R&D centre (Wintjes, 2001), Indian and Chinese firms mainly established only marketing and sales offices until 2010. Especially the search for strategic assets requires a relatively strong relationship with the host region, something which tends to develop over time.

To obtain further insight into whether the firms from the United States, Japan, India and China had different motives for investing in Europe, Figure 2.18 shows the types of industries related to the main European activities of these firms. Similar to the firms from other European countries, most firms from countries outside of Europe were found to be involved in distribution. However, the share of Chinese and Japanese firms that were involved in this activity was much larger than the share of European, Indian or US firms. Compared to the other investors, firms from the United States were much more often active in financial services, and firms from India in high-tech services (mainly software developing). In addition to distribution, Japanese firms were also more often involved in knowledge-intensive manufacturing, compared to other foreign-owned firms. In keeping with the results from prior studies on FDI by Chinese companies in Europe, our results also suggested that knowledge-extensive distribution activities were by far the most important activity of Chinese firms in Europe, at the end of 2010. The quick growth in FDI by Chinese firms may lead to quick changes in this pattern. The relatively large share of Chinese firms active in distribution may also explain why these firms are mainly located in Germany and the Netherlands, as both countries have a relatively strong specialisation in this activity.

In sum, the description of the regional spatial patterns of foreign-owned firms shows that large regional differences in the number of foreign-owned firms indeed existed, both between and within European countries. Furthermore, different patterns emerged when these firms were divided according to type of industry or country of origin. Within countries, the spatial pattern of these foreign-owned firms also differed. While in some countries most foreign-owned firms would be located in only a few interconnected regions (e.g. the United Kingdom, France), the pattern in other countries was more evenly spread (in Germany, and to some extent also the Netherlands). Although the Netherlands, as a whole, was found to have a relatively large number of foreign-owned firms, this was mainly due to their large share of

Figure 2.18
Distribution of foreign-owned firms per industry, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

financial services and distribution activities. In all other knowledge-intensive activities in the Netherlands, the share of foreign-owned firms was not large enough to achieve a top 10 position in Europe.

2.4 Geographic distribution of domestic and foreign-owned firms in the Netherlands

This section further examines the spatial pattern of foreign-owned firms in the Netherlands, in 2010, by comparing their geographic distribution over the 12 Dutch regions with that of the domestic firms. This information then provides further insight into whether foreign and domestic firms chose the same regions, or if there were concentrations of foreign firms in specific Dutch regions. Table 2.4 shows this comparison for all firms combined, for those in the knowledge-intensive and knowledge-extensive industries, and for the five knowledge-intensive industries separately.
Foreign-owned and Dutch firms clearly differed in their locational choices within the Netherlands in 2010[3]. Although South Holland had the largest share of domestic firms, in North Holland the share of foreign-owned firms was much larger (see Table 2.4). While 19% of all Dutch firms were located in North Holland, the percentage of foreign-owned firms in this region was 34%. In other words, foreign-owned firms seemed to prefer the region that holds Amsterdam, the capital city of the Netherlands, and Amsterdam Airport Schiphol as their

Table 2.4
Distribution of foreign-owned and domestic firms across regions (NUTS2) in the Netherlands in 2010

	Total firms Domestic	Total firms Foreign	Knowledge-intensive, total Domestic	Knowledge-intensive, total Foreign	Knowledge-extensive firms - Domestic	Knowledge-extensive firms Foreign	High-tech manufacturing - Domestic	High-tech manufacturing - Foriegn	Meidum high-tech manufacturing - Domesstic	Meidum h igh-tech manufacturing - Foreign	Knowledge-intensive market services - Domesitic	Knowledge-intensive market services - Foreign	Knowledge-intensive high-tech services - Domestic	Knowledge-intensive high-tech services - Foreign	Knowledge-intensive financial services - Domestic	Knowledge-intensive finacial services - Foreign
North Holland	19.1	33.7	20.3	41.0	17.3	24.5	13.7	13.2	12.2	16.1	20.1	34.9	25.7	41.3	20.0	48.7
South Holland	21.6	21.5	21.2	19.7	22.2	23.7	16.2	18.1	17.5	19.9	22.4	23.3	20.7	15.0	21.1	19.2
North Brabant	16.9	15.3	16.5	13.0	17.5	18.0	20.2	20.1	20.8	16.5	16.7	13.8	14.0	14.3	16.7	11.6
Utrecht	9.6	7.6	10.1	7.1	8.9	8.1	9.8	12.3	8.1	7.9	12.0	7.9	13.9	15.3	8.9	5.4
Gelderland	9.4	6.9	9.3	5.6	9.6	8.4	10.9	13.2	12.1	11.8	8.5	5.5	8.2	3.9	9.7	4.5
Limburg	5.4	6.0	5.0	5.1	6.0	7.1	6.0	10.3	6.1	9.4	4.8	5.2	3.7	3.3	5.2	4.2
Overijssel	7.7	2.8	7.5	2.6	8.1	2.9	9.7	3.9	11.4	7.9	5.8	2.3	5.7	0.9	8.4	2.0
Zeeland	1.7	1.7	1.5	1.5	1.9	2.0	1.3	0.5	1.5	3.5	1.1	1.3	0.7	1.2	1.8	1.4
Flevoland	1.4	1.7	1.5	1.3	1.3	2.2	2.9	2.5	1.7	2.3	1.5	1.6	2.7	3.1	1.3	0.8
Groningen	2.5	1.4	2.5	1.7	2.4	1.0	4.0	2.5	3.3	2.0	1.8	3.4	2.2	0.5	2.9	1.2
Friesland	2.9	0.9	2.9	0.7	3.0	1.1	2.9	1.5	3.5	1.7	4.2	0.7	1.5	0.6	2.3	0.4
Drenthe	1.6	0.8	1.6	0.7	1.7	0.9	2.2	2.0	1.8	1.1	1.1	0.3	1.0	0.6	1.8	0.7
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Number of firms	423,062	13,701	258,103	7,605	164,959	6,096	1,290	204	5,683	659	71,122	1,641	13,157	642	153,542	4,193

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

location. In most other regions, the number of foreign-owned firms was below that of domestic firms, with the exception of Flevoland, Zeeland and Limburg. The last two regions are thought to have attracted a relatively large share of cross-border investments because they are located adjacent to more urbanised Belgian and German regions. Particularly in the north (Friesland, Groningen, Drenthe) and east (Overijssel), regions had a small number of foreign-owned firms, compared to the number of domestic firms. Contrary to the regions in the south, these regions did not seem to benefit from their proximity to Germany.

The distinction between knowledge-intensive and knowledge-extensive activities shows that the geographic distribution of both these activities over the Netherlands varied. With respect to the knowledge-intensive activities, North Holland's attractiveness to foreign-owned firms was found to be very strong: while this region held 20.3% of all Dutch firms in these types of activities, for foreign-owned firms this was 41% (see Table 2.4). In most other regions, the number of domestic firms dominated. Although North Holland also had the largest share of foreign-owned firms active in more knowledge-extensive industries, their spatial distribution was less concentrated. North Holland and South Holland had a comparable share of foreign-owned knowledge-extensive firms (24.5% and 23.7%, respectively). Furthermore, in North Holland, South Holland, North Brabant, Limburg, Zeeland and Flevoland, the share of foreign-owned firms active in knowledge-extensive industries was larger than that of domestic firms. The exact opposite was true for the three northern regions and Overijssel, in the east, with respect to both knowledge-intensive and knowledge-extensive industries.

Table 2.4 further distinguishes between the spatial distribution of foreign-owned and domestic firms, according to the five types of knowledge-intensive industries central to this study (see Appendix 2.2). This distinction shows that the spatial distribution of firms in

high-tech and medium high-tech manufacturing differed from that of the three types of knowledge-intensive services. Not only were the manufacturing firms more equally distributed over the 12 regions, but also North Brabant (instead of North Holland) was found to be the region with the largest share of both domestic and foreign-owned firms in high-tech manufacturing. Just over 20% of these firms were located in this region, with South Holland in second place with 18.2%. However, despite the large number of these types of firms in North Brabant, the share of foreign-owned firms in high-tech manufacturing was still slightly below that of the domestic firms. South Holland, Utrecht, Gelderland and Limburg had a large share of foreign-owned firms in high-tech manufacturing, compared to the domestic share. In North Holland, the share of foreign-owned firms in high-tech manufacturing was below that of domestic firms.

The spatial distribution of medium high-tech manufacturing was not identical to that of high-tech manufacturing. Although North Brabant had the largest share of domestic firms in medium high-tech manufacturing (20.8%), for foreign-owned firms this was South Holland (19.9%). In North Brabant the share of foreign-owned firms in this industry was relatively small compared to its domestic share (16.5% and 20.8%, respectively). In addition to the situation in South Holland, also in North Holland, Limburg, Flevoland and Zeeland, foreign-owned firms in medium high-tech manufacturing outnumbered domestic ones.

Contrary to foreign-owned firms in knowledge-intensive manufacturing, the geographic distribution of knowledge-intensive services was much more concentrated. For all three types of services, North Holland was found to be the region with by far the largest share of foreign-owned firms. Nevertheless, the spatial patterns of the three types of services did differ. Compared to high-tech and financial services, knowledge-intensive market services were more equally distributed over the Netherlands. Both North Holland and South Holland had a relatively large share of foreign-owned market services (34.9% and 23.3%, respectively). In both regions, this share was larger than that of domestic knowledge-intensive market services, although this difference was much greater in North Holland.

The foreign-owned high-tech services were even more concentrated in North Holland (41%), but their distribution across the other regions was quite different. South Holland had a relatively small share of foreign-owned high-tech services, compared to its domestic share, while in both North Brabant and Utrecht the situation was reversed. Possibly, the locational preferences of high-tech services were similar to those of high-tech manufacturing, and, therefore, both activities preferred North Brabant. Utrecht has always had a large share of domestic firms, and for most types of industries the share of foreign-owned firms in this region was relatively small. With the exception of firms active in high-tech services, this region seemed to function more as a national centre.

The spatial distribution of foreign-owned financial services was found to be the most concentrated. Almost half of all foreign-owned firms in financial services in the Netherlands were located in North Holland, while the share of domestic financial services in this region was only 20%. This further confirmed the fact that foreign firms investing in financial services in the Netherlands specifically chose to be located in Amsterdam. The trust industry in the Netherlands was also concentrated in Amsterdam and, therefore, most foreign firms established their holdings in close proximity to those firms (see Appendix 2.5). In all other Dutch regions, the share of foreign-owned firms in financial services was below that of domestic firms.

In sum, this comparison shows that there was a difference in geographic distribution between foreign-owned and Dutch firms in the Netherlands. Foreign-owned firms largely preferred North Holland, especially firms that were active in knowledge-intensive services. Although North Brabant had the largest share of foreign-owned firms involved in knowledge-intensive manufacturing, the share of domestic firms in high-tech manufacturing was even larger. South Holland had a large share of foreign-owned firms in both knowledge-intensive services and manufacturing. This region had the largest share of foreign-owned firms in medium high-tech manufacturing.

2.5 Characteristics of host regions compared to home regions of parent firms

To obtain a further understanding of the motives of foreign firms for investing in Europe, and, more specifically, in Dutch regions, we compared the R&D intensity and the GDP per capita of the host regions to the home regions of the foreign-owned firms in Europe. The R&D intensity of investors' home regions provided insights into the potential effect of the foreign investments on the economies of host regions. Firms that came from regions with a higher R&D intensity were found to be more likely to bring additional resources and capabilities to the host region and, consequently, both firms and regions would benefit from these investments.

However, firms coming from technically lagging regions may have been more likely to invest in the Netherlands to obtain access to region-specific knowledge without providing the host region with any additional resources. Such investments may even have had negative effects, because in those cases region-specific knowledge would be more likely to be replicated in the home regions of these foreign firms (Chung and Alcácer, 2002).

In a similar way, we also examined the GDP per capita in home regions of firms investing in Europe and the Netherlands. This provided further insight into whether these firms invested in another country in Europe because they had developed a product or service that had proven very successful and therefore also could be marketed elsewhere, or if these firms perhaps were forced to search for other geographic markets due to a lack of demand in their home regions.

This analysis was limited to foreign-owned firms for which the location of the parent firm was known and with their main offices located in one of the 23 European countries central to this study (44.5% of all foreign-owned firms in Europe).[4] The latter selection criteria followed from the fact that we only had information on the R&D intensity and GDP per capita in those European regions. First, description is given of the similarity in characteristics between the host and home regions of European firms investing in other European countries, both with respect to R&D intensity (the share of R&D expenditures by public and private organisations in the region's GDP) and GDP per capita. Second, the focus was on characteristics of the home regions of foreign firms investing in Dutch regions. We investigated how likely it would be that foreign firms investing in the Netherlands would bring new and complementary knowledge, thus, stimulating the local economies of Dutch regions? Finally, this section takes a more in-depth look at the home regions of firms that invested in North Holland, South Holland, and North Brabant, the Dutch regions with the largest shares of foreign-owned firms in the Netherlands.

The 238 European regions included in our analysis were divided into two groups, using their average R&D intensity and GDP per capita[5]. If a region's R&D intensity or the GDP per capita was above the European average, it was considered to be a leading region. All other regions were considered lagging regions. Tables 2.5 and 2.6 show the percentage of foreign-owned firms in Europe coming from either leading or lagging regions and having invested in either leading or lagging regions within Europe, for R&D intensity and GDP per capita, respectively. In both tables, the shares of foreign-owned firms are shown in total, and of those active in knowledge-intensive manufacturing or services.

Table 2.5 shows that, within Europe, foreign firms were found to mainly invest in regions with an R&D intensity of above the European average. By far the largest share of these foreign firms was owned by an European firm that came from a leading R&D region (71.1%). The largest part of this group of firms had invested in another leading R&D region (40.9%). The largest number of these firms seemed to seek additional knowledge, as they invested in regions with an equally strong knowledge base ('home-base augmenting')[6]. Such investments may strengthen not only the investing firm's knowledge base, but also its home region and the host region. Quite a substantial share of investments still took place in regions with a lagging R&D intensity (43.7%). Most of these investments had been conducted by firms that came from leading R&D regions (30.1%). These firms seemed to invest in other European regions to take advantage of their stronger technological position ('home-base exploitation'). A much smaller share of the investors in Europe could be viewed as technology seekers, that is, firms that invest in stronger regions in order to compensate for the weakness of their home regions (15.3%).

We performed similar calculations for firms investing only in knowledge-intensive manufacturing or in knowledge-intensive services. Although both these types of investments showed a pattern similar to that of all foreign-owned firms, for knowledge-intensive services, the share of firms from leading regions that invested in leading regions was even larger (47.3%). Compared to knowledge-intensive services, firms investing in knowledge-intensive manufacturing were found to be slightly more likely to come from a lagging region and to invest in a lagging region, although this was only the case for 14% of all foreign-owned firms active in knowledge-intensive manufacturing.

Table 2.6 shows the shares of foreign-owned firms that originated from regions with a GDP per capita of below or above the European average (lagging and leading regions, respectively), and that were established in either lagging or leading host regions. This table also shows the shares of all investing firms owned by a firm from another European country, and the shares of firms active only in knowledge-intensive manufacturing or knowledge-intensive services. In general, the pattern was found to be quite similar to that based on the R&D intensity of regions; most foreign-owned firms both originated from and invested in leading regions. The differences for GDP per capita were even greater. More than 70% of all European firms that had invested in another European country both came from and invested in leading regions. Again, the second largest number of firms concerned those originating from leading regions and investing in lagging regions (21.9%).

Table 2.5

Percentage of foreign-owned firms divided according to the R&D intensity of their home and host regions within Europe (n = 71,345)

		Host region				
		Lagging		**Leading**		**Total**
Home region		Total	13.6	Total	15.3	28.9
		Knowledge-int. manufacturing	14.0	Knowledge-int. manufacturing	13.0	27.0
	Lagging	Knowledge-int. services	9.3	Knowledge-int. services	17.1	26.4
		Total	30.1	Total	40.9	71.1
		Knowledge-int. manufacturing	35.3	Knowledge-int. manufacturing	37.7	73.0
	Leading	Knowledge-int. services	26.3	Knowledge-int. services	47.3	73.6
		Total	43.7	Total	56.3	100.0
		Knowledge-int. manufacturing	49.3	Knowledge-int. manufacturing	50.7	100.0
	Total	Knowledge-int. services	35.6	Knowledge-int. services	64.4	100.0

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Leading = R&D intensity above the average of the 23 European countries included in the analysis

Lagging = R&D intensity below the average of the 23 European countries included in the analysis

Table 2.6

Percentage of foreign-owned firms divided according to the GDP per capita of their home and host regions within Europe (n = 71,345)

		Host region				
		Lagging		**Leading**		**Total**
Home region		Total	3.3	Total	4.3	7.6
		Knowledge-int. manufacturing	2.4	Knowledge-int. manufacturing	3.2	5.6
	Lagging	Knowledge-int. services	1.9	Knowledge-int. services	4.0	5.9
		Total	21.9	Total	70.6	92.4
		Knowledge-int. manufacturing	27.5	Knowledge-int. manufacturing	66.9	94.4
	Leading	Knowledge-int. services	14.5	Knowledge-int. services	79.6	94.1
		Total	25.1	Total	74.9	100.0
		Knowledge-int. manufacturing	30.0	Knowledge-int. manufacturing	70.0	100.0
	Total	Knowledge-int. services	16.4	Knowledge-int. services	83.6	100.0

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Leading = R&D intensity above the average of the 23 European countries included in the analysis

Lagging = R&D intensity below the average of the 23 European countries included in the analysis

The differences between knowledge-intensive manufacturing and services were similar to those for R&D intensity: especially the firms investing in services both came from and invested in leading regions (79.6%). Although this was also the case for by far the most firms investing in knowledge-intensive manufacturing (66.9%), the share of firms that came from leading regions and invested in lagging regions was considerably larger than for knowledge-intensive services (27.5% and 14.5%, respectively). Firms in knowledge-intensive manufacturing were possibly more likely to have made such investments because, contrary to services, they would not have to produce in the same location as where their customers would be located, and, therefore, they took advantage of the lower labour costs in lagging regions. Knowledge-intensive services, however, always require proximity to customers and, therefore, the investments in these activities were more concentrated in regions with a higher GDP per capita.

We examined whether this pattern would also apply to foreign investments in the Netherlands. Table 2.7 shows the average R&D intensity and GDP per capita belonging to the regions in which firms from other European countries had invested (host regions) and those from which investors originated (home regions). The latter was

Table 2.7
Characteristics of the host and home regions of firms owned by firms from other European countries (average over 1999–2002 period)

	North Holland	South Holland	North Brabant	NL total	Europe total
Characteristics host regions					
R&D intensity (%)	1.75	1.70	2.78	1.59	1.41
GDP per capita (euros)	31,124	27,442	27,226	25,606	19,958
Characteristics home regions					
Total foreign-owned firms					
R&D intensity (%)	2.3	2.4	2.5	2.4	2.4
GDP per capita (euros)	36,914	37,153	29,417	33,380	32,227
Number of European investors	1,166	969	881	4,518	71,345
Knowledge-intensive manufacturing					
R&D intensity (%)	2.4	2.6	3.2	2.6	2.5
GDP per capita (euros)	36,614	35,685	32,388	33,174	31,319
Number of European investors	34	55	55	291	5,111
Knowledge-intensive services					
R&D intensity (%)	2.3	2.3	2.5	2.3	2.5
GDP per capita (euros)	37,656	36,905	28,580	34,266	34,676
Number of European investors	704	378	345	1,968	18,211

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency, Eurostat 2010, Cambridge Econometrics ERP 2010

calculated as the weighted average of the R&D intensity and GDP per capita in the home regions of all foreign firms that invested in one or more of the host regions[7]. The table shows this for all firms in Europe owned by a firm from another European country, as well as for all such firms located in the Netherlands, and, more specifically, those located in one of the three Dutch regions with the largest share of foreign-owned firms in the Netherlands.

In this section, first the results for Europe as a whole are discussed, followed by results for the Netherlands and the three specific Dutch regions. Table 2.7 shows that, on a European level, the average R&D intensity and GDP per capita of the home regions were higher than of the host regions. This is also the case when only the foreign-owned firms active in knowledge-intensive manufacturing and knowledge-intensive services would be taken into account. The relatively large difference in average value between host and home regions shows that, although most firms invested in regions with an equally strong knowledge and market base (see Tables 2.5 and 2.6), a substantial group of firms did exploit their technological and market advantages by investing in regions with a lower R&D intensity and GDP per capita.

For the Netherlands, as a whole, and the three Dutch regions, in particular, both R&D intensity and GDP per capita were above the European average (see Table 2.7). However, with the exception of North Brabant, which had a high R&D intensity itself, the average R&D intensity of the home regions of the investing European firms was higher than that of the Dutch host regions. This was also the case for the Netherlands as a whole. In the Netherlands, the R&D expenditures between 1999 and 2002 on average accounted for 1.6% of the GDP, while this was 2.4% in the home regions. This suggests that most firms that invested in the Netherlands were driven by home-base exploiting motives. However, the differences were small as the Dutch regions also had a relatively high R&D intensity, and especially North Brabant was quite likely to attract firms driven by knowledge-seeking motives.

Table 2.7 also shows the average R&D intensity of the home regions of only those firms that had invested in knowledge-intensive manufacturing or services activities in the Netherlands. The R&D intensity of the home regions of firms investing in knowledge-intensive services was found to be largely comparable with the average for all foreign-owned firms. However, for the firms that invested in knowledge-intensive manufacturing, the R&D intensity of the home regions was higher (for the Netherlands as a whole 2.6% instead of 2.4% for all foreign-owned firms). Especially the average R&D intensity of the home regions of firms investing in knowledge-intensive manufacturing in North Brabant was much higher, even higher than the R&D intensity of the region itself. Compared to the average of all 23 European countries, but also to the other Dutch regions, North Brabant mainly attracted investments by firms that

Table 2.8a

Percentage of firms that invested in the Netherlands and three Dutch regions, divided according to their home regions

	Netherlands		North Holland		South Holland		North Brabant	
Top 15 of European regions								
1	Vlaams Gewest	12.61%	Inner London	5.74%	Vlaams Gewest	10.86%	Vlaams Gewest	27.57%
2	Île de France	4.63%	Île de France	4.44%	Inner London	8.01%	Île de France	5.43%
3	Inner London	4.38%	Vlaams Gewest	3.77%	Paris	4.46%	Stockholm	2.35%
4	Stockholm	2.24%	Stockholm	2.50%	Stockholm	2.63%	Brussels	2.13%
5	Brussels	1.87%	Brussels	1.73%	Brussels	1.83%	Düsseldorf	2.13%
6	Düsseldorf	1.43%	Lombardia	1.58%	Düsseldorf	1.83%	Stuttgart	1.39%
7	Copenhagen	1.41%	Luxembourg	1.41%	Copenhagen	1.83%	Copenhagen	1.39%
8	Etelä-Suomi (Helsinki)	1.22%	Etelä-Suomi (Helsinki)	1.34%	Oberbayern	1.67%	Köln	1.25%
9	Luxembourg	1.20%	Lazio	1.30%	Luxembourg	1.67%	Inner London	1.25%
10	Lombardia	0.97%	Copenhagen	1.13%	Västsverige	1.13%	Etelä-Suomi (Helsinki)	1.17%
11	Västsverige	0.90%	Berkshire cs	1.09%	Lombardia	0.97%	Sydsverige	1.10%
12	South-East Ireland	0.89%	South-East Ireland	0.99%	Berkshire cs	0.75%	Lombardia	1.03%
13	Berkshire cs	0.76%	Västsverige	0.99%	Etelä-Suomi (Helsinki)	0.70%	Wallonne	0.73%
14	Stuttgart	0.70%	Outer London	0.95%	Syddanmark	0.65%	South-East Ireland	0.73%
15	Outer London	0.68%	Comunidad de Madrid	0.88%	South-East Ireland	0.59%	Luxembourg	0.73%
US		21.69%		25.88%		21.18%		16.64%
Japan		4.38%		5.85%		2.10%		2.13%
N = 100%		8738		2840		1860		1364
% Unknown		36%		38%		37%		35%
N Total		13701		4612		2943		2091

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Berkshire cs = Berkshire, Buckinghamshire and Oxfordshire

came from other European regions with very well-developed knowledge bases. With respect to the GDP per capita, Table 2.7 shows that, on average, the GDP per capita of the home regions of firms investing in the Netherlands, as well as in the three Dutch regions, was higher than that of the Netherlands itself. This was also the case for firms that invested in knowledge-intensive manufacturing or knowledge-intensive services.

Finally, this section takes a more specific look at the home regions of the largest groups of firms investing in the Netherlands, and, more specifically, in North Holland, South Holland and North Brabant. Tables 2.8a and 2.8b show the home regions of the 15 largest groups of investors from Europe, and the relevance of investing firms from the United States and Japan to each of these regions. Table 2.8a concerns all foreign-owned firms, while Table 2.8b only concerns the firms that invested in knowledge-intensive activities.

This list clearly shows a strong neighbourhood effect, as many investing firms were found to originate from neighbouring regions in Belgium and Germany. Almost 13% of all the firms that had invested in the Netherlands came from Vlaams Gewest, which is located south of the Netherlands. North Brabant, which borders directly on to this region, even had a larger share of investors from Vlaams Gewest (more than 27%). The other two Dutch regions do not directly border on to Vlaams Gewest, but still attracted a substantial share of investors from this region. The number of investors from neighbouring German regions was much smaller, but the Netherlands did attract a fair number of investments by firms from the neighbouring Ruhr Area (Düsseldorf and Cologne).

Table 2.8b

Percentage of firms that invested in knowledge-intensive activities in the Netherlands and three Dutch regions, divided according to their home regions

	Netherlands		North Holland		South Holland		North Brabant	
Top 15 of European regions								
1	Vlaams Gewest	11.27%	Inner London	5.89%	Vlaams Gewest	8.78%	Vlaams Gewest	29.86%
2	Île de France	4.78%	Île de France	4.68%	Inner London	5.89%	Île de France	5.44%
3	Inner London	4.39%	Vlaams Gewest	3.10%	Île de France	4.39%	Stockholm	3.11%
4	Stockholm	2.25%	Stockholm	2.58%	Stockholm	2.46%	Brussels	1.87%
5	Brussels	1.93%	Lombardia	1.95%	Brussels	2.25%	Stuttgart	1.56%
6	Etelä-Suomi (Helsinki)	1.36%	Brussels	1.68%	Luxembourg	2.03%	Köln	1.56%
7	Luxembourg	1.34%	Etelä-Suomi (Helsinki)	1.58%	Düsseldorf	1.71%	Lombardia	1.56%
8	Lombardia	1.32%	Luxembourg	1.53%	Hovedstaden	1.50%	Copenhagen	1.40%
9	Copenhagen	1.24%	Comunidad de Madrid	1.16%	Västsverige	1.39%	Etelä-Suomi (Helsinki)	1.40%
10	Düsseldorf	0.94%	Outer London	1.10%	Lombardia	1.28%	Sydsverige	1.40%
11	Berkshire cs	0.94%	Berkshire cs	1.05%	Berkshire cs	1.28%	Düsseldorf	0.93%
12	Västsverige	0.88%	South-East Ireland	0.95%	Syddanmark	0.86%	Wallonne	0.78%
13	Outer London	0.80%	Piemonte	0.89%	Oberbayern	0.75%	Luxembourg	0.78%
14	South-East Ireland	0.73%	Lazio	0.84%	Etelä-Suomi (Helsinki)	0.75%	Berkshire cs	0.78%
15	Cologne	0.59%	Copenhagen	0.74%	Cataluña	0.64%	Veneto	0.62%
US		25.92%		28.98%		27.41%		19.75%
Japan		3.69%		3.73%		1.28%		1.71%
N = 100%		4765		1901		934		643
% Unknown		37%		39%		38%		35%
N Total		7599		3117		1496		990

Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Berkshire cs = Berkshire, Buckinghamshire and Oxfordshire

In addition to coming from the neighbouring regions, many investors were found to originate from the larger metropolitan areas in Europe, such as London, Paris, Munich, Milan (Lombardia), Dublin (south-east Ireland) Brussels, Berlin, Rome (Lazio) and Madrid. This shows that those regions not only attracted many foreign investments, but that firms from those regions often also invested abroad themselves. A third notable group of investors in the Netherlands came from Scandinavian regions, such as Stockholm, Helsinki, Copenhagen, Västsverige (south-west Sweden), Sydsverige (south Sweden), and Syddanmark (south Denmark).

A comparison between the lists of the three Dutch regions shows that, despite the fact that a number regions was represented in each list (Vlaams Gewest, Paris, London, Brussels, Copenhagen, Stockholm, Helsinki, Luxembourg), there were some differences in countries of origin of the investors in these regions. Compared to the other regions, North Holland mainly attracted investments from firms located in large metropolitan areas in Europe. North Brabant, in contrast, attracted more investments from Belgium (Vlaams Gewest, Brussels and Wallonne) and Germany (Düsseldorf, Stuttgart, and Cologne). These differences seemed to reflect the differences in the industrial specialisation of both Dutch regions. North Holland was more specialised in knowledge-intensive services and North Brabant in knowledge-intensive manufacturing. Services tended to be concentrated in the larger urbanised regions, while manufacturing was more concentrated in several German regions (see Chapter 2). When the overview of home regions was limited to the firms that had invested in knowledge-intensive activities in the Dutch regions, hardly any differences were found

between the two lists of home regions (see Tables 2.8a and 2.8b). The share of investors from the United States increased in all regions, while that of investors from Japan dropped. This would indicate that investors from Japan mainly invested in less knowledge-intensive activities in the Netherlands. Within Europe, the main host regions remained the same, although some shifted position. Two regions came into view, which were not on the list before: the Piemonte region in relation to North Holland and Venice for North Brabant. Both these new regions are located in the north of Italy, surrounding Lombardia (Milan). This part of Europe not only seemed to attract many foreign-owned firms active in knowledge-intensive manufacturing (see Subsection 2.3.2), but firms from that region were found to be also more likely to invest in these activities within the Netherlands.

In sum, the comparison between host and home regions of European firms investing in other European countries and, more specifically, in the Dutch regions showed that, in general, most foreign-owned firms in Europe both came from and were established in leading regions, at least with respect to R&D intensity and GDP per capita. This suggests that most firms that invested in another European country were in search of additional knowledge or additional demand. This was also the case in the Netherlands. About one third of all firms that invested in other European countries came from leading regions and invested in lagging regions. This group of firms may have been driven by home-base exploiting motives, taking advantage of their dominant position, or by resource-seeking motives, trying to reduce production costs.

2.6 Conclusions

In this chapter we focused on the question: *How many and what types of (knowledge-intensive) foreign-owned firms were located in the Dutch regions in 2010, compared to other European regions?* To answer this question, we first compared the characteristics of foreign-owned firms in the Netherlands with those in other European countries. This comparison showed that the foreign-owned firms in the Netherland had several specific characteristics. First, the percentage of foreign-owned firms in the Netherlands was relatively high compared to the European average (3.1% compared to 2.3%) and of these firms a relatively large share was active in knowledge-intensive industries (55% compared to the European average of 38% of all foreign-owned firms in Europe). However, this was only due to the fact that a very large share of foreign-owned firms in the financial services was located in the Netherlands. For all other knowledge-intensive industries, the share of foreign-owned firms in the Netherlands was found to be smaller than the European average.

A second notable difference between the Netherlands and several other European countries was that its share of foreign greenfield investments between 2003 and 2010 is small. Greenfield investments more directly contribute to the regional economy as these investments lead to an increase in regional resources and capabilities. The Netherlands benefited less from such investments between 2003 and 2010 than several other European countries.

The share of foreign firms from other European countries was slightly larger in the Netherlands than the European average (69.6% and 65.5%, respectively), while the share of firms from the United States is slightly smaller (24.8% and 21.2%). Most firms that invested in the Netherlands came from the neighbouring region of Vlaams Gewest (12%), from the larger cities within western Europe, such as Paris, London and Brussels, and from Scandinavian regions. The majority of foreign firms from outside of Europe came from the United States (more than 21%). Compared to those from other countries, the share of firms from China that invested in the Netherlands was also relatively large.

The spatial distribution of foreign-owned firms across European regions in 2010 was found to be 'spiky', that is, large numbers of foreign-owned firms were located in a few region, while many other regions only had a few of these firms. A similar pattern existed within the Netherlands: most foreign-owned firms were located in the three regions of North Holland (33.7%), South Holland (21.5%) and North Brabant (15.3%). In other words, more than 70% of all foreign-owned firms in the Netherlands were located in these three regions and their share of foreign-owned firms active in knowledge-intensive industries was even larger (more than 73%). However, a further division of the knowledge-intensive industries into five subcategories showed that the distribution of the firms in services and manufacturing differed. Knowledge-intensive services were highly concentrated in North Holland, while firms in knowledge-intensive manufacturing were more equally distributed over the Netherlands, with North Brabant and South Holland having the largest shares of high-tech and medium high-tech manufacturing firms.

A comparison of shares of foreign-owned firms between Dutch regions and other European regions showed that those in the three regions, North Holland, South Holland and North Brabant, were comparable to those of the sub top in Europe. The shares were not large enough to be part of the ten European regions with the largest share of foreign-owned firms, but in most cases the shares were high enough to be part of the top 40. Other Dutch regions had shares comparable to the European average. In

general, the Dutch regions had larger shares of knowledge-intensive services than of knowledge-intensive manufacturing. The share of foreign-owned firms in financial services in most Dutch regions was very large. North Holland was even the region with the second largest share of foreign-owned financial services of Europe. This notable position was possibly mainly due to the attractive Dutch tax regime for holdings of multinational firms and the concentration of the Dutch trust industry in Amsterdam.

Although our data only allowed us to analyse the spatial distribution of foreign-owned firms in 2010, our results did suggest two patterns for the future development of FDI within Europe: most greenfield investments between 2003 and 2010 took place in large agglomerations such as London, Paris and Milan and, to a lesser extent, also regions in eastern Europe. In other words, during this period the number of foreign-owned firms in these regions had grown, bringing more resources and capabilities to the region.

The comparison between the characteristics of the host and home regions of European firms investing in other European countries showed a similar pattern: while most foreign-owned firms in Europe both came from and invested in leading regions, at least with respect to R&D intensity and GDP per capita, a substantial number of investments was conducted by firms from leading regions in lagging regions. However, the spatial distribution of foreign-owned firms according to country of origin did show that, at least up to 2010, only European firms invested in eastern European countries.

Although the GDP per capita and R&D intensity of the three Dutch regions where most foreign-owned firms were located were well above the European average in 2010, the home regions of these firms had an even higher GDP per capita and R&D intensity. This suggests that most European firms that invested in the Netherlands were in search of additional knowledge or additional markets. The foreign firms located in North Holland, South Holland and North Brabant came from different European regions. While the foreign-owned firms in North Holland were found to mainly come from the large metropolitan areas in Europe, the firms in North Brabant mainly came from regions in Belgium and Germany. This was probably due to the difference in specialisation between both regions: most foreign-owned firms in North Holland were active in knowledge-intensive services, while those in North Brabant worked in knowledge-intensive manufacturing. For the latter, the average R&D intensity of their home regions was even larger than that of North Brabant.

The next chapter concerns a further examination of the spatial pattern of foreign-owned firms across European regions. It presents an analysis of the regional characteristics that affect the number of foreign-owned firms in the European regions. Furthermore, a comparison is presented of the characteristics of the regions with the highest number of foreign-owned firms with those of the Dutch regions, to obtain further insight into the attractiveness of the business environment of the Dutch regions to foreign-owned firms.

Notes

1 Overall, the FDI flows have grown. Nevertheless, the trend shows major fluctuations during the last decade. After several years of steep growth, a major drop occurred between 2000 and 2003, followed by a renewed increase up to a level far above the level of 2000, by 2007, and again major drops in 2008 and 2009.

2 This ranking did not change when the number of firms was weighted according to their size categories, although the position of the United Kingdom would become somewhat less dominant, because of the large numbers of small FDIs in this country. See Appendix 2.3.

3 A x^2 test performed for the number of domestic and foreign-owned firms per region made it is possible to determine the geographic distribution of both types of firms over the Netherlands. The test result shows that the geographic distribution of both types of firms was not similar across regions (x^2 = 2376, p < 0.000)

4 The home region of the European investor is not known for 45.8% of all firms owned by a firm from another European country. However, the percentage of foreign-owned firms of which the European region of origin is not known is similar for each country and therefore the bias due to this lack of information is likely to be limited.

5 As shown in Table 1.2 in Chapter 1, the average R&D intensity of European regions was 1.396 with a standard deviation of 1.16 (minimum value = 0.07, maximum value = 7.09) and the average GDP per capita was 19,904 with a standard deviation of 9,694 (min. = 3,195 and max. = 71,193). While 62.4% of the 238 Nuts II regions had an R&D intensity below the European average, for GDP per capita this was 43.9% of the 238 regions.

6 This conclusion did not change when we divided the European regions not in 2 but in 4 groups (based on the values of the quartiles of R&D intensity and GDP per capita). The largest share of foreign-owned firms were owned by a firm from a region in the highest quartile and established in a region in the highest quartile (20.9% for R&D intensity and 39.1% for GDP per capita).

7 Sum (the number of investments by firms from regions X1,X2, X3 ... Xn multiplied by the R&D intensity or GDP per capita in regions X1,X2, X3 ...Xn) / (Total investments in host region Y).

THREE

Regional characteristics underlying the spatial pattern of foreign-owned firms in Europe

3.1 Introduction

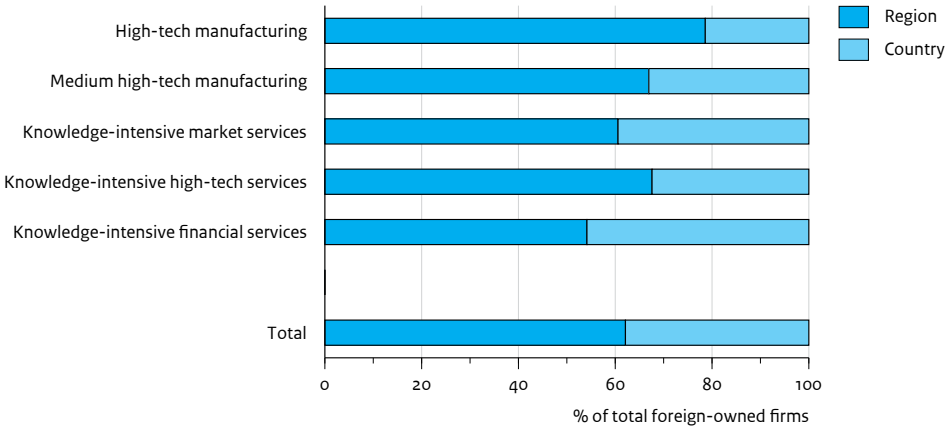
Attracting foreign direct investments to the Netherlands has been an important aim of Dutch industrial policy for the past several years, as has been the case in many other countries. Such policy requires detailed insight into the aspects of the business environment that are valued by foreign firms, as this may help policymakers to design policies that increase the attractiveness of their region to future foreign investments (Hogenbirk and Narula 2004). Therefore, this chapter aims to provide insight into the characteristics of the European regions where most of the foreign-owned firms are located, and to determine the extent to which regional characteristics in the Netherlands match those characteristics. The following two questions are addressed:

1. Which regional characteristics affect the number of (knowledge-intensive) foreign-owned firms in European regions?
2. To what extent do Dutch regional characteristics match the characteristics of European regions with most (knowledge-intensive) foreign-owned firms?

To answer the first question, we examined the relation between several regional characteristics that, according to the literature, are likely to affect the locational choice of foreign-owned firms (see Chapter 1), as well as the number of these firms per region, in 238 European regions, in 2010. As was shown in the previous chapter, the spatial pattern of foreign-owned firms depends on their industrial activities and on the home region of the investor. Therefore, we estimated separate models for each of these groups of firms. The model analyses provide insight into whether these types of firms value different regional characteristics when investing abroad, and, consequently, may be driven by different motives. The results from these analyses are described in Section 3.3.

The second question is answered in two steps. First, we compared the characteristics in the Dutch regions to those in the ten European regions where most foreign-owned firms were located in 2010. In this way, further insight was gained into the attractiveness of Dutch regions to foreign firms, and into those elements of the Dutch business environment that would require improvement. Section 3.4 describes this comparison. Second, Section 3.5 examines whether the number of foreign-owned firms already located in Dutch regions matched the number of firms that could be expected based on the market situation and knowledge base of those regions. When it did not, this suggested that there were local barriers limiting the establishment of these foreign firms. And in regions where the number of foreign-owned firms was higher than expected, this suggested the presence of certain characteristics that would increase the region's attractiveness. Because of a lack of data it was not possible to precisely determine these additional characteristics, but an overview is presented of other possible relevant factors, paying specific attention to the role of quality of living per region. The quality of living represents the degree to

Figure 3.1
Variance decomposition of foreign-owned firms in Europe, 2010



which expatriates enjoy the standard of living in the host location, and reflects the interaction between political, socio-economic and environmental factors at this host location (see Appendix 3.7 for a definition) .

But before addressing the results from the three analyses, this chapter first examines the relevance of regional characteristics to attracting foreign-owned firms. Do these characteristics matter in the choice of location or is this mainly affected by differences on national level, such as institutional arrangements, tax regimes and cultural differences? Answering this question is important as it provides an indication of how much attention policymakers should pay to regional characteristics when aiming to attract foreign investment.

3.2 Relevance of the national and regional level

The previous chapter clearly showed that within most European countries large regional differences in the number of foreign-owned firms exist. Nevertheless, differences between countries, such as taxes, culture and language, are often assumed to largely drive the locational choice of foreign firms. Therefore, the question is: to what extent do regional characteristics affect the spatial pattern of foreign firms in European regions?

To obtain insight into the relevance of the different spatial scales to the locational choice of foreign firms, we estimated the so-called intraclass correlation, using multilevel techniques. The intraclass correlation may be determined by estimating a so-called intercept-only or null model, which contains no explanatory variables. This model does not explain any variance, it only decomposes the variance into two independent components: the variance of errors at the lowest level (in this case, regions) and those at the highest level (countries). The intraclass correlation indicates the proportion of the group level variance compared to the total variance (see Hox, 2002) for a further explanation on the intraclass correlation). Figure 3.1 shows the results for the total number of foreign firms and the number of firms in each of the five knowledge-intensive industries within 238 NUTS2 regions across 20 European countries[1]. The figure shows that the largest part of the variance in the total number of foreign-owned firms follows from regional differences (62%), although differences on a national level are also quite important (38%). Hence, even within Europe, – which, in contrast to North America, consists of many small countries each with different institutional arrangements – regional differences are more important than national differences.

However, a further distinction between the five different types of knowledge-intensive activities showed that much larger differences in the relevance of the regional and national level exist between these activities. Especially the spatial distribution of firms in high-tech manufacturing is affected by differences on a regional level. About 79% of the variance in the spatial pattern of these firms could be assigned to regional differences, and

only 21% to national ones. The relevance of regional differences to this industry was found to be much higher than to medium high-tech manufacturing, across European regions, for which 67% of the variance was found to be related to regional differences. The same holds for knowledge-intensive services. Of this last group, especially the variance in the spatial distribution of high-tech services is related to regional differences (68%). This suggests that regional differences are especially important in the spatial distribution of high-tech activities, both in manufacturing and services. Compared to the other knowledge-intensive services, the spatial distribution of financial services, was found to be more related to national differences (46%). This is probably due to the fact that foreign-owned financial services choose countries that offer low effective taxes.

The intraclass correlations indicated that regional characteristics affect the number of foreign-owned firms in European regions. Nevertheless, differences at national level also seemed to matter and, therefore, it was important to control for those differences in the regression analyses to avoid that certain effects would be assigned to regional characteristics while they actually matter mainly on a national level. Therefore, we included country dummies that indicated whether a NUTS2 region belonged to a certain country or not, in each model specification (see Chapter 1).

3.3 Regression analysis on five factors

As explained in Chapter 1, firms may have different motives for investing abroad, and the characteristics of regions they chose for their investments may reveal what would have been their main motives for investing. For the 238 European regions, we measured a large number of regional characteristics that we assumed would indicate whether a foreign firm was motivated by its search for other markets, efficiency, resources or strategic assets (knowledge). For each motive, we measured multiple regional characteristics. In other words, the variations in this group of indicators is thought to mainly reflect the variation in a single unobserved variable, that is, the main motive of a firm to invest abroad. To examine whether such patterns were indeed underlying the variations of (some of) the indicators, we used a factor analysis (see Subsection 3.3.1). Subsequently, those factors were used for estimating the number of foreign firms in the European regions and, thus, could help to reveal what it is that mainly drives foreign firms to invest abroad. Similar to Chapter 2, this chapter first describes the results from the analysis of the number of foreign-owned firms in the European regions, in total and separated into the five knowledge-intensive industries (Subsection 3.3.2), followed by a separation according to home countries of investors (Subsection 3.3.3). By distinguishing between these groups of firms, we obtained further insight into the possibly different motives of these firms for investing in Europe.

3.3.1 Factor analysis

Factor analysis is a statistical method that is used for examining whether variations in several observed variables mainly reflect those in a single unobserved variable. In other words, factor analysis seeks to discover if the observed variables may be explained largely or entirely in terms of a much smaller number of variables, called factors. To determine which latent variable the factor is likely to represent, the factors can be interpreted through a single factor loading of the individual variables. The factor loadings are the correlation coefficients between variables and factors. As in the Pearson correlation, they vary in value between -1 and 1. A factor loading of 0.7 or higher shows that the independent variable is represented by a particular factor, on the rationale that the 0.7 level corresponds to about half of the variance in the indicator being explained by the factor. However, in practice, this is found to be a very high loading and, therefore, similar to many other studies, we considered a loading of 0.6 and over as high, and loadings of 0.4 and under as low. As unrotated factor solutions are often difficult to interpret because most significant loadings are assigned to one factor, we used varimax rotation, which leads to a better distribution of the factor loadings, thus improving the interpretation.
Instead of one factor analysis in which all the variables that have been described in Section 1.4 would be included, we decided to conduct two separate analyses. The results from the analysis in which all variables were included turned out to be difficult to interpret. This was mainly because the regions with high scores on regional market indicators also had high scores on several of the indicators of their knowledge base. Furthermore, some of the underlying variables were important to all the factors, which made them less distinctive. Because the indicators of the regional market situation and knowledge base represented two distinct motives for firms to invest abroad, we decided to conduct a factor analysis for both groups of indicators separately.
Tables 3.1 and 3.2 show the results from both factor analyses, the first for the indicators of the market situation, the second for the knowledge base of the region. The analysis of the market situation indicators resulted in three factors[2]. Using the factor loadings and a map of the factor scores for each European region as presented in Figures 3.2 to 3.6, we labelled each factor[3]. The factor loadings of the first factor and the map of this factor in Figure 3.1 show that these indicators are typical of agglomerations that offer a large regional market (high

Table 3.1

Results from the varimax rotation factor analysis on seven indicators of the market situation in 238 European regions*

	Factor 1 Market agglomerations	Factor 2 Market Centrality	Factor 3 Low costs
GDP weighted	.374	.852	-.226
GDP per capita	.633	.385	-.454
Unemployed percentage	-.104	-.242	.883
Population density	.585	.419	.345
Proximity to a (major) airport	.803	.040	-.343
Accessibility by road	.080	.927	-.176
Int. export orientation	.792	.184	.020

** This factor solution represents 78.3% of the variance of the seven market indictors, the factor 'market agglomerations' 31.0%, 'market centrality' 28.6% and 'low costs' 18.6%.*

Table 3.2

Results from the varimax rotation factor analysis for seven indicators of the knowledge base of 238 European regions*

	Factor 1 Soft and public knowledge	Factor 2 Technological knowledge
Number of patents per 1,000 high-tech and medium high-tech employees	.266	.763
Private R&D intensity	.419	.738
Public R&D intensity	.764	.038
Specialisation in high-tech and medium high-tech manufacturing	-.037	.876
Specialisation in knowledge-intensive services	.864	.112
University ranking	.732	.263
Highly educated employees	.759	.382

** This factor solution represents 68.8% of the variance of the seven knowledge base indictors, the factor 'soft and public knowledge' 38.4% and 'technological knowledge' 30.3%.*

scores on GDP per capita and population density) and a strong international orientation (illustrated by high factor loadings for international export orientation and proximity to a (major) airport). Figure 3.2 shows the different scores for all European regions on this factor. The regions with high scores are mainly those that include capital cities, such as London, Paris, Vienna, Berlin, Helsinki, Madrid and Copenhagen. This is also the case in the Netherlands, where North Holland, the region where Amsterdam is located, has a relatively high score. However, besides capital cities, also other large cities have high scores, such as Milan, Hamburg and Munich, and the Belgian region of Flanders. Therefore, this factor is called 'market agglomerations'.

The second factor based on the market situation indicators has been labeled 'market centrality', because this factor has high factor loadings for the accessibility by car (the size of the population that can be reached by car within a 30-minute drive) and the GDP of the region weighted against the GDP in surrounding regions as an indicator of the market potential of the region. Figure 3.3 shows that especially the regions within central Europe have high scores on this factor. These regions offer central locations for firms that aim to serve a large market area within Europe from a single location.

The third factor has been labeled 'low costs'. This factor mainly has a high loading for the percentage of unemployed in a region, but compared to the other factors also shows a high negative loading for GDP per capita. In other words, regions with a high percentage of unemployed and a low GDP per capita have a high score on this factor. Figure 3.4 shows that these are mainly the regions in eastern Europe (including the eastern regions in Germany), the Baltic States, and in the south of Europe, such as in Greece, the south of Italy and the southern regions of Spain. The lower GDP per capita and higher unemployment may imply that labour costs in these regions are relatively low and, therefore, these regions

Figure 3.2
Factor scores of 'Market agglomerations'

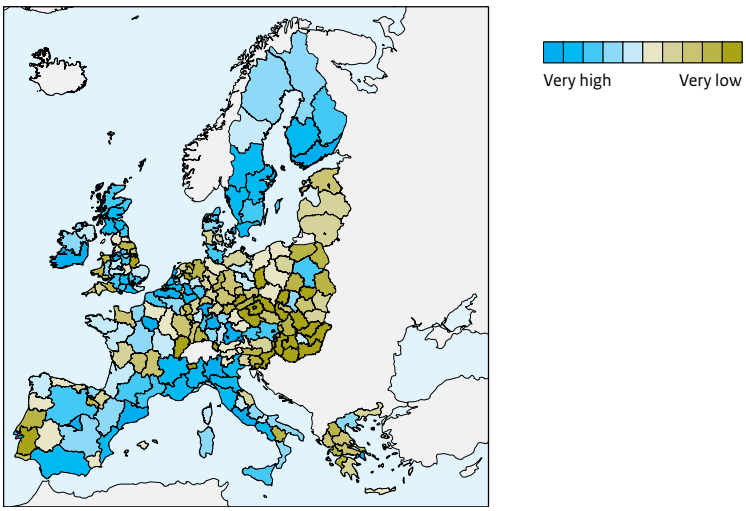
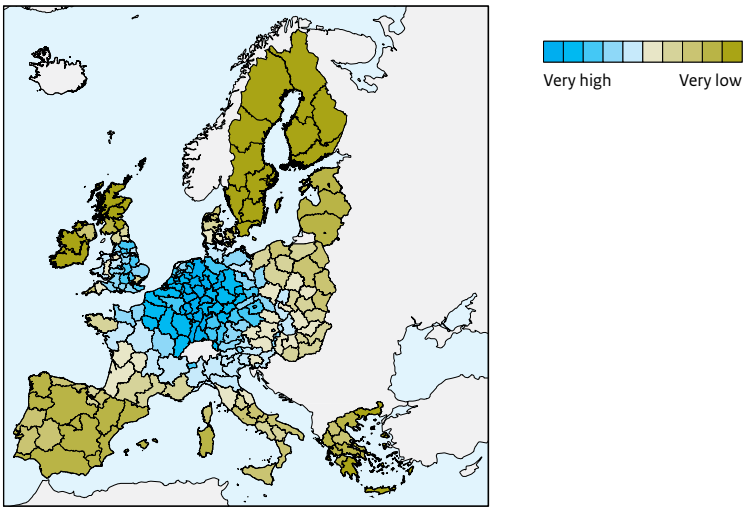


Figure 3.3
Factor scores of 'Market centrality'



may be mainly attractive to firms searching for a location where they can lower their costs of production.

Table 3.2 shows the results of the factor analysis of the seven indicators of regional knowledge bases. This analysis resulted in two factors. We have labeled the first factor 'soft and public knowledge', because the factor loadings are high for indicators of a strong presence of public knowledge (university ranking, public R&D intensity) and the share of jobs in knowledge-intensive services (specialisation), which are activities that mainly require non-technological or 'soft' knowledge. In contrast, the second factor has been labeled 'technological knowledge', because the three indicators that have high factor loadings for this factor all concern indicators of a strong technological knowledge base. Patents and investments in R&D by private organisations mainly take place in high technology industries, such as electronics, chemicals and pharmaceuticals. Therefore, it is not very surprising that this factor also has a high loading on the specialisation of the region in high-tech

Figure 3.4
Factor scores of 'Low costs'

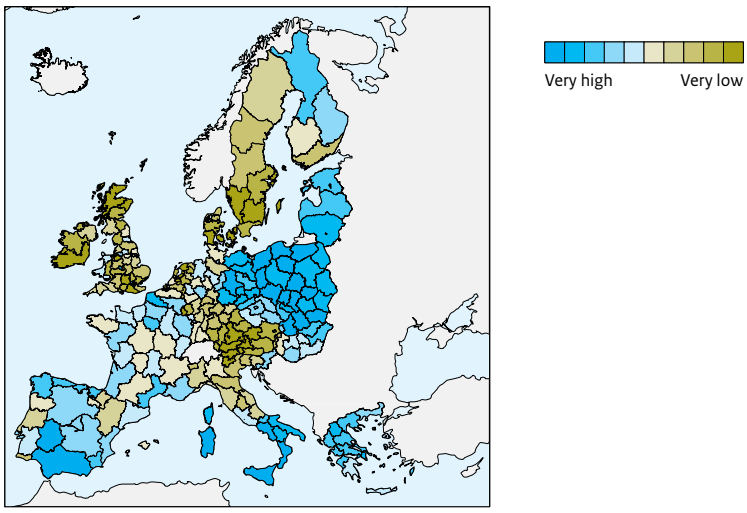
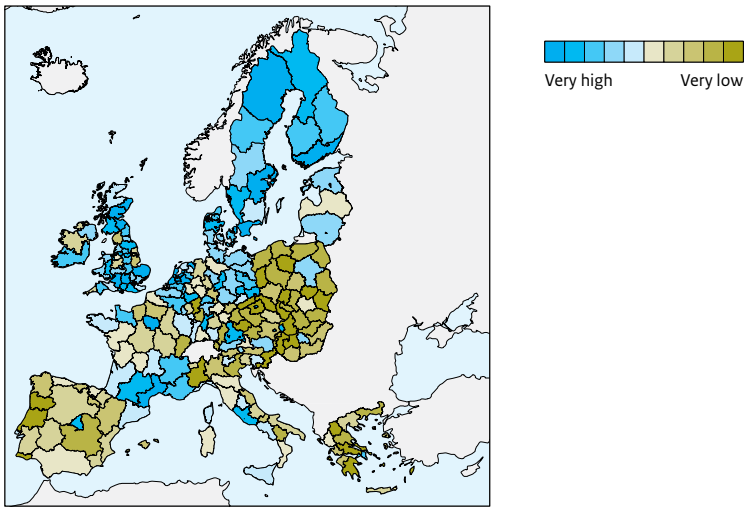


Figure 3.5
Factor scores of 'Soft and public knowledge'

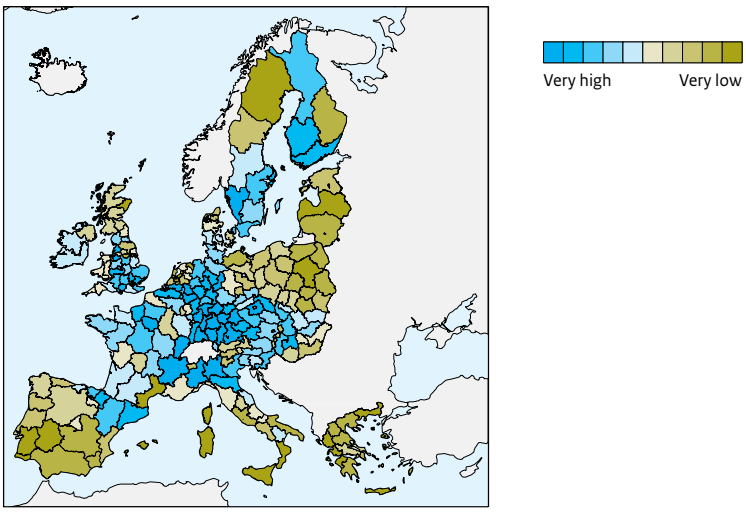


and medium high-tech manufacturing, measured by the share of jobs in those activities in each region.

What should be noted is that, although the factor loading of private R&D intensity was the highest for the factor 'technological knowledge', it also affected the factor 'soft and public knowledge'. In other words, regions which had a specialisation in knowledge-intensive services, a large share of highly educated employees and with high ranking universities, also tended to have quite a high amount of R&D investments by private organisations.

This may have been mainly due to the fact that, in the larger urban areas in Europe, in absolute numbers, quite a lot of firms were investing in private R&D, but that the relative share of these industries in those regions was quite low because of the wide diversity of these industries. Consequently, these regions did not have a high specialisation in high-tech and medium high-tech manufacturing, while private R&D intensity was still quite high. This, for instance, applies to Paris.
Figures 3.5 and 3.6 show the scores for the European regions on both knowledge factors. These figures clearly

Figure 3.6
Factor scores of 'Technological knowledge'



show that the spatial patterns of these two factors were highly different. Both public R&D and knowledge-intensive activities tended to be concentrated in cities, leading to high scores for urban areas such as London, Stockholm, Copenhagen and Berlin for the factor 'soft and public knowledge'. Within the Netherlands, North Holland, South Holland and also Utrecht had high scores on this factor, also compared to other European regions. The spatial pattern of the factor 'technological knowledge' clearly dominated in the regions in the south of Germany, northern Italy and Rhone-Alpes in eastern France, but also in some regions in Scandinavia, Paris and eastern Europe. The Dutch region North Brabant had a very high score on this factor, belonging to the top 10 in Europe, due to the presence of several large technology-based firms.

The results from the factor analyses indeed appeared to represent several of the different motives of firms for investing abroad, as described in Chapter 1: firms seeking local markets are most likely to locate in the regions that score high 'market agglomeration', firms seeking to serve a large market area in Europe from one location may prefer regions with a high score for 'market centrality', and firms looking for a location where they can lower their production costs are more likely to choose a region with a high score for 'low costs'. With respect to the results for the indicators of the knowledge base, a distinction could be made between two types of knowledge, soft and public knowledge and technological knowledge, which each tended to be available in different types of regions within Europe. As explained in Chapter 1, firms are assumed to increasingly invest abroad to obtain access to region-specific knowledge. However, the literature that presents those arguments does not distinguish between the two types of knowledge that show up from our factor analysis. Most studies examining the relevance of knowledge seeking as a motive for investments abroad, focused on high-tech industries for which technological knowledge mainly matters (e.g. Cantwell and Piscitello, 2005). Therefore, not much is known about how firms value the presence of 'soft and public knowledge' when they search for a location abroad.

The following section empirically examines which of the different motives mainly underlie the locational choice of foreign firms in Europe and, more specifically, whether the motives of firms investing in knowledge-intensive activities differ from those of the investments in general. As explained in Chapter 1, investments in knowledge-intensive activities are assumed to be more driven by strategic asset-seeking behaviour, that is, a search for region-specific knowledge. This would imply that especially the knowledge factors affect the number of knowledge-intensive foreign-owned firms in European regions. Using regression analyses, we examined whether this was indeed the case.

3.3.2 Results from the regression analysis per industry

The dependent variable of the regression models is the number of foreign-owned firms in 238 European regions in 2010. Consequently, the variable can only have non-negative integer values. A Poisson model is often used for estimating such a variable, because an Ordinary Least Squares (OLS) estimation could lead to biased and inefficient parameter estimates (Long, 1997). However, an analysis of the dependent variable shows that the

conditional variance is not equal to the conditional mean, indicating that overdispersion characterises the dependent variable. Therefore, we used a negative binomial regression model. This model incorporates an additional parameter α in the conditional mean, which is an estimate of the degree of overdispersion (Long, 1997; Brienen et al., 2010).

Table 3.3 shows the estimates for the negative binomial regression model on the number of foreign-owned firms in European NUTS2 regions in 2010, in total, for all five knowledge-intensive activities together, and for each of them, separately[4]. The models included the five factors that resulted from the factor analysis described in the previous section and two control variables. We examined to what extent the different factor scores for the European regions were related to the number of foreign-owned firms is those regions. Factor analysis always produces uncorrelated factors, but because we used two separate factor analyses to produce the five factors and we included two control variables, we tested for problems with multicollinearity. Appendix 3.1 shows the correlation matrix and the variance inflation factors (VIF) of the independent variables included in the models. Both indicate that the models did not pose any problems with multicollinearity.
First the results from the analysis is described for the total number of foreign-owned firms (model 1). All the factors were shown to have a significant effect, but the signs of the factors did differ. Two of the three factors that are based on the indicators of the market situation of the European regions were shown to have a positive effect: market agglomeration and market centrality. In other words, the number of foreign-owned firms is higher in regions with a large regional market and a strong international orientation (market agglomeration) and in regions that have a central location within Europe offering a strong market potential (market centrality). The effect of the factor low costs was negative. This indicates that in regions with a high share of unemployed people and a relatively low GDP per capita the number of foreign-owned firms is significantly lower. This suggests that searching for lower costs of production is not a dominant motive for foreign firms investing in Europe. Instead, most foreign-owned firms are located in regions with a large regional market and good access to other markets.
The two factors that are based on the indicators of the knowledge base of the region are both significant, indicating that, besides regional differences in the market situation, the knowledge base of regions also affects the locational choice of foreign-owned firms. However, the two factors appeared to have opposite effects on the number of foreign-owned firms in the region: the effect of the factor 'soft and public knowledge' is positive, while the factor 'technological knowledge' has a negative effect (see model 1). In other words, the number of foreign-owned firms is higher in regions that have a more developed soft and public knowledge base, but lower in regions with a stronger technological knowledge base. This latter result seems to contrast the results from several previous empirical studies that found a positive effect of technological knowledge indicators on the locational choice of foreign firms (Chung and Alcacer, 2002; Cantwell and Piscitello, 2005; Allred and Park, 2007). Nevertheless, our mixed results for the knowledge base factors may have been due to the fact that the total number of foreign-owned firms concerned firms involved in both knowledge-intensive and knowledge-extensive activities, while most previous studies were focused on the locational choice of knowledge-intensive firms. Therefore, we also limited the analysis by estimating the number of foreign-owned firms only involved in knowledge-intensive activities (see model 2).
The results presented in model 2 show that the effects of four of the five factors was similar to those in model 1, but that the effect of the technological knowledge factor became insignificant. Hence, the spatial pattern of foreign-owned firms involved in knowledge-intensive activities was largely similar to that of foreign-owned firms in general, except that they were not less likely to locate in regions with a stronger technological knowledge base. This result indicates that in regions with a stronger specialisation in high-tech and medium high-tech manufacturing, a higher number of patents and more investments in R&D by private organisations, the number of foreign firms involved in knowledge-extensive activities would be lower.

Models 3 to 7 show the estimates for the number of foreign-owned firms active in each of the five types of knowledge-intensive activities, separately. The results indicate that the spatial pattern of knowledge-intensive foreign-owned firms differed between manufacturing and services firms. The models for the three different types of knowledge-intensive services (models 5, 6 and 7) all reflect the results of the model for foreign-owned firms involved in knowledge-intensive activities, in general (model 2). However, the effect of the knowledge factors on the number of firms active in high-tech and medium high-tech manufacturing differed. For both activities, we found that the number of foreign-owned firms was higher in regions with a stronger technological knowledge base. In other words, such regions would only be attractive to foreign-owned firms that are specialised in activities with a stronger technological focus. In regions with a higher soft and public knowledge base, the number of foreign-owned firms in high-tech manufacturing was also higher, while this factor did not

Table 3.3
Negative binomial regression on the number of foreign-owned firms in European regions in 2010

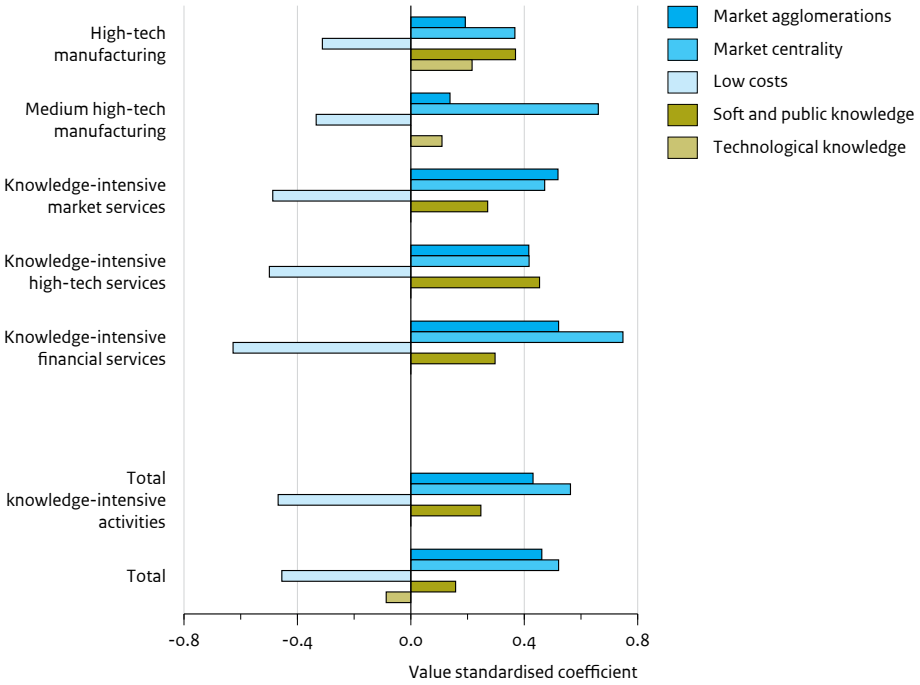
Model:	1	2	3	4	5	6	7
	Total	Knowledge-intensive activities	High-tech man.	Medium high-tech man.	Knowledge-intensive market services	Knowledge-intensive high-tech services	Knowledge-intensive financial services
Market situation							
Agglomerations	0.462***	0.431***	0.192***	0.138**	0.519***	0.416***	0.521***
	(0.064)	(0.070)	(0.072)	(0.055)	(0.083)	(0.082)	(0.113)
Centrality	0.521***	0.563***	0.367***	0.661***	0.472***	0.417***	0.748***
	(0.064)	(0.060)	(0.072)	(0.065)	(0.075)	(0.071)	(0.099)
Low costs	-0.455***	-0.468***	-0.312***	-0.334***	-0.487***	-0.499***	-0.627***
	(0.049)	(0.053)	(0.068)	(0.057)	(0.072)	(0.058)	(0.078)
Knowledge base							
Soft/public knowledge	0.158***	0.247***	0.369***	0.0595	0.271***	0.454***	0.297***
	(0.050)	(0.050)	(0.077)	(0.048)	(0.071)	(0.073)	(0.074)
Tech. knowledge	-0.087*	0.000	0.216***	0.110**	-0.061	0.031	-0.075
	(0.045)	(0.049)	(0.071)	(0.049)	(0.056)	(0.058)	(0.080)
Control variables							
Capital city (0/1)	0.699***	0.841***	0.188	0.0369	1.011***	0.983***	1.385***
	(0.157)	(0.171)	(0.197)	(0.139)	(0.210)	(0.206)	(0.241)
Ln Population size	0.947***	0.949***	1.037***	1.132***	0.868***	1.012***	0.993***
	(0.060)	(0.064)	(0.089)	(0.069)	(0.086)	(0.096)	(0.107)
Constant	-7.875***	-8.726***	-12.98***	-13.03***	-9.048***	-12.23***	-10.54***
	(0.858)	(0.913)	(1.285)	(1.000)	(1.224)	(1.369)	(1.511)
N of observations	238	238	238	238	238	238	238
N of firms	237,659	91,228	4,218	11,776	30,854	14,659	22,002
Log likelihood	-1,549	-1,294	-705	-918	-1,062	-858	-867
Wald Chi^2	3,649***	8,955***	1,174**	1,705***	1,498***	1,315***	1,681***
LR overdispersion (α)	28,000***	13,000***	531.43***	1,221.45***	7,060.31***	1,658.66***	2,572.66***

*** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses

affect the number of firms in medium high-tech manufacturing.

In addition to the five factors that resulted from the factor analysis described in the previous section, two control variables were included in all model specifications: a variable that indicated whether the capital city of a country is located in the region or not, and population size as measured by the number of inhabitants in a region. The first variable was included because firms could be attracted to those regions because of the proximity to government agencies and national research institutes that are overrepresented in those regions (Hoekman et al., 2009). The results from model 1 in Table 3.3 show that the effect of the presence of a capital city on the number of foreign firms was indeed positive. In other words, foreign firms would be more likely to locate in such regions. However, the further distinction of foreign firms based on the type of knowledge-intensive activity in which they invest (models 3 to 7) showed that only the number of foreign firms investing in knowledge-intensive services was higher in regions with a national capital city, while the effect on the number of foreign firms investing in knowledge-intensive manufacturing was not significant.
The variable population size was included for two reasons. The first, practical, reason was the widely varying sizes of NUTS2 regions within Europe, and, therefore, it was necessary to control for a so-called dartboard effect: all other things being equal, more investments will take place in larger regions (see Chung and Alcácer, 2002; Hogenbirk, 2002). The second reason was that the concentration of a population in a region may lead to so-called urbanisation economies, that is, the economic benefits that may arise from the large number and variety of economic activities and supporting organisations that are present in such a region. Foreign firms may be more likely to locate in such a region to

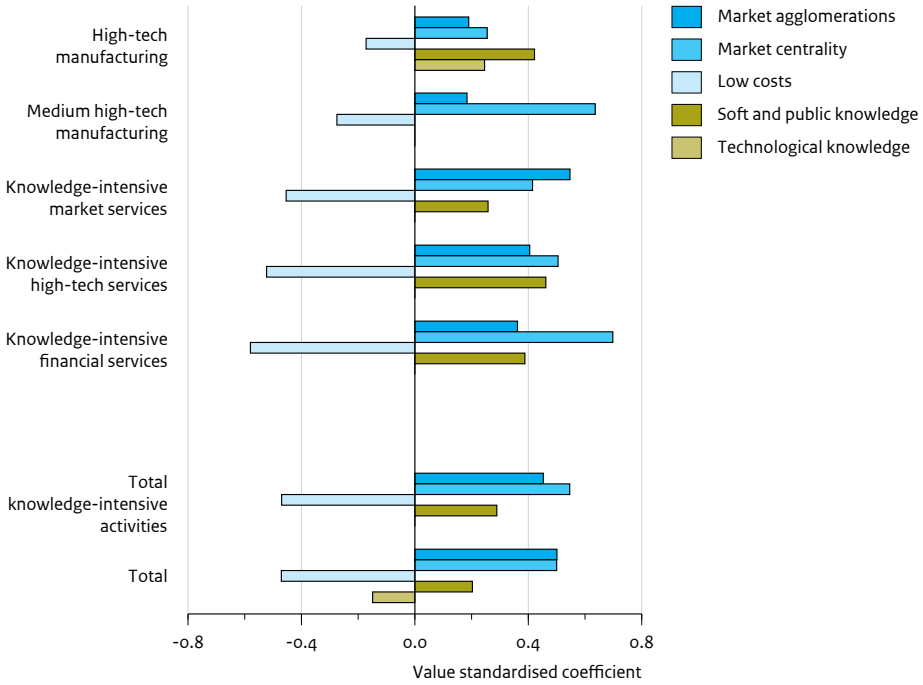
Figure 3.7
Effects of the five factors on total foreign-owned firms in Europe, 2010



benefit from those urbanisation economies, especially because this would make it easier for them to compete with domestic firms. Table 3.3 shows that this variable had a strong positive effect in all models, indicating that the number of foreign firms is indeed higher when the population size rises, irrespective of the type of activity in which they invest.

In most model specifications, at least four of the five factors had a significant effect and the effect of the three factors based on the market situation in the regions was even the same in all the models. Nevertheless, the strength of the effect of the five factors did differ, indicating that certain factors have more effect on the presence of certain type of foreign-owned firms in European regions. As the factor scores for each region have been standardised, it is possible to compare the effects of the five factors on the number of foreign-owned firms, using the coefficients of the estimation in Table 3.3. To make it easier to observe the differences, Figure 3.7 shows the coefficients of the five factors per industry.
In general, market factors have a stronger effect on the number of foreign-owned firms per region than knowledge factors, except for firms in high-tech manufacturing. For this industry, the effect of the soft and public knowledge base of the region was slightly higher than that of the market centrality factor. Although the spatial pattern of this industry was also found to be affected by the technological knowledge base, the effect of this factor was still lower than those of market agglomeration and low costs. The spatial pattern of high-tech services was also quite strongly affected by the soft and public knowledge base of regions. The effect of this factor was just slightly lower than that of the low costs factor, but, in general, the strength of the effects of the factors did not differ greatly for this industry.
The spatial patterns of the other three types of knowledge-intensive foreign-owned firms were mainly affected by market factors, although which market factors had the largest effect, varied. Compared to the other factors, market centrality had by far the largest effect on the presence of firms in medium high-tech manufacturing in European regions. The effect of the other factors was limited and although technological knowledge did have a positive and significant effect, this factor had the weakest effect of the four significant factors. Market centrality also had the strongest effect on the number of foreign-owned financial services per region, but the spatial pattern of these firms was also strongly affected by low costs and market agglomeration. Knowledge-intensive market services was the only

Figure 3.8
Effects of the five factors on 'greenfield investments 2003 – 2010' in Europe, 2010



industry for which market agglomeration had the strongest effect on its spatial pattern, but again the difference with the effect of low costs and market centrality was limited.

In addition to the effect of the different factors on the total number of foreign-owned firms in the European NUTS2 regions, we also estimated the effect on the number of greenfield investments in each region between 2003 and 2010[5]. In general, the results were largely similar to those from the models that estimated the total number of foreign-owned firms, except that the effect of technological knowledge on the number of foreign-owned firms in medium high-tech manufacturing was no longer significant (for an overview of the results see Appendix 3.2). However, the relative importance of each of the factors did vary, as shown in a comparison between Figures 3.7 and 3.8. In general, the comparison shows that while the effect of market agglomeration on the number of greenfield investments between 2003 and 2010 was larger, the effect of market centrality was a bit lower. In other words, firms that invested in greenfields in Europe between 2003 and 2010 did so less often in the central regions and slightly more often in the agglomerations of Europe. The number of foreign firms that invested in greenfields in high-tech manufacturing activities between 2003 and 2010 was also more affected by the knowledge factors than by market centrality. Compared to all the foreign-owned firms that invested in this industry, the firms that entered through greenfield investments seemed more often to have chosen regions with a stronger knowledge base than the regions with a central location in Europe, at least in more recent years. For investments in high-tech services, the results suggested the opposite: the firms that had entered through greenfield investments more often chose central regions than regions with a strong soft and public knowledge base, compared to all the foreign-owned firms in this industry.
Although it was not possible to observe actual changes in the spatial pattern of foreign-owned firms across Europe, over time, using the Amadeus data set because the ownership structure was only known for 2010, the similarity between the models for total foreign-owned firms within Europe in 2010 and the greenfield investments between 2003 and 2010 , did suggest that the newer investments had largely taken place in regions with similar characteristics as those where most prior investments by other foreign-owned firms had taken place. In other words, the spatial pattern of foreign-

owned firms within Europe seems to be characterised by path dependency: foreign firms are more likely to invest in regions in which other foreign firms have also invested. Such an effect has also been regularly shown in previous studies (see Subsection 1.4.2). Nevertheless, the comparison also suggested that some differences did exist. Foreign firms that entered Europe through greenfield investments between 2003 and 2010 more often seemed to locate in large agglomerations than foreign-owned firms in general. The effect of both the factor market agglomeration and soft and public knowledge was higher in the models estimating the number of greenfield investments, and especially the larger cities within Europe have high scores for these factors, as shown in Figures 3.2 and 3.5. This suggests that especially in these regions FDI contributed to the regional economy during the last seven years, as greenfield investments lead to a direct growth in the number of firms.

3.3.3 Results from regression analyses per home country

In addition to the number of foreign-owned firms divided according to type of activity, we also estimated the number of foreign-owned firms per region, divided according to country of origin of the investor. Chapter 2 showed that the spatial patterns of firms with an owner from another European country, the United States, Japan, India and China were quite different. This mainly seemed to be related to historical linkages and similarity in languages, but also to the types of activities in which these firms invested. This section examines whether this also implies that the relevance of the five regional factors differed for each of those groups of foreign-owned firms, which would suggest that these firms had different motives for investing in European regions. We estimated five negative binomial regression models for the total number of foreign-owned firms divided according to home country. Subsequently, we limited the number of firms to only those that were involved in any of the five knowledge-intensive activities that are central to this study (see Appendix 2.2). The number of firms owned by a firm from the United States, Japan and, in particular, India and China in 2010, was very small and, therefore, we could not further distinguish between the five types of knowledge-intensive activities.

Table 3.4 shows the estimates for the model on the total number of foreign-owned firms in European NUTS2 regions in 2010, divided according to home country of the investor[6]. The results from the model that estimated the number of firms owned by a firm from another European country, per region (model 1), largely resembled the model results for the total number of foreign-owned firms: the number of these foreign-owned firms was higher in regions with a stronger regional market and international orientation, a more central location within the European market and with a stronger soft and public knowledge base, while the number of firms was lower in regions with lower costs and a more technological knowledge base. The coefficients of the five factors showed that the effect of the market factors on the number of foreign-owned firms with an owner from another European country was almost four times stronger than that of the knowledge factors.
A comparison of the five models showed that the effect of the factors based on the indicators of the regional market situation were similar, irrespective of the investor's home country, but the effect of two knowledge factors did differ. Similar to the firms with an European owner, the number of foreign-owned firms from the United States and Japan was also higher in regions with a stronger soft and public knowledge base. However, this factor had no statistically significant effect on the number of foreign-owned firms from China and India. Furthermore, only the number of firms owned by a firm from another European country was negatively affected by the technological knowledge base of a region, as this factor had no statistically significant effect on the number of firms owned by investors from one of the countries outside of Europe.

Similar to the results from the models that estimated the number of foreign-owned firms per industry, population size also had a positive effect on the number of foreign-owned firms in all models shown in Table 3.4. In general, foreign firms were more likely to invest in regions with a larger population. Although the effect of the variable that indicates whether the capital city of a country is situated in the region or not was positive in all models, presented in Table 3.4, it had no statistically significant effect on the number of firms with a Chinese owner. Contrary to the other investors, these firms were not more likely to have invested in such a region.

The models from which the results are presented in Table 3.4 were not limited to foreign-owned firms active in knowledge-intensive activities, which may explain the negative effect and the lack of effect of the technological knowledge base of regions. Therefore, Table 3.5 presents comparable model results to those in Table 3.4, except that the number of foreign-owned firms was limited to those involved in knowledge-intensive activities. Indeed, the negative effect of the factor technological knowledge on the number of firms owned by a firm from another European country disappeared when the number of firms was limited to those active in knowledge-intensive industries (see results from model 1 in Table 3.5). Nevertheless, the effect of this factor on the number of foreign-owned firms divided according to the

Table 3.4
Negative binomial regression on the number of foreign-owned firms in European regions in 2010 per home country

Model:	1	2	3	4	5
	Europe	US	Japan	China	India
Market situation					
Agglomerations	0.485***	0.492***	0.566***	0.641***	0.591***
	(0.082)	(0.070)	(0.115)	(0.194)	(0.083)
Centrality	0.560***	0.511***	0.539***	0.687***	0.423***
	(0.084)	(0.065)	(0.118)	(0.215)	(0.118)
Low costs	-0.475***	-0.528***	-0.446***	-0.420***	-0.401***
	(0.048)	(0.061)	(0.104)	(0.162)	(0.099)
Knowledge base					
Soft/public knowledge	0.141**	0.249***	0.274***	0.099	0.049
	(0.055)	(0.054)	(0.106)	(0.170)	(0.100)
Tech. knowledge	-0.105**	0.042	0.096	-0.036	-0.026
	(0.050)	(0.054)	(0.079)	(0.126)	(0.081)
Control variables					
Capital city (0/1)	0.677***	0.902***	0.431**	0.0690	0.465*
	(0.160)	(0.167)	(0.192)	(0.427)	(0.250)
Ln Population size	0.972***	1.012***	0.973***	0.629***	0.896***
	(0.071)	(0.079)	(0.139)	(0.234)	(0.116)
Constant	-8.563***	-10.74***	-12.03***	-8.594***	-11.92***
	(1.015)	(1.098)	(2.041)	(3.244)	(1.665)
N of observations	238	238	238	238	238
N of firms	137,023	41,340	4,703	540	1,386
Log likelihood	-1,427	-1,039	-660	-303	-405
Wald Chi^2	3,643***	2,795***	1,368**	4,107***	7,771***
LR overdispersion (α)	21,000***	4,840***	941.90***	99.84 ***	128.32 ***

*** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses

investor's home country remained limited. Although the coefficient of the factor was positive in all cases, except for the firms with an owner from another European country, the effect was only statistically significant for the number of knowledge-intensive firms owned by a Japanese firm. Possibly this was due to the fact that knowledge-intensive Japanese firms within Europe more often are active in high-tech and medium high-tech manufacturing than other foreign-owned firms (see Subsection 2.3.2). The analysis in Subsection 3.3.2 shows that a technological knowledge base was only attractive to foreign-owned firms active in that industry. Furthermore, the effect of the variable that indicates whether the capital city of a country is located in that region or not was also not significant for the number of Japanese firms involved in knowledge-intensive activities. This was also similar to the results from the model that estimated the number of foreign-owned firms involved in high-tech and medium high-tech manufacturing (results from models 3 and 4 in Table 3.3). Foreign firms involved in those activities seemed to prefer a location in regions with a stronger technological knowledge base but were not more often located near the capital city of a country.

The effect of the other knowledge factor, soft and public knowledge base, did not change when the number of foreign-owned firms was limited to those involved in knowledge-intensive activities. Although the effect was positive in all models, it was only statistically significant for the number of firms with an owner from another European country, the United States or Japan. Firms with a Chinese or Indian owner were not significantly more often located in a region with a stronger knowledge base, even when they were involved in more knowledge-intensive activities. In the other three models, the strength of the effect of the soft and public knowledge base was somewhat higher in the results in Table 3.5 than in Table 3.4. This suggests that the soft and public knowledge base was a more important factor for firms involved in knowledge-intensive activities, although the

Table 3.5
Negative binomial regression on the number of knowledge-intensive foreign-owned firms in European regions in 2010, per home country

Model:	1	2	3	4	5
	Europe	US	Japan	China	India
Market situation					
Agglomerations	0.435***	0.471***	0.406***	0.511**	0.558***
	(0.085)	(0.065)	(0.099)	(0.229)	(0.121)
Centrality	0.629***	0.543***	0.500***	0.584**	0.537***
	(0.079)	(0.063)	(0.104)	(0.264)	(0.165)
Low costs	-0.512***	-0.541***	-0.336***	-0.285	-0.558***
	(0.056)	(0.067)	(0.098)	(0.194)	(0.144)
Knowledge base					
Soft/public knowledge	0.231***	0.264***	0.316***	0.212	0.160
	(0.054)	(0.060)	(0.103)	(0.233)	(0.122)
Tech. knowledge	-0.028	0.077	0.181**	0.108	0.021
	(0.0531)	(0.060)	(0.0780)	(0.142)	(0.087)
Control variables					
Capital city (0/1)	0.823***	0.813***	0.266	-0.091	0.883***
	(0.157)	(0.182)	(0.255)	(0.587)	(0.307)
Ln Population size	1.006***	1.014***	0.998***	0.261	0.686***
	(0.076)	(0.083)	(0.152)	(0.293)	(0.171)
Constant	-10.01***	-11.34***	-13.21***	-4.327	-10.04***
	(1.073)	(1.159)	(2.144)	(4.111)	(2.432)
N of observations	238	238	238	238	238
N of firms	44,753	17,816	1,482	140	590
Log likelihood	-1,126	-869	-458	-160	-290
Wald Chi^2	2,894***	2,367***	1,007**	9,801***	2,613***
LR overdispersion (α)	7,484.52***	2,140.73***	196.08***	19.02***	62.32***

*** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses

three market indicators still had a stronger effect than the knowledge factors.

Limiting the number of foreign-owned firms to only those involved in knowledge-intensive activities hardly led to any changes in the effect of the three market factors. In general, market agglomeration and market centrality had a positive effect on the number of foreign-owned firms, while lows costs had a negative effect. An exception to the last effect were the firms with a Chinese owner; according to this model the effect of low costs was still negative but no longer significant. This may have been due to the fact that the number of knowledge-intensive firms with a Chinese owner in Europe in 2010 was very limited. This is also the only model in which the effect of the two control variables was not significant.

3.3.4 Conclusions on the motives of foreign-owned firms

In sum, the results from the models that estimated the effects of different regional characteristics on the number of foreign-owned firms show that the factors did not affect the spatial pattern of each type of foreign-owned firm in the same way. This suggests that different motives were underlying the investments of those foreign-owned firms. There was one exception: resource-seeking motives, in the sense of investing in regions where the costs of production could be lowered, did not seem to be an important motive of foreign firms for investing in Europe, irrespective of the type of activity in which they invested or the investor's home country. The number of foreign-owned firms was lower in regions where the unemployment levels were higher and GDP per capita was lower, as shown by the statistically significant and quite strong negative effect of the low cost factor in almost every model. Nevertheless, the negative effect of low costs was less strong for the number of forms in high-tech and medium high-tech manufacturing in

European regions. This suggests that a small number of these type of firms may have located in the low costs regions to lower their production costs.

Considering the importance of the different market factors to the spatial pattern of firms in knowledge-intensive market services, financial services, and medium high-tech manufacturing, the main motives of the firms that have invested in these knowledge-intensive activities within Europe up to 2010 seemed to have been the search for new markets, not knowledge. The spatial pattern of the two knowledge-intensive services was more affected by market agglomeration than that of the firms in medium high-tech manufacturing. Possibly, this was due to the fact that these services firms tend to serve a smaller market than most manufacturing firms do, as face-to-face customer contact is highly important in the services industry. Consequently, services firms are more likely to establish multiple sites within the larger cities of Europe, while firms in medium high-tech manufacturing generally are located in a central region from which their products can be easily exported all over Europe. These foreign firms were also found to differ in their valuation of certain regional characteristics: foreign firms that invested in services preferred regions that would offer large regional markets and good international access to other large agglomerations, enabling access to the head offices and their other subsidiaries. Firms in medium high-tech manufacturing, however, were found to appreciate central locations with good road transport accessibility for exporting purposes. The importance of such good accessibility may even imply that these firms would prefer not to be located directly within larger agglomerations, to avoid congestion.

Compared to the other three knowledge-intensive activities, foreign firms investing in both high-tech manufacturing and high-tech services appeared more often to be driven by the possibilities of obtaining access to region-specific knowledge. For both of these types of firms, regional differences in knowledge bases had a rather strong effect on the number of firms in European regions, compared to the effect of the market factors. Nevertheless, this does not mean that market-seeking motives were totally unimportant to these firms, as market factors also seemed to affect their spatial distribution. To some extent, foreign firms investing in high-tech manufacturing and high-tech services did seem to appreciate different types of knowledge bases. The spatial pattern of foreign-owned firms in high-tech services was positively affected only by soft and public knowledge base, while firms in high-tech manufacturing seemed to appreciate soft and public knowledge as well as technological knowledge bases, albeit to a somewhat lesser degree. Hence, the results showed that only foreign firms investing in high-tech manufacturing seemed to value the presence of a strong technological knowledge base, although also for these firms, the presence of soft and public knowledge seemed to be more relevant.

A possible reason for this pattern may be that, although patents and R&D investments by private organisations are indicators of active development of new products and processes by regional industries, this does not imply that such newly developed knowledge would be accessible to foreign firms investing in the region. Firms may also use patents as a strategy to avoid competitors from having free access to any newly developed knowledge. Therefore, high numbers of patents granted to private enterprises may be an indication of strong competition and a limited access to knowledge. In a study on locational choices of FDI in the United States, Alcácer and Chung (2007) also found a result that would suggest such an effect. They found that foreign firms preferred to invest in regions with a higher number of academic patents, while avoiding regions with a higher number of industrial patents.

Thus, although firms investing abroad in knowledge-intensive market services, financial services and medium high-tech manufacturing all seemed mainly to be driven by market-seeking motives, the differences between their activities did lead to differences in locational preferences within Europe. In a similar way, firms in high-tech manufacturing and high-tech services were found to also appreciate a different type of regional knowledge base. For policymakers interested in attracting foreign investment, it would be important to understand those differences, so that they could focus on improving those regional characteristics that are important to the types of activities they would want to attract.

3.4 Benchmark of regional characteristics in the Dutch regions

The previous section provided further insight into the motives of foreign firms investing in European regions, and their related appreciation of certain regional characteristics. However, a question that has not yet been addressed is the extent to which regional characteristics of the Dutch regions match those that foreign firms appear to value when investing in Europe. This section addresses this question by comparing regional characteristics in the three Dutch regions where, in 2010, most foreign-owned firms were located (North Holland, South Holland and North Brabant, see Chapter 2) with those of the ten European regions with the highest

Table 3.6
Average z-scores on different regional characteristics in the 10 European regions with the highest number of foreign-owned firms*

	Total	Knowledge-intensive activities	High-tech manu-facturing	Medium high-tech manu-facturing	Knowledge-intensive market services	Knowledge-intensive high-tech services	Knowledge-intensive financial services
GDP weighted	1.90	2.12	1.62	1.57	1.71	2.05	1.94
GDP per capita	2.13	2.46	1.70	1.38	2.13	2.51	2.55
Unemployed percentage	-0.22	-0.47	-0.56	-0.48	-0.31	-0.34	-0.52
Population density	3.56	3.20	1.57	1.38	2.25	3.59	3.52
Proximity to a (major) airport	1.48	1.68	1.47	1.57	1.56	1.63	1.59
Accessibility by road	0.71	0.87	0.52	0.71	1.27	0.67	0.58
Int. export orientation	2.48	2.62	2.66	3.04	2.50	2.84	2.58
Number of patents	1.39	1.72	1.84	1.81	2.39	1.58	1.18
Business R&D intensity	0.04	0.41	0.58	0.22	0.81	0.34	0.14
Public R&D intensity	0.35	0.39	0.33	0.13	0.43	0.56	0.53
Spec. high-tech and medium high-tech manufacturing	-0.29	-0.10	0.21	0.52	0.27	-0.17	-0.65
Spec. knowledge-intensive services	1.62	1.76	1.22	0.68	1.26	1.86	2.04
University ranking	1.32	1.72	1.52	1.22	1.08	1.67	2.08
Highly educated population	1.51	1.60	1.08	0.66	1.55	1.60	1.70

** Weighted for the number of foreign-owned firms per region*

numbers of foreign-owned firms. As Chapter 2 has shown, the spatial patterns of foreign firms involved in the different knowledge-intensive industries differed, and, therefore, the regions where most of them were located also differed per type of industry. Furthermore, the previous section showed that the these firms also value regional characteristics differently. Therefore, the comparison was made for each knowledge-intensive activity, separately, and was limited to only those regional characteristics that were found to be relevant for attracting foreign-owned firms active in that specific field, in the regression analyses of which the results were described in the previous section.

Before a comparison is made between the regional characteristics in the three Dutch regions and those in the top European regions, a more detailed look is taken at what characterised the business environment in the ten regions with the highest number of foreign-owned firms in Europe. Table 3.6 shows the average scores for those regions on each regional characteristic and for each activity, separately. As the number of foreign-owned firms differed quite substantially between the ten regions (see Chapter 2), we weighted the scores for the number of foreign-owned firms per region. Furthermore, the scores on regional characteristics were standardised and, therefore, zero represents the European average. Because of this standardisation, it was possible to compare the relevance of the different characteristics.

For the total number of foreign-owned firms, the most distinguishing regional characteristic of the top regions was their high population density and strong international export orientation. Both scores were far above the European average. But the regions also had a high GDP per capita and most were in the proximity of a (major) airport[7]. The factor analysis described in Subsection 3.3.1 showed that these four characteristics are typical of the larger agglomerations within Europe, such as Paris, London, and Milan. Two of the regional characteristics of the twenty European regions with the highest numbers of foreign-owned firms received negative scores, and, hence, were below the European average. This concerned the percentage of unemployed, and the level of specialisation in high-tech and medium high-tech manufacturing.

Although scores differed slightly, the ten regions with the most foreign-owned firms involved in knowledge-intensive activities had largely the same characteristics. The level of specialisation in high-tech and medium high-tech manufacturing was also below the European average. However, the scores on several other characteristics relating to the knowledge base, such as the number of patents, business R&D intensity, university ranking and share of highly educated employees, all were higher than in regions with the highest numbers of total foreign-owned firms. Foreign-owned knowledge-intensive firms did seem to be concentrated in regions

with a more developed knowledge base, suggesting that, besides market-seeking motives, these firms may also have been driven by their wish to obtain access to region-specific knowledge.

Similar to the results in the previous section, a further distinction between the five knowledge-intensive activities showed different characteristics in the top regions with those activities. Regions with most foreign-owned firms in high-tech and medium high-tech manufacturing had a stronger international export orientation and, although still above the European average, a much lower population density than the regions with the most foreign-owned firms involved in knowledge-intensive activities. This suggests that these firms especially would prefer a location from which goods may easily be exported to other European regions. Regions where many exporting firms are located would be likely to offer a well-developed international network as well as many supporting logistical services, which could easily be accessed by foreign firms locating in those regions.

Compared to the top regions for all foreign-owned firms, those containing the most foreign firms in high-tech and medium high-tech manufacturing were found to have a specialisation in this field of above the European average. The number of patents per thousand employees in high and medium high technology manufacturing was also higher, suggesting that these foreign firms were concentrated in regions with a well-developed technological knowledge base. The factor analysis in Subsection 3.3.1 showed that business R&D intensity also would characterise regions with a technological knowledge base. However, the scores presented in Table 3.6 show that, although this did characterise the top regions with foreign firms in high-tech manufacturing, the score on business R&D intensity for the top regions with foreign firms in medium high-tech manufacturing was not that high. Possibly this was due to the fact that the firms involved in high-tech manufacturing would invest more in R&D than the firms in medium high-tech manufacturing and that, therefore, the latter firms attached less value to the regional presence of technological knowledge. In addition to favouring a regional location with concentrations of similar types of activities, foreign firms in medium high-tech manufacturing seemed to also prefer regions from which they could access a large market area, as suggested by the high scores on the proximity to a (major) airport the GDP weighted indicators.

For regions with most foreign firms involved in the knowledge-intensive market, and high-tech and financial services, characteristics also differed. Characteristics in regions with most knowledge-intensive market services were largely similar to those containing most firms in knowledge-intensive manufacturing, although the top regions for the first type of foreign firms had a slightly less strong international export orientation and much higher population densities. Somewhat surprising were the high scores on the number of patents and business R&D intensities of these regions. Possibly this was due to the fact that these foreign firms were mainly concentrated in German regions, which would not only offer a central location within the European market, but also would have a relatively well-developed technological knowledge base. Foreign firms involved in market services were found to mainly prefer the market centrality of those regions, as also suggested by the high score on accessibility by road.

The ten European regions with the most foreign-owned firms in high-tech and financial services were mainly characterised by a population density and GDP per capita that was far above the European average. This was largely due to the fact that by far the largest share of these foreign firms was located in the Inner London region, in 2010. More than 14% of all European foreign-owned firms in high-tech services and 18.6% in financial services were located in this region. Its strong regional concentration, combined with a very high population density (z-score of 9.8) and GDP per capita (z-score of 5.3) led to a high average score for the top regions in both high-tech and financial services. Nevertheless, the spatial pattern of both of these activities, as described in Chapter 2, has shown that, in general, these firms were found to be concentrated in larger urban areas of Europe. Furthermore, the regions with the most foreign firms in high-tech and financial services were also characterised by a strong international export orientation. In general, these characteristics indicate that these regions were mainly larger urban areas with a strong regional market and good international connections. With respect to the different characteristics of the regional knowledge base, the scores in Table 3.6 show that the top regions did not have a strong technological focus, but did have a well-developed soft and public knowledge base, seeing their high public R&D intensity, strong specialisation in knowledge-intensive services, high-ranking universities and large percentage of employees with a higher education.

In sum, the regions with the most foreign-owned firms in knowledge-intensive manufacturing were less urbanised than those with the most foreign-owned firms in high-tech and financial services. For the first group of firms, especially regions with an international export orientation, a specialisation in high-tech and medium high-tech manufacturing and a strong technological

knowledge base were found to be attractive locations. Foreign firms in high-tech and financial services were found to prefer locations within larger agglomerations with well-developed regional markets, strong soft and public knowledge bases and good international connectivity. The group of foreign-owned firms in market services were in between these two extremes, with concentrations in regions with a strong export orientation and a good accessibility by road.

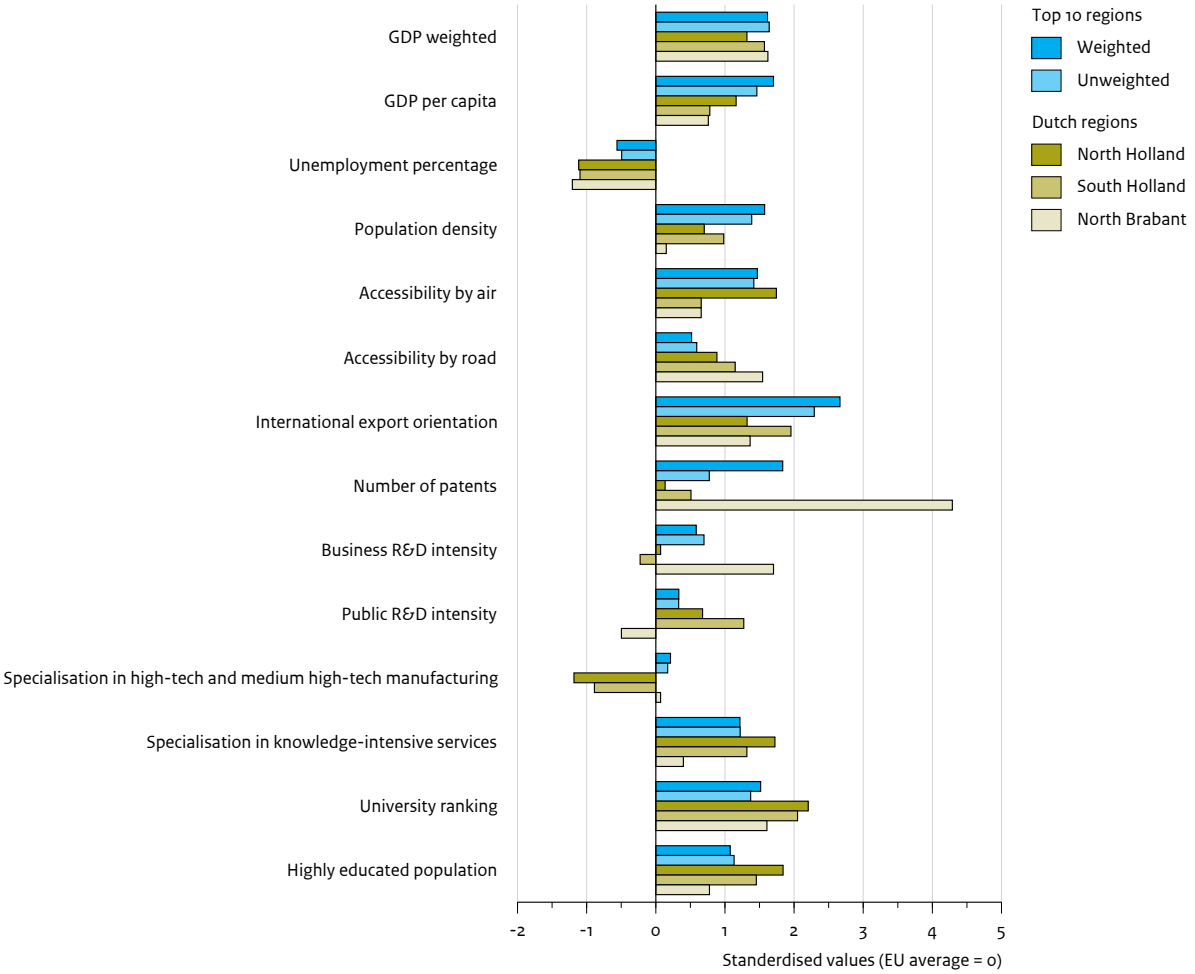
Subsequently, we examined the extent to which the regional characteristics of European regions with the most foreign firms matched with those of the three Dutch regions of North Holland, South Holland and North Brabant. Figures 3.9 to 3.13 show comparisons for each knowledge-intensive activity, separately. The figures show the scores for the three Dutch regions and for the ten European regions with the highest numbers of foreign-owned firms in this particular industry. The average scores for the top ten regions are shown, both weighted for the number of foreign-owned firms and unweighted, because this provides insight into the extent to which the scores were affected by the strong concentration of foreign firms in the London region.

Figure 3.9 shows the scores for the three Dutch regions and the average scores, related to the characteristics of the ten European regions with the highest numbers of foreign-owned firms active in high-tech manufacturing. Compared to the three Dutch regions, these European regions were found to have a better regional market situation, in several ways. The top regions had a higher GDP per capita, population density, and international export orientation than the three Dutch regions. The difference between the weighted and unweighted scores for the top regions on these three regional characteristics was small, which is mainly due to the fact that the foreign-owned firms in high-tech manufacturing were not strongly concentrated in Inner London (see also Chapter 2). Although North Holland was found to offer good accessibility by air due to the presence of Amsterdam Airport Schiphol, for both South Holland and North Brabant the accessibility by air was lower than in the top regions. For the Dutch regions, compared to the characteristics that were found to belong to their market agglomeration positions, those of market centrality were slightly better; the regions had comparable scores, when GPD weighted, but from each of the three Dutch regions a larger population could be reached within a thirty-minute drive by car.

However, as was shown in the results from the regression analyses described in the previous section, foreign-owned firms in high-tech manufacturing were also found more often to be located in regions with a well-developed technological and soft and public knowledge base.
Comparison between the characteristics of the knowledge bases of the three Dutch regions and those of the top European regions, shown in Figure 3.9, showed that the Dutch regions had a greater specialisation in either technological knowledge (North Brabant) or soft and public knowledge (North Holland and South Holland). However, further analyses showed that the knowledge bases of most top European regions were comparable to those of the Dutch regions. Figure 3.9 shows that the average scores of the top European regions for both types of knowledge bases was lower than those of the three Dutch regions. However, this followed from the fact that these top ten European regions were found to be either specialised in technological or in soft and public knowledge, lowering their combined average score. To illustrate this, Appendix 3.4 shows a comparison between the scores of all the European regions on the soft and public knowledge base and the technological knowledge base. The ten regions with most firms in high-tech manufacturing have been marked with their regional codes. This figure shows that some of these top European regions, such as Lombardia (Milan), Frankfurt and Munich, were mainly specialised in technological knowledge, while others, especially those in the United Kingdom, were highly specialised in soft and public knowledge. Inner London had a very strong soft and public knowledge base, as were the adjacent regions of Berkshire and Oxfordshire, which were more specialized in soft and public knowledge than in technological knowledge. Only Paris offered both a well-developed technological and soft and public knowledge base.

In sum, the knowledge base of the Dutch regions was comparable to those of the regions with most foreign-owned firms in high-tech manufacturing. The knowledge base of Noth Brabant was more similar to that of the regions in Germany (Frankfurt, Munich) and northern Italy (Lombardia), which all had a strong technological profile. However, a more detailed comparison of the different characteristics underlying the technological knowledge base did show a difference between North Brabant and the top European regions in high-tech manufacturing: North Brabant had a very high number of patents per employee in the high-tech and medium high-tech industry (the region ranked third of Europe according to this indicator), and a relatively high business R&D intensity (ranking 20th of the 238 European regions), but the level of specialisation in high-tech and medium high-tech manufacturing was even below the European average (location quotient of 0.96) and, therefore, considerably lower than that of most of the top European regions in this industry (see Appendix 3.5).

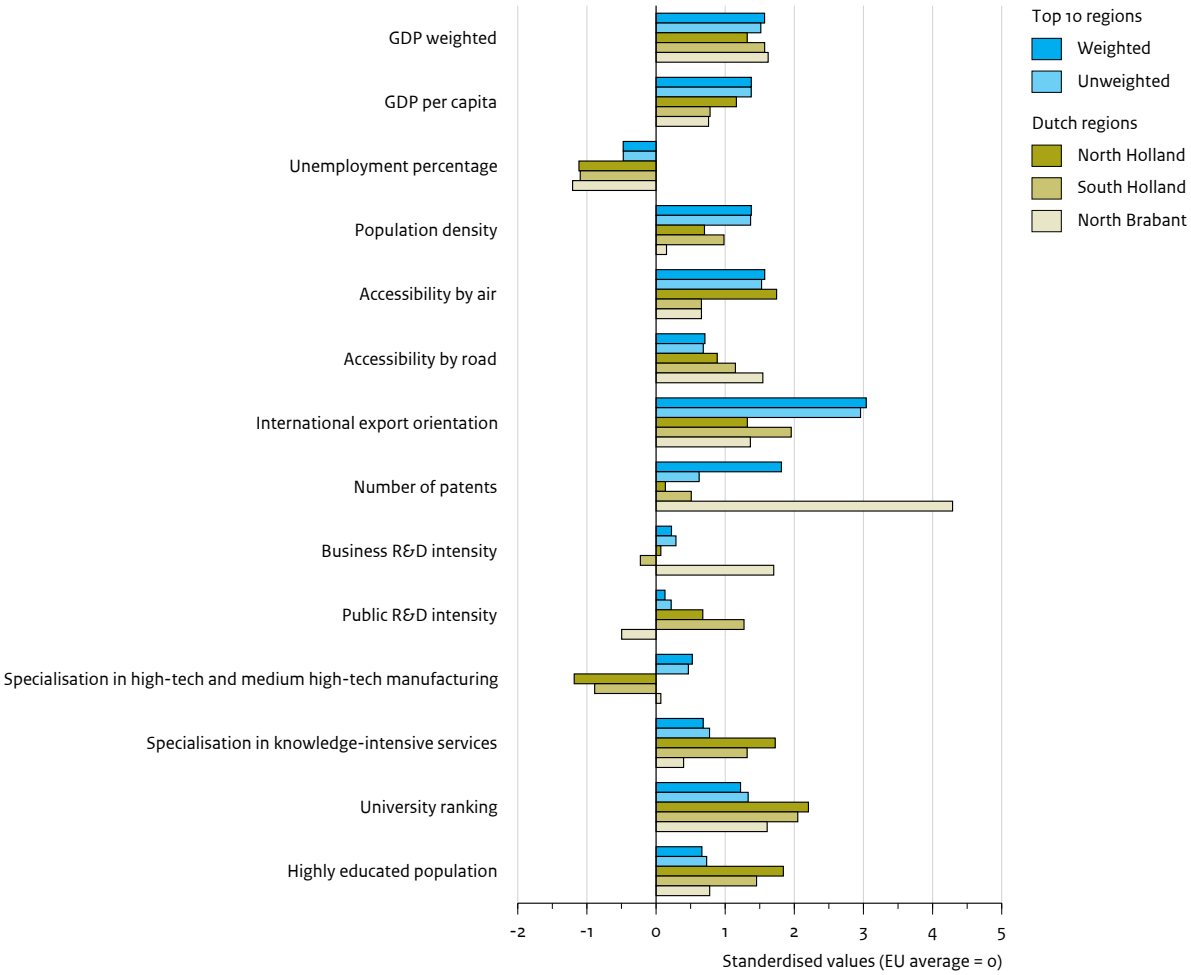
Figure 3.9
Regional characteristics of regions with foreign-owned firms in high-tech manufacturing, 2010



The strongly developed soft and public knowledge bases of North Holland and South Holland were comparable to those of the regions of South East England. Although North Holland and South Holland had lower scores than Inner London, their scores were higher than those of regions, such as Berkshire and Oxfordshire (see Appendix 3.4). The comparison of the different regional characteristics that together determine the score of a region on the soft and public knowledge base factor also confirmed this: the level of public R&D intensity and the specialisation in knowledge-intensive services of North and South Holland was comparable to those of the top European regions, although Inner London had a much higher specialisation in knowledge-intensive services, even compared to the other top ten regions (see Appendix 3.5). Furthermore, both the university rankings and the percentage of highly educated employees were also high in North Holland and South Holland (for both indicators these regions were in the top 20 of the 238 European regions). Results suggested that the knowledge bases of these Dutch regions were not the reason for the lower number of foreign-owned firms than in the top ten European regions. The difference in the level of market agglomeration seemed to be more important in this respect.

Figure 3.10 shows a similar comparison between the three Dutch regions and the European regions with the highest number of foreign-owned firms in medium high-tech manufacturing. With respect to the regional market situation, these top regions had a GDP per capita and population density that was slightly below that of the

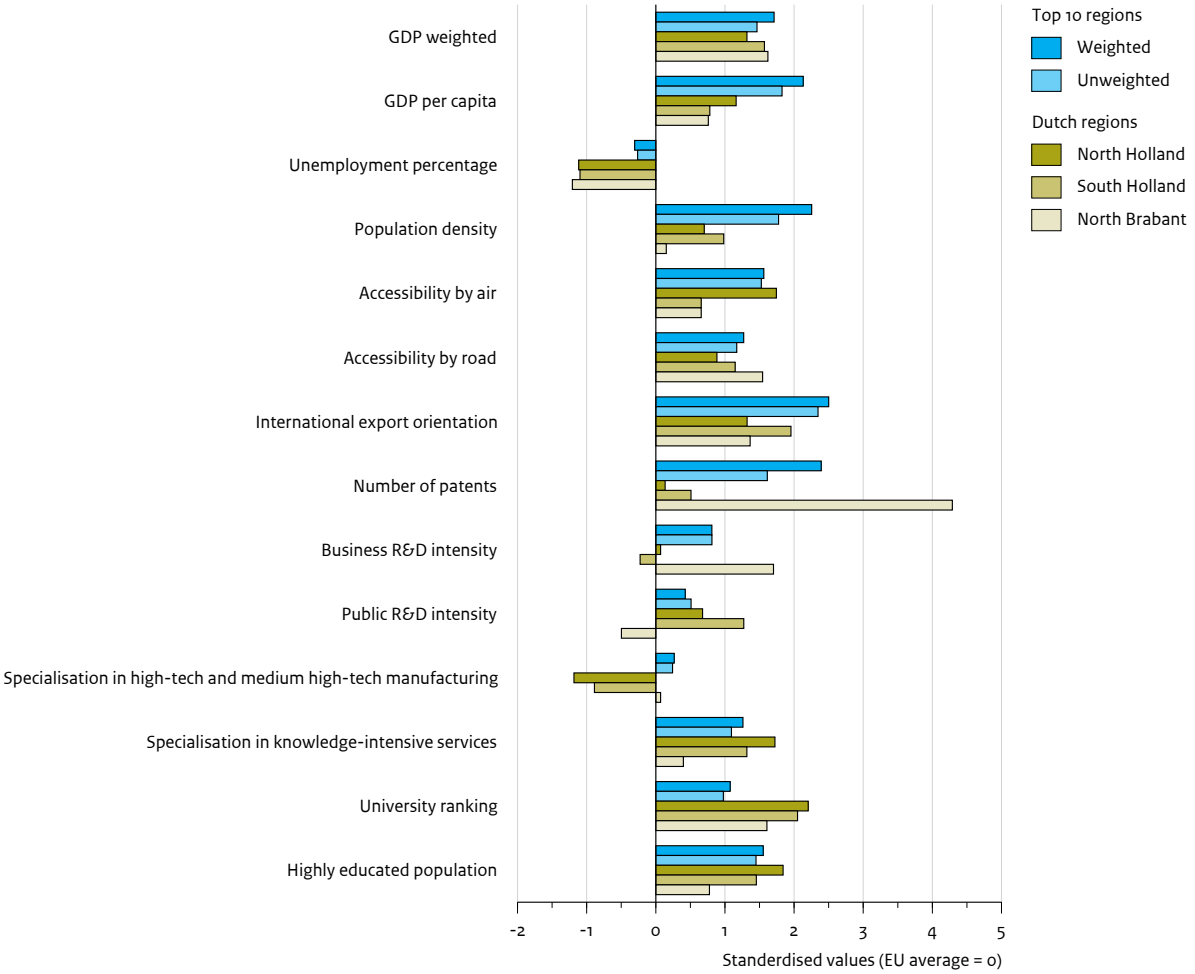
Figure 3.10
Regional characteristics of regions with foreign-owned firms in medium high-tech manufacturing, 2010



regions with the most foreign-owned firms in high-tech manufacturing, while the international export orientation of these regions was slightly greater. Furthermore, the results also showed that these firms were hardly concentrated in Inner London, as the weighted and unweighted scores on population density and GDP per capita did not differ. In general, the market situation in the Dutch regions appeared to match better with that in the top regions for this industry, than for firms in high-tech manufacturing. Only the international export orientation for the ten top regions was found to be much greater than for the three Dutch regions.

With respect to the regional knowledge base characteristics, Figure 3.10 shows that the regions with the most foreign-owned firms in medium high-tech manufacturing were even more specialised in knowledge-intensive manufacturing than those with the most foreign-owned firms in high-tech manufacturing. This is confirmed by the comparison in Appendix 3.4, which shows that, except for Inner London and South East Ireland, the top regions of this industry all have a technological knowledge base of above the European average. This also reflects the analysis presented in Section 3.3, which showed that only the technological knowledge base of a region significantly would affect their number of foreign-owned firms in this industry. While the characteristics of North Holland and South Holland clearly did not match the preferences of these firms, North Brabant generally seemed to offer a good business environment. However, as the top European regions in medium high-tech manufacturing were even more specialised in high-tech and medium high-tech

Figure 3.11
Regional characteristics of regions with foreign-owned firms in knowledge-intensive market services, 2010

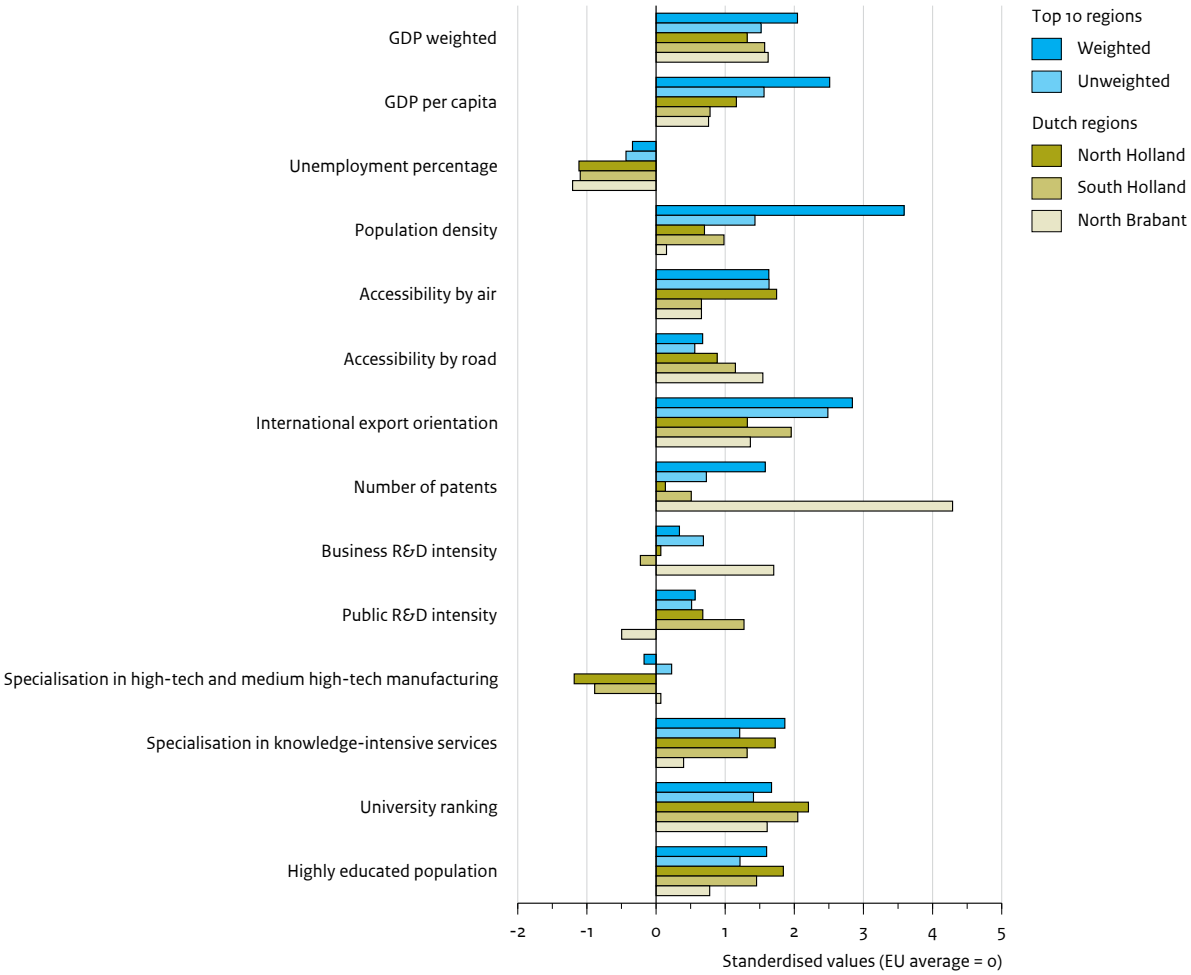


manufacturing, the lower level of specialisation in this industry in North Brabant was even more pronounced than for high-tech manufacturing (see Appendix 3.5).

For foreign-owned firms in knowledge-intensive services, the difference between the market situation in the three Dutch regions and the top European regions was much larger than for those in knowledge-intensive manufacturing. Figures 3.11, 3.12 and 3.13 show the scores for the three Dutch regions and the top European regions, for the number of firms in knowledge-intensive market services, high-tech services and financial services. Similar to the situation for knowledge-intensive manufacturing, the market centrality of the Dutch regions was found to largely resemble that of the top European regions (as measured by GDP weighted and accessibility by road).

However, with respect to market agglomeration, the situation in the three Dutch regions was found to be largely different from that in the European regions with the most foreign-owned firms in knowledge-intensive services.
Figure 3.11 shows that the European regions with the most firms in knowledge-intensive market services had a GDP per capita and population density that was twice as high as that of the Dutch regions. Furthermore, although the top European regions with foreign firms in knowledge-intensive services had a slightly less strong international export orientation than those with firms in knowledge-intensive manufacturing, their average scores were still higher than for the three Dutch regions.
The analysis in Section 4.3 showed that only the characteristics of soft and public knowledge base were

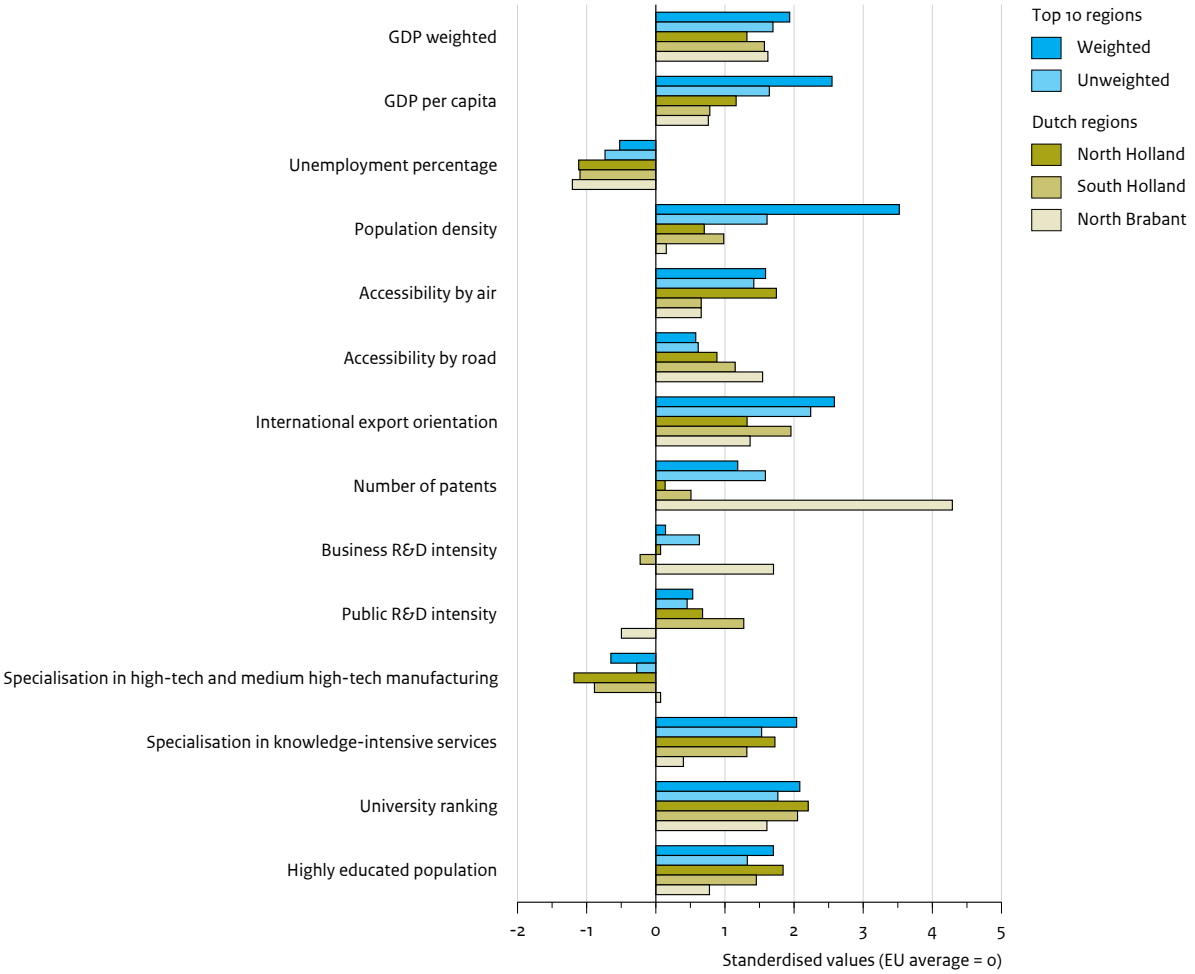
Figure 3.12
Regional characteristics of regions with foreign-owned firms in knowledge-intensive high-tech services, 2010



related to the number of foreign-owned firms in knowledge-intensive services. Therefore, we focused on the comparison between the regional characteristics of the Dutch regions and the top European regions, in relation to these services, and those that affected the soft and public knowledge bases of these regions. With respect to market services, the public R&D intensity, specialisation in knowledge-intensive services, university ranking and educational level was higher in North Holland and South Holland than the average score of the top European regions. North Brabant, in contrast, scored lower on all these regional characteristics, except on university ranking. Appendix 3.5 shows the scores on public R&D intensity for the top ten European regions, separately, and their specialisation in knowledge-intensive services. While the scores on public R&D intensity for the top ten European regions varied widely, all of these regions did have a specialisation in knowledge-intensive services of above the European average, with the exception of Lombardia.

Figure 3.12 shows the scores for the Dutch regions and the European regions with the highest number of high-tech services. The large difference between the weighted and unweighted scores on population density and GDP per capita in this figure shows the effect of the strong concentration of these firms in the very densely populated regions of Inner and Outer London. However, although the unweighted average score was much lower for both regional characteristics, these scores were still higher than those of the three Dutch regions. Therefore, with respect to market agglomeration, the difference

Figure 3.13
Regional characteristics of regions with foreign-owned firms in knowledge-intensive financial services, 2010



between the position of the Dutch regions and the European regions with the most firms in high-tech services, in 2010, was even larger than for market services.
Contrary to the regional market situation, the knowledge base of top European regions largely resembled that of North Holland and South Holland, with large shares of highly educated employees, high university rankings, a strong specialisation in knowledge-intensive services and high public R&D intensity. The comparison of the scores of each of the top ten European region, separately, between public R&D intensity and the specialisation in knowledge-intensive services, as shown in Appendix 3.5, shows a similar pattern as that for market services. Scores of these regions on public R&D intensity varied widely, while all the regions, except for Lombardia, did have a specialisation in knowledge-intensive services of above the European average. As both North Holland and South Holland were also highly specialised in these activities, this suggests that both Dutch regions could be considered attractive locations for these types of firms. Because the analysis in Section 3.3 also showed that the soft and public knowledge base was an even more important explanatory factor for the number of foreign-owned firms in high-tech services than the regional market situation.

The comparison between the characteristics of the ten European regions with the most foreign-owned firms in financial services and the Dutch regions was more difficult to make, because for this industry the regions were all part of the top ten. Nevertheless, Figure 3.13 still

shows that the average score of the ten European regions on higher population density and GDP per capita was even slightly higher than of the regions with the most other foreign-owned knowledge-intensive services. This was largely due to the fact that by far the most foreign-owned financial services were located in Inner London and, therefore, the weighted scores for these characteristics were largely affected by the high scores of this region. Not surprisingly, the characteristics of the soft and public knowledge base of the top European regions were almost similar to that of the regions of North Holland and South Holland, which had the second and fifth highest number, respectively, of financial services in all European regions (see Chapter 2).

In sum, the comparison between the regional characteristics of the three Dutch regions with by far the most foreign-owned firms in the Netherlands and the top European regions, showed some clear differences in regional business environment. The top European regions were found to be densely populated regions with a strong regional market, high GDP per capita, strong international connections, illustrated by the presence of a major airport in the region, and the fact that local firms export their goods internationally to a large number of regions. These are the typical characteristics of the large agglomerations within Europe, such as London, Paris and Milan. The analysis also suggests that such regions would be especially attractive locations for foreign firms involved in knowledge-intensive services. The European regions with the most foreign-owned firms in knowledge-intensive manufacturing had lower average population densities, GDP per capita, and were less easily accessible by air, although population densities and GDP per capita were still higher than in the three Dutch regions.
The analysis also showed the Dutch regions to have a highly specialised knowledge base in either technological knowledge (North Brabant) or soft and public knowledge (North Holland and South Holland). The knowledge bases of North Holland and South Holland were largely comparable to those of the top regions in South East England, while the knowledge base of North Brabant was more similar to those of regions in the north of Italy and several German regions. However, compared to the highest ranking regions (Lombardia for manufacturing and London for services), the level of specialisation of North Brabant in high-tech and medium high-tech manufacturing and that of North Holland and South Holland in knowledge-intensive services was lower.

3.5 More or less than expected

Section 3.3 describes how the number of foreign-owned firms in a region was found to be related to the regional characteristics. Based on the results from that analysis, it was possible to calculate how many foreign-owned firms would be likely to be located in each European region, given the market situation and knowledge base of that region[8]. Subsequently, the number of firms projected by the models could be compared to the actual number of firms in a region, to determine whether less or more foreign-owned firms were located in the region in 2010 than could be expected on the basis of its market situation and knowledge base. If the expected and observed numbers of foreign-owned firms did not match, this suggested that other regional characteristics were also involved and that these made a region either more attractive or functioned as a barrier to attracting investments by foreign firms. This section presents this comparison for all the Dutch regions, with a separate focus on the three Dutch regions of North Holland, South Holland and North Brabant, where by far most foreign-owned firms of the Netherlands were located. The second part of this section discusses any other (regional) characteristics that may have had an effect on the number of foreign-owned firms, besides regional market situation and knowledge base.

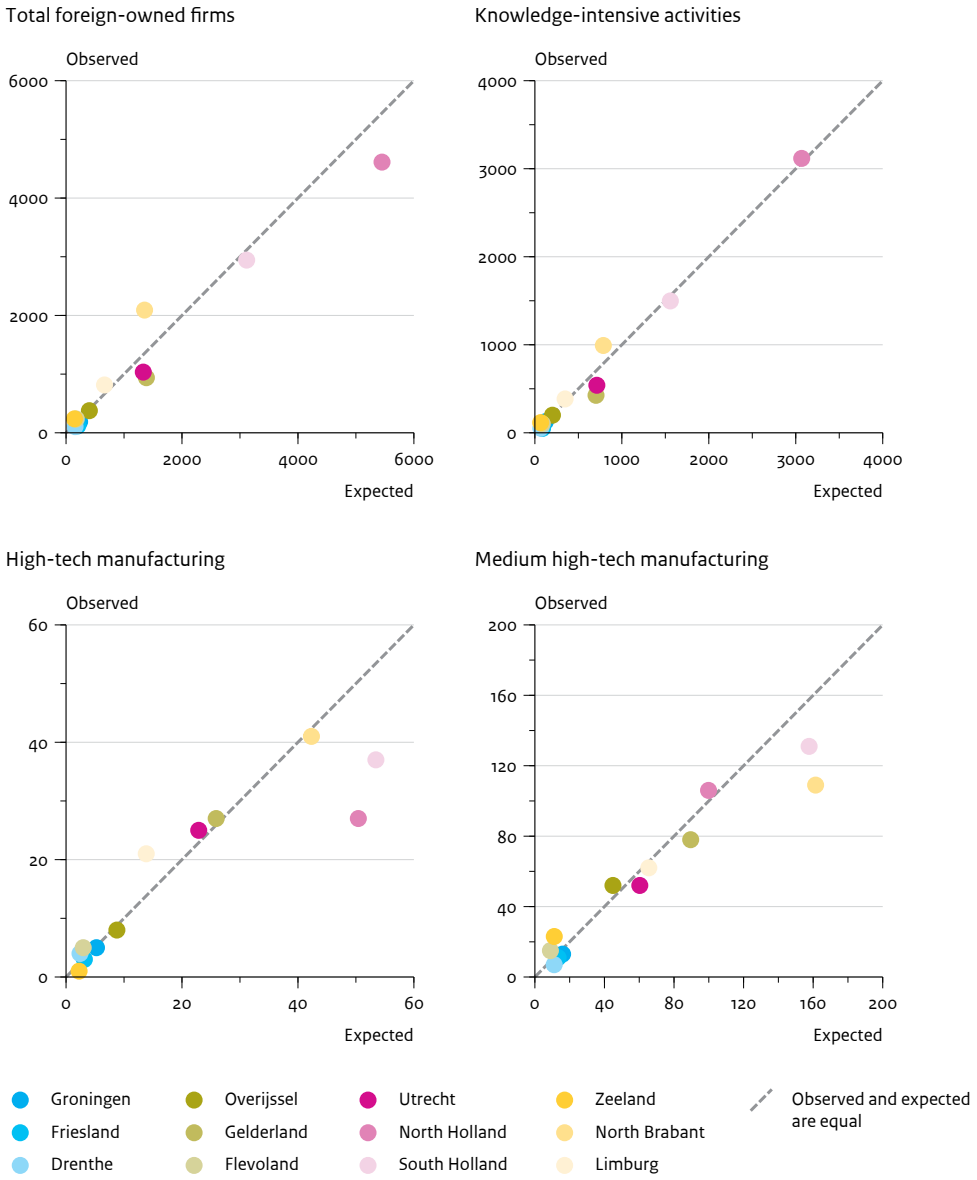
3.5.1 A comparison between the expected and observed number of foreign-owned firms

Figure 3.14 shows the comparison between the number of expected and observed foreign-owned firm in the 12 Dutch regions, showing total number of firms, those involved in knowledge-intensive activities, and the number of firms per activity. The x axis shows the number of foreign-owned firms per region predicted by the models as described in Subsection 3.3.2, and the y axis shows the observed number of foreign-owned firms in 2010. When both numbers were similar, the region was positioned on the diagonal line. When the observed number of foreign-owned firms in a region would be higher than the number predicted by the model, the region was positioned above the line, and below the line when the actual number was lower than predicted. The regions are represented by their regional codes (NL32 for North Holland, NL33 for South Holland, and NL41 for North Brabant).

The figure for the total number of foreign-owned firms shows that, in 2010, by far the most foreign-owned firms were indeed located in North Holland, South Holland and North Brabant, although there were large differences in numbers between the three regions. North Brabant is situated above the diagonal line and, therefore, in this region, the observed number of foreign-owned firms was

Figure 3.14a

Comparison between observed and expected number of foreign-owned firms per region, 2010

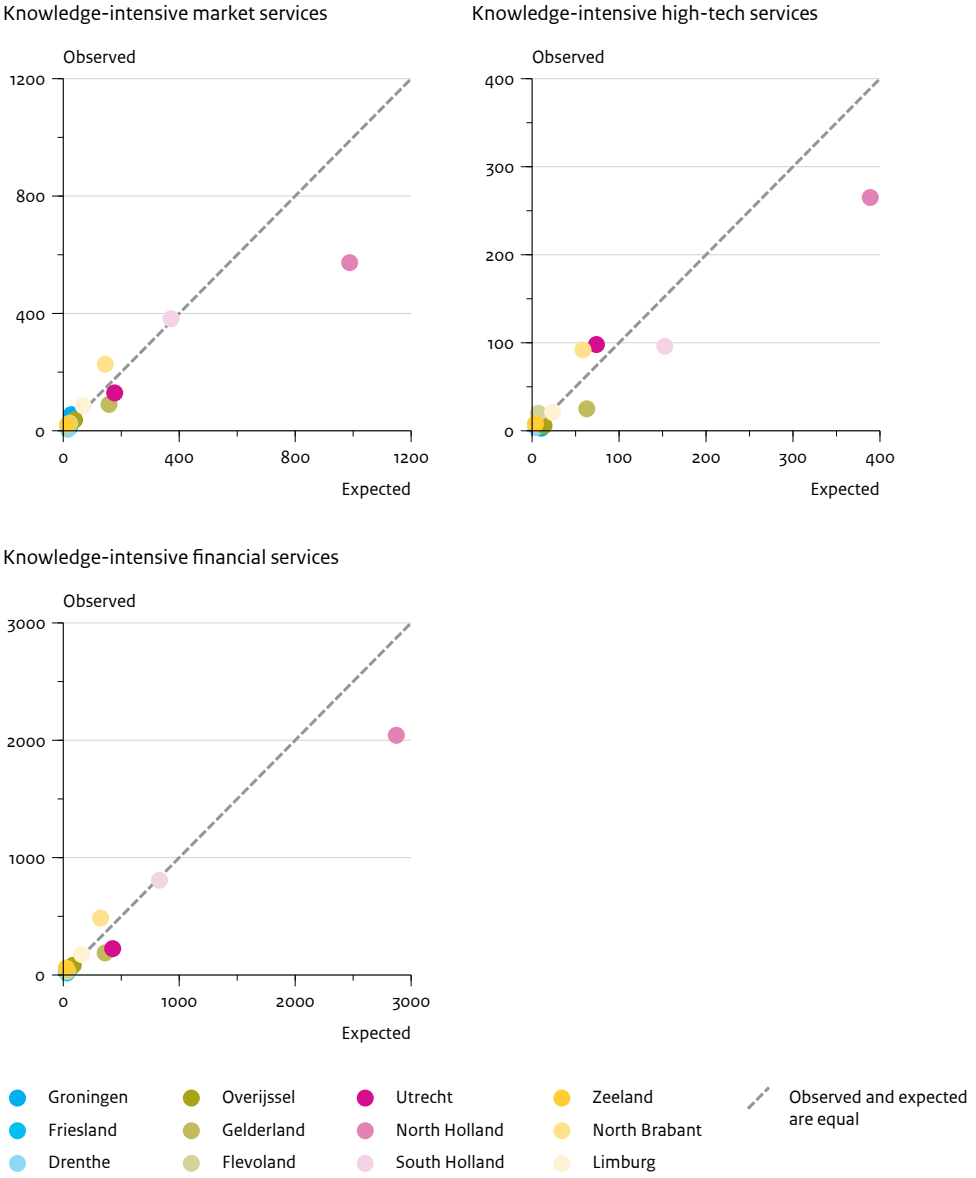


higher than the number based on the market and knowledge base of this region, while in South Holland and especially in North Holland the numbers of firms were lower than expected. However, when limited to only those firms involved in knowledge-intensive activities, the figure shows that the regions are positioned near the line. In other words, the observed number of foreign-owned firms involved in knowledge-intensive activities in these regions largely matched the expected number of firms , based on their region's market situation and knowledge base.

The distinction between the five knowledge-intensive activities showed several differences. For foreign-owned firms in high-tech manufacturing, the expected number was higher than the actual number, in South Holland and North Holland. Only in North Brabant did the number of firms in high-tech manufacturing largely match the expected number. However, in medium high-tech manufacturing, the number of foreign-owned firms in North Brabant was lower than expected. In other words, despite the region's strong specialisation in technological knowledge, it attracted fewer foreign firms involved in

Figure 3.14b

Comparison between observed and expected number of foreign-owned firms per region, 2010



medium high-tech manufacturing than expected, based on this specialisation. Only in North Holland did the actual and predicted numbers of foreign firms in medium high-tech manufacturing more or less match. In general, the findings for firms in high-tech and medium high-tech manufacturing seemed to be in line with earlier research on the position of the Netherlands, which showed its relatively weak position in attracting the type of foreign research and development activities that typically take place in this industry (see Haveman and Donselaar, 2008; Erken & Ruiter, 2005).

The results for firms in knowledge-intensive services were quite different, as shown in Figure 3.14. For all three types of knowledge-intensive services, the actual number of firms in North Brabant was slightly higher than expected, while the opposite was true for North Holland. For both market and financial services in South Holland, the observed and predicted numbers of foreign-owned firms were similar. Only for high-tech services, the actual number of firms was lower than expected, based on the market situation and the relatively high public R&D

intensity and strong specialisation in knowledge-intensive services of this region.

Appendix 3.6 shows the results from a similar analysis of the number of greenfield investments between 2003 and 2010. The results for knowledge-intensive services showed a largely similar pattern as that for the total foreign-owned firms in this industry. However, the results for foreign firms in knowledge-intensive manufacturing were slightly different than for the total number of foreign-owned firms. The number of greenfield investments in high-tech manufacturing during this period in North Brabant and North Holland was not lower but higher than predicted, while the difference between the actual number of greenfield investments involved in medium high-tech manufacturing and the predicted number was smaller for both North Brabant and South Holland. The barriers that have lead to a relatively low actual number of investments in both industries, up to 2010, appeared less relevant for greenfield investments.

In sum, the results from this analysis show that, in general, for all three Dutch regions, the difference between the actual and the expected numbers of foreign-owned firms, based on the regional market situation and knowledge base, were limited. However, there were two exceptions: numbers of foreign-owned firms in medium high-tech manufacturing were lower than expected in North Brabant, although for greenfield investments between 2003 and 2010, this effect was less, and North Holland showed a lower number of foreign-owned firms in knowledge-intensive services. This is somewhat surprising as both regions were found to be specialised in those respective activities. The previous section described that foreign firms tended to be concentrated in regions with specialisations similar to their own. In both these regions, other factors than those included in the analysis in Subsection 3.3.2 seemed to matter, factors that lowered the number of foreign-owned firms in those regions. We looked at the factors that may have formed those barriers.

3.5.2 Relevance of other regional characteristics

In addition to regional market potential and knowledge base, several other factors may have affected the likelihood of foreign firms investing in certain regions. Possibly, the most important factor would be firm-specific preferences. For example, foreign firms were found to sometimes prefer a location near a specific other organisation (such as an important customer or supplier), or choices would largely be affected by individual preferences of owners of these firms. Several prior empirical studies on FDI have shown that foreign firms are likely to choose a region where many other people from the same country are living (e.g. Brienen et al., 2010), or where other firms from the same country are already located (Belderbos et al., 2009). Making the right locational choice is very difficult and therefore hardly ever a completely rational decision. Firms tend to rely on the choices made by other firms before them, especially large firms, assuming that those firms made well-informed decisions, or they simply choose regions with concentrations of people of the same ethnicity, therefore having specific schools, shops or other services available.

Our data was limited to information on regional characteristics and to certain firm characteristics (industrial activity and the home region of the investor), we did not have any further information on firm-specific preferences. However, even if we did have such information it would often not be possible to measure firm-specific choices, because such considerations are highly firm specific and only partly reflected in regional characteristics. In other words, there is quite a lot firm-specific heterogeneity that goes beyond the scope of our model specifications. Because of the fact that firm-specific matters were found to play such an important role in locational decisions of foreign firms, customisation is highly relevant during the process of international acquisition.

A second important factor may be the image of the region. This may have such a strong effect that foreign firms decide not to invest in a region, while objectively viewed the regional situation could be quite attractive. An interesting question is whether the image of the Dutch regions of North Brabant (for technological firms) and North Holland (for services) matches with their regional characteristics.

Another factor that may influence the locational choice of foreign firms and actually may be highly related to the image of the region, is that of the quality of living in a region. Quality of living refers to a wide array of qualities, ranging from safety, education, hygiene, health care, public transportation, to cultural and recreational facilities, to political-economic stability. Because of the fact that firms increasingly are footloose, that is, they hardly require any region-specific factors and therefore may locate in many different places, the relevance of quality of living to attracting firms is receiving increasing attention in economic literature (e.g. Love and Crompton, 1999; Salvesen and Renski, 2003). Love and Crompton (1999), for instance, found that, although the characteristics related to quality of living ranks in importance behind those related to markets, these factors would have an added value in explaining the locational choice of firms, both national and international. Especially the more footloose firms, such as those looking to invest in another country, and more

Table 3.7
Negative binomial regression on the number of foreign-owned firms in 37 European regions

	1 Total	2 Knowledge-intensive activities	3 High-tech man.	4 Medium high-tech man.	5 Knowledge-intensive market services	6 Knowledge-intensive high-tech services	7 Knowledge-intensive financial services
Quality of living	0.020*	0.043***	0.028**	0.009	0.050***	0.022*	0.038
	(0.012)	(0.014)	(0.013)	(0.010)	(0.013)	(0.013)	(0.025)
Capital city (0/1)	0.675**	0.706**	0.258	0.015	0.402	0.970***	1.453***
	(0.319)	(0.339)	(0.266)	(0.232)	(0.310)	(0.361)	(0.541)
Ln Population size	0.603***	0.558***	1.132***	1.102***	0.334*	0.732***	0.673***
	(0.145)	(0.168)	(0.126)	(0.101)	(0.186)	(0.140)	(0.204)
Constant	-1.650	-2.406	-13.77***	-12.03***	-0.045	-6.521***	-5.932*
	(2.164)	(2.498)	(1.917)	(1.464)	(2.767)	(2.094)	(3.142)
N of observations	37	37	37	37	37	37	37
N of firms	123,244	49,627	1,745	3,875	17,811	8,301	13,751
Log likelihood	-327.52	-292.80	-163.19	-190.48	-225.21	-225.21	-236.75
Wald Chi^2	24.35***	28.04***	81.61***	153.24***	21.61***	32.40***	28.59***
LR overdispersion (α)	79,000***	34,000***	725.94***	1,185.02***	10,000***	6,672.90***	19,000***

**** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses*

knowledge-intensive firms which often rely more on higher educated professionals, seem to value the quality of living at their location.

Although there are many anecdotes about the importance of the quality of living to firms selecting a new business location in another country, empirical evidence is still highly limited, mainly due to a lack of regional data on the factors that determine regional quality of living. Detailed information on relevant factors is also lacking for the 238 European regions discussed in this study. However, to obtain some initial insights into the potential relevance of differences in quality of living, we performed some model calculations to estimate the potential effect of the quality of living in cities within Europe on the number of foreign-owned firms in each region. The quality of living was based on the ranking in a survey by Mercer. Once a year, Mercer conducts a survey on quality of living, to assist multinational companies in assessing comparative international quality of living standards for their expatriate workers (see Appendix 3.7 for a more extensive description of this data). Based on detailed assessments and evaluations of 39 criteria, each having coherent weightings reflecting their relative importance, Mercer values the quality of living in more than 320 cities, worldwide, 37 of which located in Europe. As the scores were not available for each criteria separately, we used total scores to determine which European city had the highest and which the lowest quality of living (the highest being a score of 37; the lowest a score of 1, Appendix 3.7 shows this ranking). This variable was included in the model to estimate its effect on the number of foreign-owned firms in the 37 regions for which Mercer had data available. Because of the limited number of regions in the models, it was not possible to control for all the other variables included in the models described in Section 3.3. Therefore, in addition to the ranking of each city, we only included the two control variables: capital city and population size. Table 3.7 shows the results from the model estimations.

Several of the models showed positive and significant effects for the ranking of regions by their quality of living according to Mercer, suggesting that the number of foreign-owned firms is indeed higher in regions with a higher quality of living. Although this effect was only just significant in the model estimation of the total number of foreign-owned firms (model 1), it had a more-pronounced significant effect in the estimation of the number of foreign-owned firms in the knowledge-intensive industry (model 2). This, in keeping with previous studies on quality of living, also suggested that firms involved in knowledge-intensive activities attach more value to the regional quality of living than those in knowledge-

extensive industries. The models for the five types of knowledge-intensive activities did show a difference in the effects of quality of living between these types of industries. The quality of living, following the Mercer ranking, had a positive and significant effect on the number of foreign firms in high-tech manufacturing, knowledge-intensive market services and high-tech services, while this effect was found to be not significant for those in medium high-tech manufacturing and financial services. A possible explanation for the limited effect of quality of living on these last two industries may be that other factors were more important to these firms. The results from previous analyses discussed in this chapter already showed that firms in medium high-tech manufacturing were more likely to locate in regions specialised in this same activity and located centrally in the European market. The proximity to similar types of firms and the possible access that such locations would offer to specialised services or technological knowledge may have been more important to these firms than a higher quality of living. The limited effect for financial services is more surprising as these firms do rely on highly educated employees, who tend to prefer living in a region offering a wide diversity of amenities. Nevertheless, the high relevance of beneficial tax regimes and direct accessibility to services firms that are well-informed about the institutional arrangements in a specific country, may imply that locations in capital cities would be considered more important to firms active in these industries than the quality of living in those cities.

Due to the lack of detailed data for all European regions, we only have been able to provide some preliminary results on the relevance of quality of living as a regional characteristic that would affect locational choices of foreign firms. However, our results do suggest that quality of living matters, especially to knowledge-intensive firms. Future research should focus on further unravelling the underlying elements that affect locational choices of foreign firms, and examine the relevance of this factor when controlled for the regional market situation and knowledge base.[9]

3.6 Conclusions

The analyses, of which the results are described in this chapter, provided insight into the regional characteristics that affected the number of foreign-owned firms in European regions and into the extent to which the business environment in the Dutch regions matched those characteristics. We found that regional characteristics certainly matter in explaining the spatial pattern of foreign-owned firms in European regions. The variance in the number of foreign-owned firms per region was found to be affected even more by regional differences than by national differences. Therefore, the first conclusion is that policymakers, in an effort to attract foreign firms to the Netherlands (or any other European country), should pay attention to differences in regional characteristics.

In a second step, we examined which regional characteristics would be the most important. Based on the literature review described in Chapter 1, we assumed that strategic asset-seeking behaviour and, more precisely, the procurement of access to region-specific knowledge would be important motives for foreign firms involved in knowledge-intensive activities. Our results partly confirmed this. In general, we found that regional differences in knowledge base did matter, but differences in the market situations had a greater effect on the regional numbers of foreign-owned firms, even those involved in knowledge-intensive activities. This suggested that, for their investments in Europe, foreign firms were mainly motivated by their search for markets. The relevance of obtaining access to region-specific knowledge seemed to depend on the type of activity of these firms: those involved in high-tech activities (both manufacturing and services) did appear to be driven by such knowledge-seeking motives. The results also showed an important difference between the technological and the soft and public knowledge base of a region. While a soft and public knowledge base would be relevant to almost all types of foreign knowledge-intensive firms, the relevance of technological knowledge would be limited to foreign firms involved in high-tech and medium high-tech manufacturing. Finally, the regions in the east and south of Europe that offer lower production costs, were found to be not very attractive to foreign firms. Consequently, the search for resources motivated by a lowering of productions costs, did not seem to play a large role for foreign firms investing in Europe.

The analysis of the number of foreign-owned firms divided per country of origin confirmed the fact that the value that foreign firms had put on regional characteristics largely depended on their type of industrial activity. This seemed especially the case for the regional technological knowledge base, which only appeared of interest to firms active in high-tech or medium high-tech manufacturing. As firms with a Japanese owner were more often active in these industries, only the number of Japanese firms was found to be affected by the technological knowledge base. For policymakers who aim to attract foreign investment, it is important to understand that appreciation of regional characteristics varies according to the type of industry of the investing firm. This implies that the type of regional

characteristics to be improved largely depends on the type of activity a region would want to attract.

The second main question in this chapter centres around the extent to which regional characteristics of the Dutch regions match the locational demands by foreign firms investing in Europe. This question was answered by comparing the regional characteristics in the Dutch regions with those in the ten European regions with the most foreign-owned firms. This comparison showed that the market situation of the Dutch regions is slightly less developed than that of the top regions. Although the Dutch regions have a relatively central location within Europe and therefore score high on market centrality, the top regions tend to have strong regional markets (high GDP per capita and population densities) and strong international connectivity (international export orientation and proximity to a major airport).

With respect to the regional knowledge base, the comparison showed that the Dutch regions had a strong specialisation in either technological knowledge (North Brabant) or soft and public knowledge (North Holland and South Holland). This is comparable to the knowledge bases of most top European regions that were also specialised in either soft and public knowledge or technological knowledge. Only Paris had a knowledge base that offered a combination of both types of knowledge. The knowledge bases of North Holland and South Holland were largely comparable to those of the top regions in South East England, while the knowledge base of North Brabant was more similar to those of regions in the north of Italy and several German regions. However, a comparison of the different regional characteristics underlying the knowledge base factors did show that the levels of specialisation of the Dutch regions was lower than that of regions with the highest numbers of foreign-owned firms. Although North Holland and South Holland were highly specialised in knowledge-intensive services, this specialisation was even much stronger in Inner London. For North Brabant the difference was even larger. This region had a very high number of patents and high business R&D intensity, but its specialisation in high-tech and medium high-tech manufacturing was below the European average.

In general, the numbers of foreign-owned firms in knowledge-intensive industry located in the three Dutch regions was largely comparable to what could be expected based on their regions' market situations and knowledge bases. However, the distinction between the five different knowledge-intensive activities did indicate certain differences. For high-tech manufacturing, and based on the market situation and knowledge base of the region, North Brabant was found to largely attract the expected number of firms, but both in North and South Holland, numbers were lower than expected. The pattern of foreign firms in medium high-tech manufacturing showed the opposite: particularly in North Brabant numbers were lower than expected, while in North Holland they were slightly higher. Most foreign knowledge-intensive services were located in North Holland, but the analysis showed that this number was lower than could be expected, based on the region's market situation and knowledge base.

In sum, especially in North Brabant and North Holland there were barriers that seemed to lead to lower numbers of foreign-owned firms, in medium high-tech manufacturing and knowledge-intensive services, respectively. The exact nature of those barriers has remained an open question. The quality of living in both regions did not seem to be the problem. Of all the European regions in the Mercer ranking, Amsterdam ranked 6th (see Appendix 3.7) and, therefore, was considered to have a high quality of living. Although the quality of living in North Brabant would probably be lower (the region was not included in the Mercer ranking) in part due to a lower number of consumer services, the analysis in Section 3.5.2 also showed that this factor was less important to foreign firms investing in medium high-tech manufacturing. Therefore, the lower number of foreign firms in both regions may have been due to firm-specific preferences or to the image of the region. A possible explanation may be that, although both regions could be considered highly specialised and, objectively measured, offered an attractive market situation and knowledge base, they were not the top regions in this field within Europe. This may imply that, internationally, these regions at the time of our investigation did not have the image of being a top location for these industries. Due to this image effect and the large relevance of path dependency (firms looking for new investment locations are more likely to choose regions that already have the strongest concentration of foreign firms in the same industry), foreign firms may be more likely to invest in the top European regions than in the Dutch regions.

Notes

1 In total, 23 European countries were included in the analysis, however, because the Nuts2 division is similar to the national level for the Baltic States and Luxembourg, the three Baltic States were considered as one country and Luxembourg was added to Belgium.

2 To determine the number of factors, we used two criteria: the eigenvalue of each factor should be higher than 1 and the level of contribution of each factor to the variance of the data. Only the factor 'market low costs' had the lower eigenvalue of 0.92, but this factor does represent 18.6% of the variance of the data.

3 Each region's estimated score on each factor is a weighted sum of the products of scoring coefficients and the subject's standardised scores on the original variables.

4 All models are estimated using the White estimator to obtain robust standard errors.

5 As explained in Chapter 2, we have defined greenfield investments as the number of firms that have been established since 2003 and that were owned for at least 50% by a firm from another country in 2010. Because the Amadeus database does not provide any information on the ownership structure in the past, a more precise definition is not possible.

6 Similar to the analysis of the number of foreign-owned firms divided per industry, we also estimated the number of greenfield investments in each region between 2003 and 2010, divided according to home country of the investor. The results are shown in Appendix 3.3. However, the only difference with the model for the total number of foreign firms divided according to home country was that the effect of the control variable 'capital city' was no longer significant for the Japanese firms. Therefore, these results have not been included in this section.

7 The very high scores for population density and GDP per capita are mainly due to the fact that a large share (10.3%) of all foreign-owned firms in Europe were found to be located in the region of Inner London, which has a very high population density (z-score of 9.83) and GDP per capita (z-score of 5.30). Consequently, when the total number of foreign-owned firms were weighted per region, the average score of the top 10 regions for population density was three times higher, and for GDP per capita two times higher, than the unweighted score.

8 This is done by calculating the predicted value based on the coefficients and the value of each independent variable in the 238 regions.

9 To obtain some insights in how robust the effect of quality of living is when we control for the regional market situation and knowledge base, we have estimated so-called conditional logit models in which the locational choice of each firm separately is estimated limiting the problems of the small number of regions for which the Mercer data is available. These models show that the effect of the quality of living remains positive and significant in such a model estimation.

Appendices

Appendix 1.1

Operationalisation of the independent variables

	Description	Source
GDP per capita	Gross Domestic Product at current market prices per region, divided by the population of the region (average 1999-2002)	Eurostat (GDP) and Cambridge Econometrics ERP (population), 2010
GDP weighted	Gross Domestic Product at current market prices of each region, weighted by the GDP of all other European regions using a distance decay function (average 1999-2002)	Eurostat, 2010
International export orientation total	Export orientation of every region which takes into account both the number of regions where all products and services are sold and the share of sales of products and services in those regions, 2000	PBL, 2010
Accessibility by road	Size of the population that can be reached within 30 minutes driving by car, average 1999-2000	Espon, 2010
Proximity to (major) airport	Classification of the proximity of a region to a (major) airport. Regions score 3 points when they have a major international airport (29 regions, based on the first natural break in number of passengers), 2 points when it borders another region with a major airport, 1 point when it has a smaller airport, and 0 in all other cases, November 2000	PBL, 2010
Unemployed percentage	Number of unemployed divided by the economically active population (average 1999-2002)	Eurostat, 2010
Business R&D intensity	Gross Domestic expenditure on R&D of the business enterprise sector, divided by total GDP in each NUTS2 region, average 1999-2002	Eurostat, 2010
Public R&D intensity	Gross domestic expenditure on R&D of public sector (higher education sector and government), divided by total GDP in each NUTS2 region, average 1999-2002	Eurostat, 2010
Highly educated population	The sum of the number of people that successfully completed a tertiary education level and those without such an education but who work in a science and technology occupation for which such an education would normally be required, divided by the economically active population of the region, average 1999-2002	Eurostat, 2010
Number of patents per 1,000 employees in the high-tech and medium high-tech industry	Number of patents assigned to a person living in the region divided by the number of people working in high and medium high-tech manufacturing in the region, average 1999-2002	Eurostat, 2010
University ranking	Ranking score of every region, based on the QS university ranking 600 (=248 in Europe), region with the highest ranking university receives the highest score (scores counting down from 248, 247, 246 and so on, the 0 being for regions without a university).	QS network
Specialisation in high-tech and medium high-tech manufacturing	Share of people working in high-tech and medium high-tech manufacturing in every region (of total employment), average 1999-2002	Eurostat, 2010
Specialisation in knowledge-intensive services	Share of people working in knowledge-intensive services in every region (of total employment), average 1999-2002	Eurostat, 2010
Population density	Number of people living in the region per square kilometre (average 1999-2002)	Eurostat, 2010
Capital city (0/1)	1 indicates that the political centre of the country is located in the region	PBL, 2010
Population size	Number of people living in the region	Cambridge Econometrics (ERP)

	Description	Source
Country level		
20 country dummies	20 variables that indicate whether the NUTS2 region belongs to that country (1) or not (0). Both Luxembourg and the Baltic States consist of only 1 NUTS2 region and therefore we added Luxembourg to the country dummy of Belgium and used one dummy variable for the three Baltic states.	

Appendix 2.1

Size categories and additional criteria according to the AMADEUS database

Inclusion Criteria

To be included a company should satisfy at least one of the following size criteria :

Very large companies (VL)

Companies on AMADEUS are considered to be Very Large when they have :

	Operating Revenue	>=	100 million EUR
OR	Total assets	>=	200 million EUR
OR	Employees	>=	1 000
OR	Listed		

Note: companies with ratios Operating Revenue per Employee or Total Assets per Employee below 100 EUR are excluded from this category.

Large companies (L)

Companies on AMADEUS are considered to be Large when they have :

	Operating Revenue	>=	10 million EUR
OR	Total assets	>=	20 million EUR
OR	Employees	>=	150
AND NOT	VL		

Note: companies with ratios Operating Revenue per Employee or Total Assets per Employee below 100 EUR are excluded from this category.

Medium sized companies (M)

Companies on AMADEUS are considered to be medium sized when they have :

	Operating Revenue	>=	1 million EUR
OR	Total assets	>=	2 million EUR
OR	Employees	>=	15
AND NOT	VL OR L		

Note: companies with ratios Operating Revenue per Employee or Total Assets per Employee below 100 EUR are excluded from this category.

Small companies (S)

Companies on AMADEUS are considered to be small when they are not included in another category (VL, L, or M)

Additional rules

In addition to the size criteria detailed above, the following additional rules for inclusion are applied:

- Banks and insurance companies are not included in the database.
- A company must have recent financials (not older than five years).

Appendix 2.2

Knowledge-intensive manufacturing and services based on NACE rev.2, 2 digits or 3 digits

		Knowledge-intensive manufacturing	Europe	NL
High-tech manufacturing	21	manufacture of basic pharmaceutical products and pharmaceutical preparations	0.42	0.24
	26	manufacture of computer, electronic and optical products	1.28	1.20
	303	manufacture of aircrafts and spacecrafts and related machinery	0.08	0.05
		TOTAL HIGH-TECH MANUFACTURING	**1.77**	**1.49**
Medium high-tech manufacturing	20	manufacture of chemicals and chemical products	1.21	1.62
	254	manufacture of weapons and ammunition	0.01	0.00
	27	manufacture of electrical equipment	0.96	0.47
	28	manufacture of machinery and equipment n.e.c.	1.99	2.10
	29	manufacture of motor vehicles, trailers and semi-trailers	0.57	0.26
	302	manufacture of railway locomotives and rolling stock	0.04	0.02
	304	manufacture of military fighting vehicles	0.00	0.00
	309	manufacture of transport equipment n.e.c.	0.05	0.02
	325	manufacture of medical and dental instruments and supplies	0.14	0.28
		TOTAL MEDIUM HIGH-TECH MANUFACTURING	**4.96**	**4.77**
		TOTAL KNOWLEDGE-INTENSIVE MANUFACTURING	**6.74**	**6.26**
		Knowledge-intensive services	**Europe**	**NL**
Knowledge-intensive market services	50	water transport	0.45	1.01
	51	air transport	0.12	0.14
	69	legal and accounting activities	0.76	1.32
	70	activities of head offices; management consultancy activities	6.26	4.72
	71	architectural and engineering activities; technical testing and analysis	1.75	1.94
	73	advertising and market research	1.45	1.23
	74	other professional, scientific and technical activities	1.46	0.47
	78	employment activities	0.56	0.93
	80	security and investigation activities	0.17	0.20
		TOTAL KNOWLEDGE-INTENSIVE MARKET SERVICES	**12.98**	**11.98**
Knowledge-intensive high-tech services	59	motion picture, video and television programme production, sound recording and music publishing activities	0.50	0.37
	60	programming and broadcasting activities	0.25	0.02
	61	telecommunication	0.68	0.53
	62	computer programming, consultancy and related activities	3.69	3.15
	63	information service activities	0.44	0.05
	72	scientific research and development	0.61	0.56
		TOTAL KNOWLEDGE-INTENSIVE HIGH-TECH SERVICES	**6.17**	**4.69**
Knowledge-intensive financial services	64	financial service activities, except insurance and pension funding	7.89	29.07
	65	insurance, reinsurance and pension funding, except compulsory social security	0.00	0.00
	66	activities auxiliary to financial services and insurance activities	1.37	1.55
		TOTAL KNOWLEDGE-INTENSIVE FINANCIAL SERVICES	**9.26**	**30.62**
Other knowledge-intensive services	58	publishing activities	1.10	0.69
	75	veterinary activities	0.01	0.03
	85	education	0.42	0.27
	86	human health activities	0.62	0.33
	87	residential care activities	0.10	0.00
	88	social work activities without accommodation	0.06	0.00
	90	creative, arts and entertainment activities	0.24	0.23
	91	libraries, archives, museums and other cultural activities	0.04	0.09
	92	gambling and betting activities	0.14	0.07
	93	sports activities and amusement and recreation activities	0.51	0.23
		TOTAL OTHER KNOWLEDGE-INTENSIVE SERVICES	**3.25**	**1.94**
		TOTAL KNOWLEDGE-INTENSIVE SERVICS	**31.66**	**49.23**
		Less knowledge-intensive manufacturing	**Europe**	**NL**
Medium low-tech manufacturing	182	reproduction of recorded media	0.05	0.04
	19	manufacture of cokes and refined petroleum products	0.08	0.12
	22	manufacture rubber products	1.03	0.74
	23	manufacture of other non-metallic mineral products	0.73	0.37
	24	manufacture of basic metals	0.46	0.28
	25	manufacture of metal products, except machinery and equipment (exclusive 254)	1.71	1.03
	301	building of ships and boats	0.09	0.10

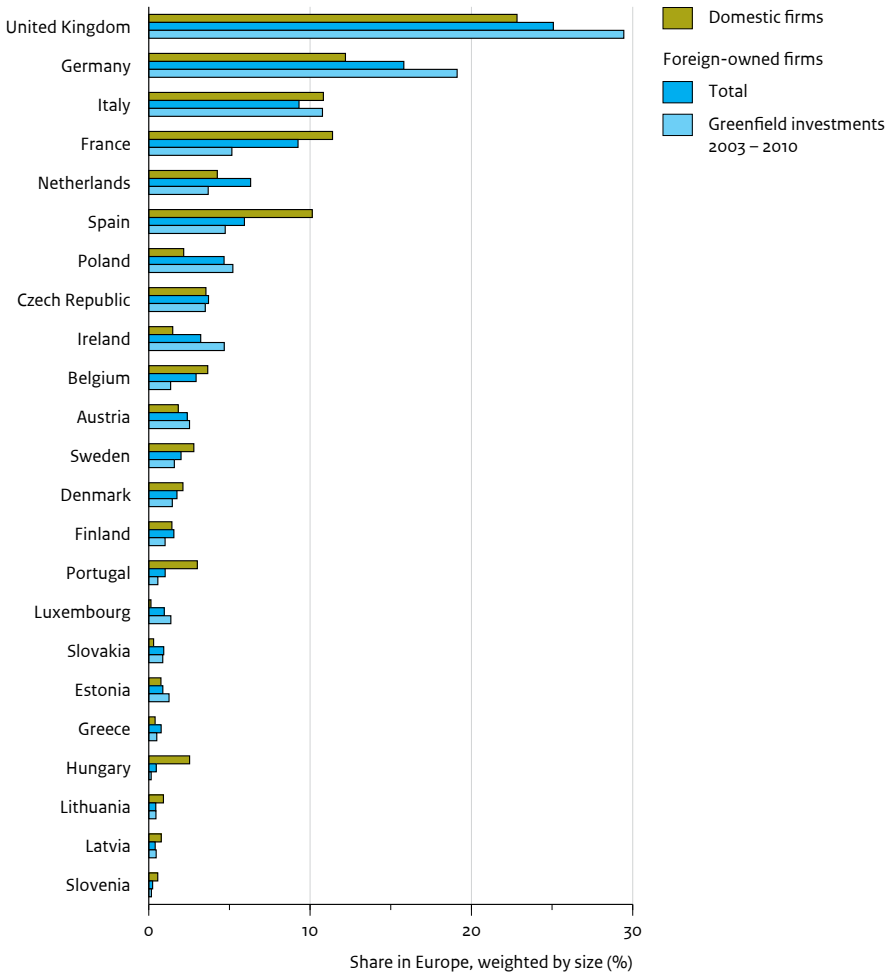
	33	repair and installation of machinery and equipment	0.26	0.10
		TOTAL MEDIUM LOW-TECH MANUFACTURING	**4.40**	**2.78**
Low-tech manufacturing	10	manufacture of food products	1.03	0.83
	11	manufacture of beverages	0.20	0.03
	12	manufacture of tobacco products	0.04	0.11
	13	manufacture of textiles	0.35	0.20
	14	manufacture of apparel	0.25	0.12
	15	manufacture of leather and related products	0.09	0.10
	16	manufacture of wood and wooden and cork products, except furniture; manufacture of articles of straw and plaiting materials	0.28	0.16
	17	manufacture of paper and paper products	0.45	0.46
	181	printing and service activities related to printing	0.35	0.23
	31	manufacture of furniture	0.24	0.20
	321	manufacture of jewellery and related articles	0.03	0.01
	322	manufacture of musical instruments	0.01	0.01
	323	manufacture of sports goods	0.04	0.02
	324	manufacture of games and toys	0.03	0.04
	329	manufacturing n.e.c.	0.35	0.04
		TOTAL LOW-TECH MANUFACTURING	**3.75**	**2.56**
		TOTAL LESS KNOWLEDGE-INTENSIVE MANUFACTURING	**8.15**	**5.35**
		Less knowledge-intensive services	**Europe**	**NL**
Distribution services	45	wholesale and retail trade and repair of motor vehicles and motorcycles	1.29	0.99
	46	wholesale trade, except for motor vehicles and motorcycles	16.48	21.96
	49	road transport and transport via pipelines	0.95	1.24
	52	warehousing and supporting activities for transportation	1.71	2.57
		TOTAL DISTRIBUTION SERVICES	**20.42**	**26.77**
Consumer services	47	retail trade, except for motor vehicles and motorcycles	3.46	1.64
	55	accommodation	1.06	0.45
	56	food and beverage service activities	0.68	0.15
	79	travel agencies, tour operators, reservation services and related activities	0.54	0.49
	95	repair of computers and personal and household goods	0.14	0.11
		TOTAL CONSUMER SERVICES	**5.87**	**2.84**
Other market services	68	real-estate activities	8.11	2.56
	77	rental and leasing activities	0.99	1.85
	81	services to buildings and landscape activities	0.22	0.15
	82	office, office support and other business support activities	8.12	0.30
		TOTAL OTHER MARKET SERVICES	**17.45**	**4.86**
		TOTAL LKIS	**43.74**	**34.47**
		Other industries	**Europe**	**NL**
Other less knowledge-intensive activities	53	postal and courier activities	0.07	0.18
	96	other personal service activities	1.56	0.23
		TOTAL LESS KNOWLEDGE-INTENSIVE ACTIVITIES	**1.63**	**0.41**
Resource-based industry	01	Crop and animal production, hunting and related service activities	0.65	0.34
	02	Forestry and logging	0.07	0.02
	03	Fishing and aquaculture	0.08	0.03
	05	Coal and lignite mining	0.01	0.00
	06	Extraction of petroleum and natural gas	0.18	0.52
	07	Mining of metal ores	0.02	0.00
	08	Other mining and quarrying	0.24	0.23
	09	Mining support service activities	0.17	0.42
		TOTAL RESOURCE-BASED INDUSTRY	**1.40**	**1.55**
Construction and public utilities	35	Electricity, gas, and steam supply, and air conditioning	1.21	0.38
	36	Water collection, treatment and supply	0.07	0.02
	41	Building construction	3.42	0.86
	42	Civil engineering	0.29	0.17
	43	Specialised construction activities	1.29	0.91
	37	Construction of sewerage systems	0.05	0.01
	38	Waste collection, treatment and disposal activities; materials recycling	0.34	0.37
	39	Environmental remediation activities and other waste management services	0.02	0.02
		TOTAL CONSTRUCTION AND PUBLIC UTILITIES	**6.68**	**2.75**
		TOTAL OTHER ACTIVITIES	**9.71**	**4.70**
Excluded	84	Public administration and defence; compulsory social security		
	94	Activities of membership organisations		
	97	activities of households as employers of domestic personnel		
	98	undifferentiated goods-and services-producing activities of private households for own use		
	99	activities of extraterritorial organisations and bodies		

Appendix 2.3

Distribution of foreign-owned firms across European countries, weighted according to size

Large and very large firms may contribute more to local economies in terms of employment and value added, compared to their smaller counterparts. In the Amadeus data set, numbers of employees or turnovers were not given for all foreign firms and, therefore, it was not possible to rank the countries according to these indicators. However, the data set did provide an indication of size, distinguishing between four categories: small, medium-sized, large and very large firms, using information on operating revenues, assets and/or employees (see Appendix 2.1). We used this indicator to learn whether the ranking of the European countries based on the number of foreign firms would be sensitive to the size distribution of these firms, as some countries mainly attract a certain size of firm. The number of firms per country were weighted by multiplying the firms by their size category (small firms were multiplied by 1, medium-sized firms by 2, large firms by 3 and very large firms by 4). Figure A.1 shows the distribution.

Figure A.1
Foreign-owned and domestic firms in Europe, 2010



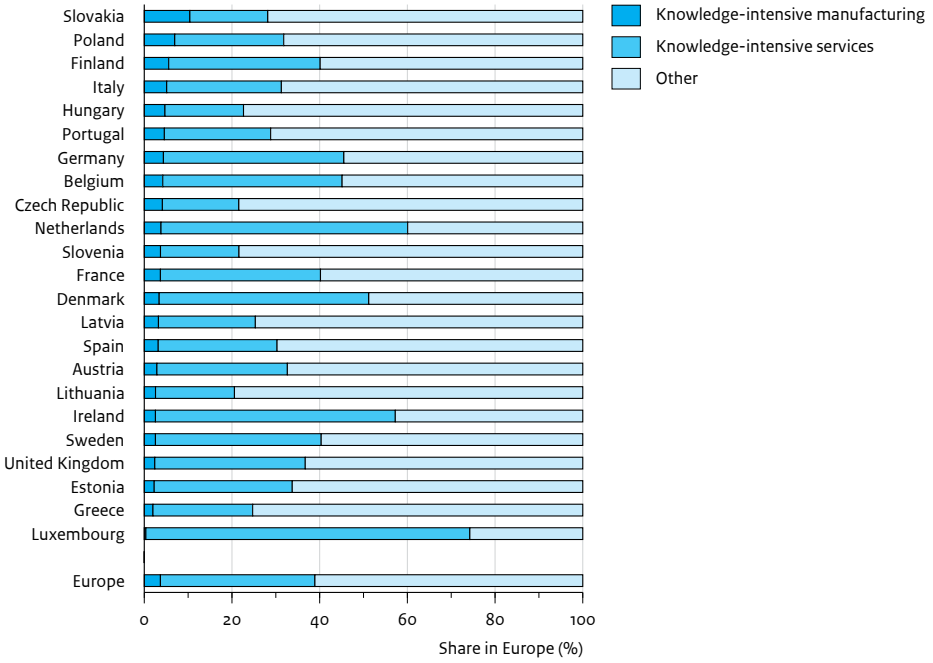
Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Appendix 2.4

Industry and size distribution of greenfield investments per country

The graphs below show the distribution of greenfield investments (firms that have been established since 2003 and were foreign-owned in 2010) for every country in Europe according to industrial activity (knowledge-intensive manufacturing, knowledge-intensive services and all other activities, which are considered to be knowledge-extensive) and size category (see Appendix 2.1).

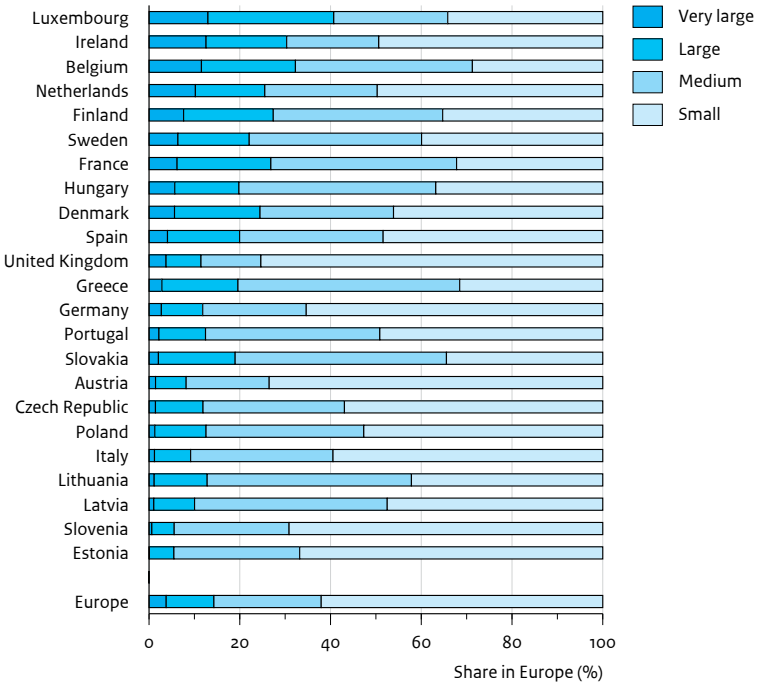
Figure A.2
Distribution of 'greenfield investments 2003 – 2010' per country, 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Figure A.3

Size distribution of 'greenfield investments 2003 – 2010', 2010



Source: Amadeus 2010, edited by PBL Netherlands Environmental Assessment Agency

Appendix 2.5

The attractiveness of the Netherlands to holdings

This appendix provides a description of the attractiveness of the Netherlands to the holdings of foreign-owned firms, based on the report by SEO Economic Research 'The Dutch trust industry: facts and figures' (Van den Berg et al., 2008).

To lower the costs of production, to get access to local markets and to region-specific resources, multinational firms operate in multiple countries and, consequently, have to deal with different fiscal and legal regimes. In a similar way as for their production plants, these firms may also decide to locate their financial and administrative activities in regions that offer the lowest costs. In fact, the location of the financial and administrative headquarters of multinational firms may have a large financial impact on these firms. Therefore, most multinational operations use so-called offshore financial centres to reduce international tax liabilities and structure financial transactions in an efficient way. These centres offer a combination of low tax rates, regulation and trading facilities (e.g. bilateral treaties) making them attractive to businesses as a location for their financial headquarters.

The Netherlands also is an attractive location for financial and administrative headquarters of multinational firms. The country has a long tradition in international trade and therefore provides a well-developed network of logistics and services focused on international activities. The country's economic and political stability is an additional favourable condition. Moreover, the Netherlands is also attractive from a fiscal point of view, not because of a low nominal corporate tax rate (this is even slightly higher than EU and OECD averages), but because of the extensive network of bilateral tax agreements, participation exemptions and the absence of withholding taxes of interest. Furthermore, the possibility of advanced tax rulings is an additional attractive characteristic of the Dutch tax system. These rulings are an agreement on the tax characterisation of international corporate structures, such as advance certainty about application approval of participation exemptions. For multinational firms, advanced tax rulings reduce uncertainties concerning the fiscal consequences of their corporate financial structures.

In relation to these activities, the attractiveness of the Netherlands to a large extent has been historically determined. Because of the relatively small size of the national economy, several Dutch multinationals started to invest abroad decades ago. These firms were confronted with double taxations: on the income of their subsidiaries in other countries, and on income of the parent company located in the Netherlands. To solve this issue of double taxation, the Dutch Government entered into tax treaties with foreign governments.

This favourable tax system has led to a growing trust industry in the Netherlands, especially in Amsterdam, which attracted investments by foreign firms in financial services. A major activity of trust offices is the management of companies, an important number of which are special financial institutions (SFIs). These SFIs are finance, royalty and holding companies, established by foreign firms in the Netherlands. They accumulate and transfer financial assets across international borders and, consequently, constitute important links in the financing chains of large multinational firms. One of the main tasks of these trust offices is to help their clients to structure corporate holdings in order to optimise the tax situation of these companies. In other words, multinational firms use legal entities in the Netherlands for reducing international tax liabilities, especially preventing double fiscal liabilities, and for structuring their financial transactions.

The Netherlands is not the only European country that has a favourable tax system for foreign firms: Luxembourg and Ireland are considered to be the main competitors of the Netherlands, in this area, but so are Switzerland, Denmark, Cyprus and Malta. The Netherlands has a relatively long history af having a cluster for trust activities, but Luxembourg has since caught up, partly by copying the Dutch trust industry. Ireland offers low tax rates, an absence of transfer pricing at group level, and an active government-supported regime for enhancing international financial services. Thanks to a flexible labour market and an English speaking population, Ireland has been extremely successful in attracting operational activities from multinational firms.

Appendix 3.1

Correlation matrix and VIF values of the independent variables

Pearson product–moment correlation, one-tailed with pairwise deletion

	Market -agglomerations	Market - centrality	Low costs	Soft & public knowledge	Technological knowledge	Capital city	VIF
Agglomerations	-						3.460
Centrality	0.000	-					4.074
Low costs	0.000	0.000	-				2.724
Soft/public knowledge	0.585**	0.143*	-0.168**	-			3.729
Tech. knowledge	0.201**	0.327**	-0.345**	0.000	-		2.738
Capital city (0/1)	0.479**	-0.022	0.129*	0.429**	-0.062	-	2.092
Ln Population size	0.478**	0.174**	0.274**	0.155*	0.330**	0.198**	2.455

** $p < 0.001$; * $p < 0.05$

Note: the VIF scores have been calculated in a model including the country dummies

Appendix 3.2

Negative binomial regression on the number of greenfield investments in the 2003–2010 period, in European regions, per industry

	1	2	3	4	5	6	7
Model:	**Total**	**Knowledge-intensive activities**	**High-tech man.**	**Medium high-tech man.**	**Knowledge-intensive market services**	**Knowledge-intensive high-tech services**	**Knowledge-intensive financial services**
Market situation							
Agglomerations	0.501***	0.453***	0.190**	0.184***	0.547***	0.405***	0.362***
	(0.072)	(0.081)	(0.078)	(0.062)	(0.098)	(0.094)	(0.101)
Centrality	0.500***	0.546***	0.255***	0.636***	0.415***	0.505***	0.698***
	(0.074)	(0.073)	(0.091)	(0.095)	(0.090)	(0.084)	(0.101)
Low costs	-0.471***	-0.470***	-0.172**	-0.275***	-0.454***	-0.523***	-0.580***
	(0.063)	(0.071)	(0.086)	(0.074)	(0.090)	(0.074)	(0.083)
Knowledge base							
Soft/public knowledge	0.203***	0.289***	0.422***	0.054	0.258***	0.462***	0.388***
	(0.056)	(0.061)	(0.107)	(0.069)	(0.092)	(0.082)	(0.077)
Tech. knowledge	-0.149***	-0.051	0.246***	0.038	-0.080	-0.013	-0.127
	(0.052)	(0.059)	(0.080)	(0.059)	(0.068)	(0.069)	(0.084)
Control variables							
Capital city (0/1)	0.691***	0.779***	0.127	-0.143	0.818***	0.807***	1.367***
	(0.175)	(0.182)	(0.219)	(0.204)	(0.224)	(0.200)	(0.237)
Ln Population size	0.923***	0.933***	0.882***	1.005***	0.840***	0.983***	1.107***
	(0.077)	(0.083)	(0.124)	(0.108)	(0.111)	(0.115)	(0.119)
Constant	-9.225***	-10.12***	-12.57***	-13.46***	-9.888***	-13.44***	-13.75***
	(1.087)	(1.154)	(1.803)	(1.560)	(1.581)	(1.656)	(1.666)
N of observations	238	238	238	238	238	238	238
N of firms	80,275	31,233	864	2,090	12,670	5,207	7,887
Log likelihood	-1295	-1045	-421	-583	-863	-640	-659
Wald Chi^2	5,835***	11,925***	567***	895***	2,129***	1,273***	2,086***
LR overdispersion (α)	13,000***	6,006.3***	41.08***	162.23***	4,066.96***	514.82***	891.14***

**** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses*

Appendix 3.3

Negative binomial regression on the number of greenfield investments in the 2003–2010 period, in European regions, per country of origin

Model:	**1**	**2**	**3**	**4**	**5**
	Europe	**US**	**Japan**	**China**	**India**
Market situation					
Agglomerations	0.488***	0.533***	0.676***	0.491**	0.535***
	(0.0941)	(0.0882)	(0.132)	(0.242)	(0.103)
Centrality	0.493***	0.600***	0.671***	0.572**	0.536***
	(0.0934)	(0.0845)	(0.143)	(0.224)	(0.207)
Low costs	-0.417***	-0.558***	-0.636***	-0.336*	-0.548***
	(0.0665)	(0.0965)	(0.159)	(0.179)	(0.156)
Knowledge base					
Soft/public knowledge	0.241***	0.363***	0.248*	0.083	-0.004
	(0.060)	(0.074)	(0.135)	(0.159)	(0.136)
Tech. knowledge	-0.130**	-0.028	0.035	-0.043	-0.063
	(0.062)	(0.0721)	(0.100)	(0.120)	(0.087)
Control variables					
Capital city (0/1)	0.618***	0.653***	0.421	0.413	0.965***
	(0.176)	(0.205)	(0.271)	(0.559)	(0.313)
Ln Population size	0.940***	0.892***	0.916***	0.949***	1.091***
	(0.100)	(0.111)	(0.200)	(0.332)	(0.200)
Constant	-9.951***	-11.05***	-13.86***	-13.97***	-16.42***
	(1.383)	(1.540)	(2.894)	(4.599)	(2.871)
N of observations	238	238	238	238	238
N of firms	37,126	9,401	650	255	424
Log likelihood	-1128	-714	-311	-199	-238
Wald Chi^2	1,654***	3,017***	3,704**	5,390***	3,874***
LR overdispersion (α)	7,807.51***	1,378.74***	69.00***	23.41***	38.67***

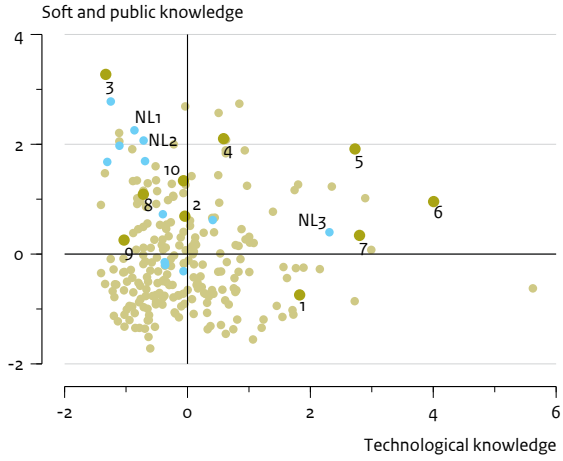
*** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses

Appendix 3.4

Z-scores for the European regions on the factors 'soft and public technological knowledge' and 'technological knowledge'

Standardised scores on knowledge factors of European regions, 2010

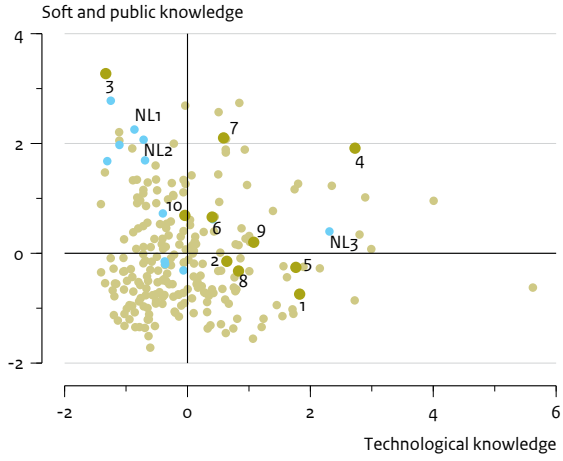
Foreign-owned firms in high-tech manufacturing



Ranking

1	Lombardia	NL1	North Holland
2	South-east Ireland	NL2	South Holland
3	Inner London	NL3	North Brabant
4	Berkshire cs.		
5	Île de France		
6	Oberbayern		
7	Darmstadt/Frankfurt		
8	Outer London		
9	Mazowieckie (Warsaw)		
10	Surrey, East and West Sussex		

Foreign-owned firms in medium high-tech manufacturing



Ranking

1	Lombardia	NL1	North Holland
2	Cataluña	NL2	South Holland
3	Inner London	NL3	North Brabant
4	Île de France		
5	Düsseldorf		
6	West Midlands		
7	Berkshire cs.		
8	Emilia-Romagna		
9	Vlaams gewest		
10	South-east Ireland		

Top 10 regions
- Dutch regions
- Other regions

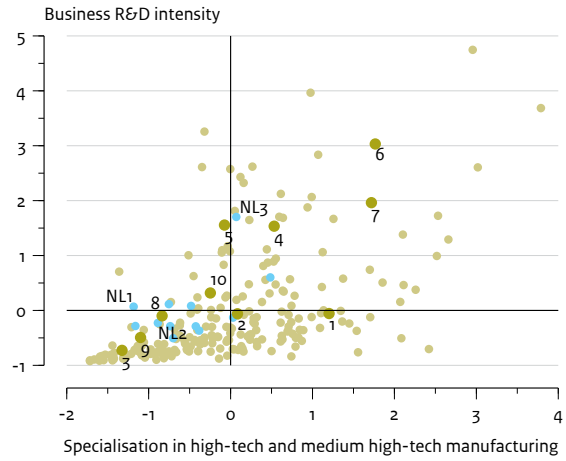
Other
- Dutch regions
- Other regions

Appendix 3.5

Z scores of the European regions on different regional characteristics

Standardised scores on regional knowledge characteristics of European regions, 2010

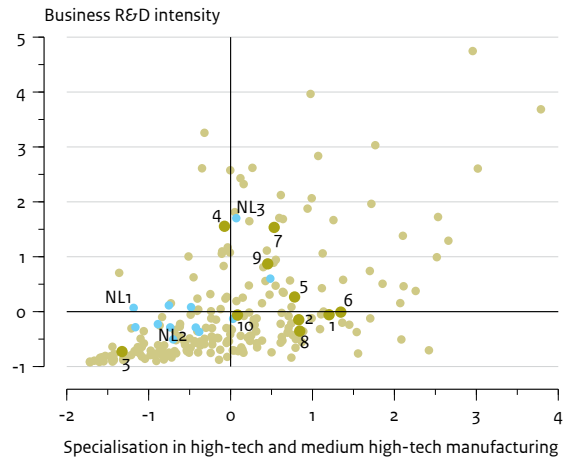
Foreign-owned firms in high-tech manufacturing



Ranking

1	Lombardia	NL1	North Holland
2	South-east Ireland	NL2	South Holland
3	Inner London	NL3	North Brabant
4	Berkshire cs.		
5	Île de France		
6	Oberbayern		
7	Darmstadt/Frankfurt		
8	Outer London		
9	Mazowieckie (Warsaw)		
10	Surrey, East and West Sussex		

Foreign-owned firms in medium high-tech manufacturing



Ranking

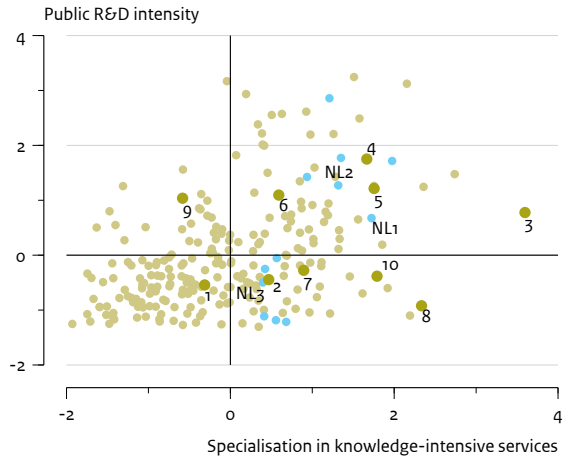
1	Lombardia	NL1	North Holland
2	Cataluña	NL2	South Holland
3	Inner London	NL3	North Brabant
4	Île de France		
5	Düsseldorf		
6	West Midlands		
7	Berkshire cs.		
8	Emilia-Romagna		
9	Vlaams gewest		
10	South-east Ireland		

Top 10 regions
- Dutch regions
- Other regions

Other
- Dutch regions
- Other regions

Standardised scores on regional knowledge characteristics of European regions, 2010

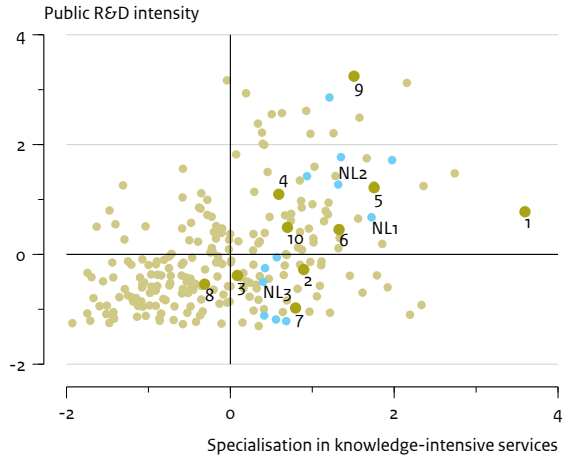
Foreign-owned firms in high-tech manufacturing



Ranking

1	Lombardia	NL1	North Holland
2	South-east Ireland	NL2	South Holland
3	Inner London	NL3	North Brabant
4	Berkshire cs.		
5	Île de France		
6	Oberbayern		
7	Darmstadt/Frankfurt		
8	Outer London		
9	Mazowieckie (Warsaw)		
10	Surrey, East and West Sussex		

Foreign-owned firms in knowledge-intensive market services



Ranking

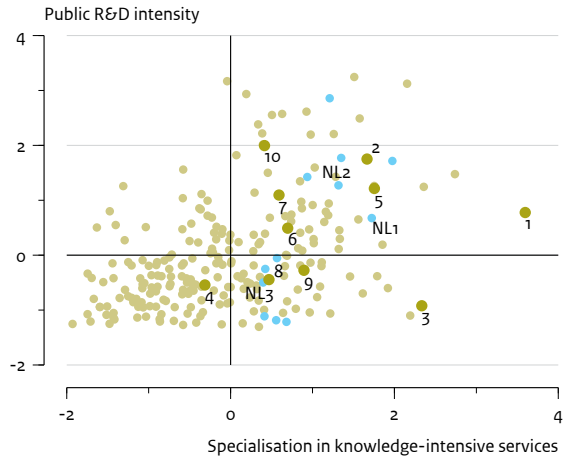
1	Inner London	NL1	North Holland
2	Darmstadt/Frankfurt	NL2	South Holland
3	Düsseldorf	NL3	North Brabant
4	Oberbayern		
5	Île de France		
6	Hamburg		
7	Luxembourg		
8	Lombardia		
9	Berlin		
10	Comunidad de Madrid		

Top 10 regions
- Dutch regions
- Other regions

Other
- Dutch regions
- Other regions

Standardised scores on regional knowledge characteristics of European regions, 2010

Foreign-owned firms in knowledge-intensive high-tech services

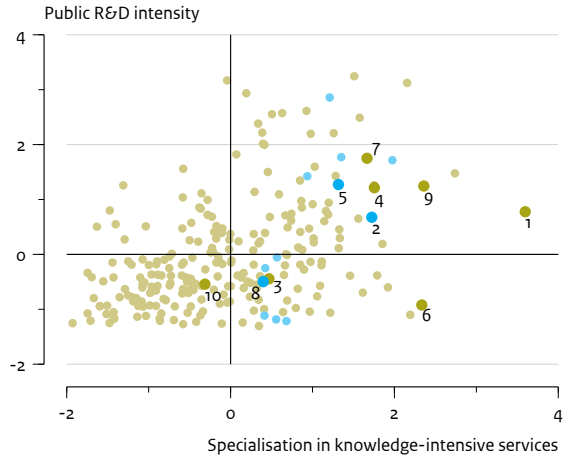


Ranking

1 Inner London
2 Berkshire cs.
3 Outer London
4 Lombardia
5 Île de France
6 Comunidad de Madrid
7 Oberbayern
8 South-east Ireland
9 Darmstadt/Frankfurt
10 Lazio

NL1 North Holland
NL2 South Holland
NL3 North Brabant

Foreign-owned firms in knowledge-intensive financial services



Ranking

1 Inner London
2 North Holland
3 South-east Ireland
4 Île de France
5 South Holland
6 Outer London
7 Berkshire cs.
8 North Brabant
9 Hovedstaden
10 Lombardia

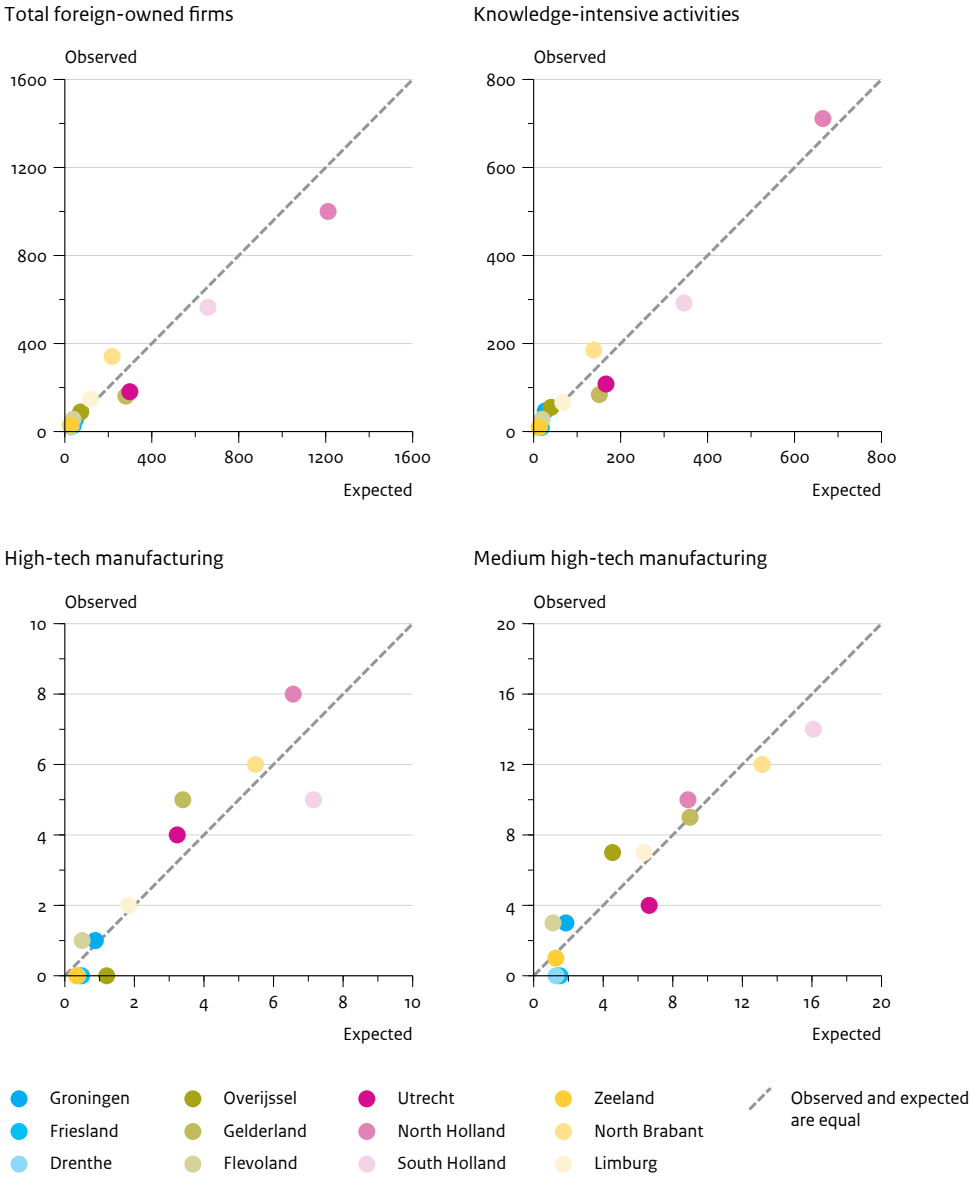
Top 10 regions
- Dutch regions
- Other regions

Other
- Dutch regions
- Other regions

Appendix 3.6

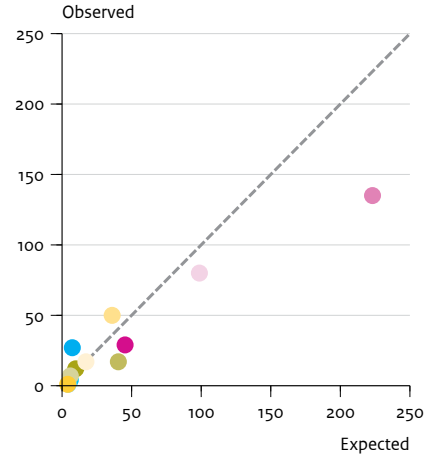
Scatter plots of the observed and expected values of the number of greenfield investments per European region

Comparison between observed and expected number of 'greenfield investments 2003 – 2010' per region, 2010

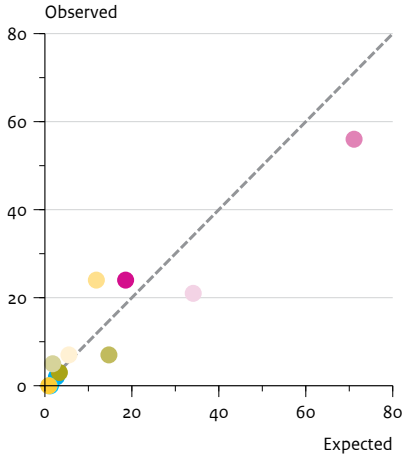


Comparison between observed and expected number of 'greenfield investments 2003 – 2010' per region, 2010

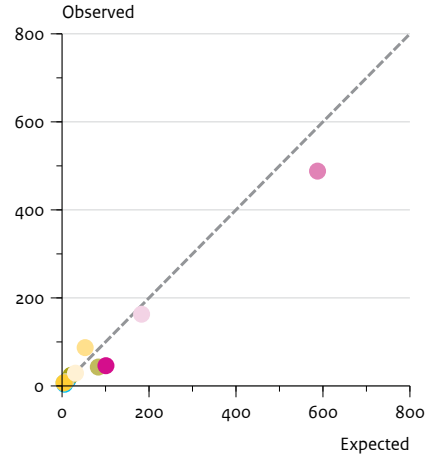
Knowledge-intensive market services



Knowledge-intensive high-tech services



Knowledge-intensive financial services



Appendix 3.7

Data from the Mercer survey

Mercer conducts surveys on the quality of living, to assist multinational companies in assessing comparative international 'quality of living standards' for their expatriate workers. Mercer makes a distinction between quality of life and quality of living and emphasises that their ranking is only based on quality of living criteria. Alongside the different personal and subjective assessments each of us may make, there are some aspects everyone would probably agree on as being important for having a good standard or quality of living such as personal safety and security, health issues, transport infrastructure, availability of consumer goods and adequate housing and schooling and recreational opportunities. According to Mercer's distinction, quality of life may involve a subjective assessment or opinion and is about a person's emotional state and personal life. This may depend on individual income level, social status, and health. Therefore, one may live in the highest ranked city in terms of quality of living and still experience a very bad quality of life because of unfortunate personal circumstances (e.g. illness, unemployment or loneliness).

Quality of living, in the Mercer survey, represents the degree to which expatriates enjoy the standard of living in the host location, and reflects the interaction between political, socio-economic and environmental factors at this host location.

Mercer's studies have been based on detailed assessments and evaluations of 39 key quality-of-living determinants, for 320 cities worldwide, grouped in the following categories: (1) Political and social environment (e.g. political stability, crime, law enforcement), (2) Economic environment (e.g. currency exchange regulations, banking services), (3) Socio-cultural environment (e.g. censorship, limitations on personal freedom), (4) Medical and health considerations (e.g. medical supplies and services, infectious diseases, sewage, waste disposal, air pollution), (5) Schools and education (e.g. school rankings), (6) Public services and transportation (e.g. electricity, water, public transport, traffic congestion), (7) Recreation (e.g. restaurants, theatres, cinemas, sports and leisure), (8) Consumer goods (e.g. availability of food/daily consumption items, cars), (9) Housing (e.g. housing, household appliances, furniture, maintenance services), and (10) Natural environment (e.g. climate, record of natural disasters).

Table A1

Ranking of the 37 European cities included in the Mercer survey

Ranking	Name region - city	Ranking	Name region - city
37	Wien	18	Cataluña
36	Düsseldorf	17	Lisboa
35	Brandenburg Nordost	16	Comunidad de Madrid
34	Oberbayern	15	North Eastern Scotland
33	Copenhagen	14	Lazio
32	North Holland	13	West Midlands
31	Brussels	12	South Eastern Scotland
30	Berlin	11	Northern Ireland
29	Luxembourg	10	Leipzig
28	Stockholm	9	Praha
27	Hamburg	8	Kozep-Magyarorszag (Budapest)
26	Mittelfranken	7	Attiki (Athens)
25	South-East Ireland	6	Zahodna Slovenija
24	Stuttgart	5	Lietuva
23	Île de France	4	Mazowieckie (Warsaw)
22	Etelä-Suomi (Helsinki)	3	Bratislavsky kraj - Slovenska
21	Rhône-Alpes	2	Eesti
20	Inner London	1	Latvija (Riga)
19	Lombardia		

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The Dutch Government aims to attract more investments by foreign firms, especially by those involved in knowledge-intensive activities. This study addresses the question of how attractive the Netherlands currently is to such investments. Results show that regional characteristics have a greater influence on the locational choice made by foreign firms, than national characteristics. Consequently, macroeconomic policies are not sufficient, and governments should direct their focus towards both national and regional policies. In the Netherlands, most foreign-owned firms are located in three regions: North Holland, South Holland and North Brabant. However, within Europe, these regions only belong to the sub-top. Although the Dutch regions offer a good business environment and well-developed knowledge base, they seem to lack agglomeration forces; the GDP per capita, population density and export orientation of already established firms is lower. As especially this agglomeration force is found to be important for attracting future investments by foreign-owned firms, the differences between the top European regions and the Dutch regions in attracting foreign investments are likely to increase in the future, rather than decrease.

This policy study is a publication by

PBL Netherlands Environmental Assessment Agency

Mailing address
PO Box 30314
2500 GH The Hague
The Netherlands

Visiting address
Oranjebuitensingel 6
2511VE The Hague
T +31 (0)70 3288700

www.pbl.nl/en

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