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The City is Spiky:
Spatial characteristics of Foreign Direct Investments - a classification of Business Districts

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Thesis UMD 9, September 2013
Specialisation: Urban Competitiveness and Resilience
Supervisor: dr. Ronald Wall

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SUMMARY

The last decades we have seen the development of a global economy with international networks of firms, people and cities. One of the main characteristics of multinational enterprises, is the split of their firm activities in separate divisions over different countries to profit from either ownership, location, or internalization (e.g. of knowledge) benefits in the destination country. These foreign direct investments (FDI) play an important role in the development of cities and their international ties in the global network. Within this global economy cities are competing over the attraction of this FDI-capital and firms, the knowledge, and the high educated people. Although capital brings immediate benefits through investments, the presence of firms, knowledge and highly educated people brings competitiveness and benefits on the long term.

Many theories and studies have focussed on the competitive characteristics of cities and attraction of FDI, firms and people to these cities. Many stress the importance of accessibility and international infrastructure, the knowledge and creativity of the people, and institutional and organizational aspects. Other studies stress the importance of developing local or regional industries and knowledge clusters, being influenced by face-to-face-contacts, tacit knowledge-spillovers and interaction. However, almost none of the studies focussed on the spatial characteristics of the locations of firms and cities. Locations bring characteristics of proximity, functionality, urbanity and quality to the firm and they ameliorate the interaction environments of these districts. Focussing on these aspects gives insight in the spatial needs and determinant of firms.

Besides scientific relevance, this study is centered on policy recommendations for the city of Rotterdam. The city is in transition to a more knowledge based economy and is developing it's economic and spatial strategy to be more competitive, both in local clusters of knowledge in different sectors as well as global networks of cities. However, these strategies are not yet related to spatial developments and the spatial needs of firms. This study aims to show insight in the characteristics of business districts and cities for different knowledge intensive firm activities, in order to develop spatial-economic policies for municipalities.

In this study, data of fDi Markets is used to analyse trends of FDI in knowledge intensive activities over the years 2003-2012, in six North- and West-European countries. For 15 cities in the league of Rotterdam (same number of investments) the FDI for the knowledge intensive activities was geo-mapped and the characteristics of these locations recorded, e.g. aspects of proximity / accessibility, functional districts, urban characteristics and spatial quality. Analyses of the data resulted in findings on spatial determinants for FDI in specific activities.

Based on these data a classification of business districts was set up, with 7 distinctive districts characterized by their proximity to either city-centre, airport or university, and characteristics in urban, functional and quality aspects. Regression analysis showed that availability of certain districts is related to the presence of specialised firm activities.

Development of a coherent spatial-economic strategy for a city should identify the activities and sectors the strategy is aimed at. Further the strategy should focus on development of the right type of business districts with the characteristics these activities need. Allover the study shows that international access by air is one of the most important conditions for the development of a strong business environment in a city regarding KI FDI.

Keywords
Global Networks, Business Districts, Spatial Characteristics of FDI, Foreign Direct Investments, Interaction Environments

ACKNOWLEDGEMENTS

In October 2005, Richard Florida wrote an article in the Atlantic Monthly in reaction to Thomas Friedman's assertion that the world is flat. Florida argued that although globalization had changed the map of the world, it had not become flat - on the contrary. The title of his article was 'The World is Spiky'.

The title of my thesis has been derived from Florida's article, for which I have to give due recognition. The content however is based on the theories of many great thinkers and scholars in the field of Urban Economics, Economic Geography, and Urban Planning and Design - theories and knowledge I've enjoined to internalize over the last year during the MSc programme in Urban Management & Development at IHS.

First of all I'd like to thank Ronald Wall for introducing me into the principles of Economic Geography and Urban Competitiveness, and for the inspiration on the topic of this thesis.

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LIST OF ABBREVIATIONS

BS	Business Services (firm activity)
CH	Zwitserland
DE	Germany
DDT	Design, Development and Testing (firm activity)
E&T	Education & Training (firm activity)
FDI	Foreign Direct Investments
HQ	Headquarters (firm activity)
ICT	Internet and Communication Technologies and Infrastructure (firm activity)
KI	knowledge intensive
KIA	knowledge intensive (firm) activities
LFD	location factor data
MNE	Multinational Enterprise
MRA	Multiple Regression Analysis
NL	the Netherlands
NW-Europe	North- and West-Europe
NO	Norway
R&D	Research & Development (firm activity)
SE	Sweden
SMS	Sales, Marketing and Support (firm activity)
UK	United Kingdom

GLOSSARY

Activities (of the firm) : Divisions of a firm for control, support and operations of the different tasks involved in the value-chain.

Business districts : Spatial bounded areas within a city characterised by a combination of elements of Kitson's Capitals and with distinctive spatial qualities.

Business Services (firm activity) : Activity for support and management of the whole value-chain of an enterprise (such as accounting, finance, regulations).

Categorical distance (indicator) : Distance measured on categorical levels. (view table 2)

Clusters : Geographical concentrations of interconnected firms, suppliers, services and institutions in an industry sector that compete and cooperate at the same time. (source: Porter, 2000)

Competitiveness : The ability (of a city, region, country) to have stable or increasing market shares and sustaining stable or

increasing standards of living for the inhabitants / employees. (source: Storper, 1997)

Concentration ratio (indicator) : Measured level of concentration of economic activity (FDI) in a city. (view table 2)

Design Development & Testing (firm activity) : Stage in the development of a product after the research-phase for further design and testing of the product and development into a producable product.

Destination city (of FDI) : City in which the new activity is developed; receiving the FDI.

Education & Training (firm activity) : Division of a firm specialised in (internal or external) trainings on the use and control of a product, machine, process, etc.

Firm activities : The different activities of a firm in the value chain (divided in vertical or horizontal seperated divisions).

Foreign direct investments (FDI) : Investments done by Multinational Enterprises outside their country of origin with the purpose to have the control over the facility (either by Acquisition & Mergers, Greenfield investments, or Brownfield investments).

Global networks : Connections between firms and people in different parts of the world, resulting in interconnected networks. Because of the spatial clustering of firms and people in cities and regions, also these geographical places are interlocked in global networks.

Headquarters (firm activity) : The (global or regional) center of management and control for the operations of an enterprise.

ICT & Internet Infrastructure (firm activity) : The division that's involved in the maintenance and development of the firm's technological infrastructure for information handling and communication.

Kitson's Capitals : Bases of regional competitive advantage (productive capital, human capital, social-institutional capital, cultural capital, infrastructural capital, knowlegde/creative capital). (source: Kitson et al., 2004)

Knowledge intensive activities : The activities of a firm that are based on knowledge and information, rather than on labour, capital or materials. Within the fDi Markets the following activities are considered as knowledge intensive: Business Services, Design Development & Testing, Headquarters, ICT & Internet Infrastructure, Research & Development, Sales Marketing & Support. View annex 3 for a decription of the fDi Markets Database.

Links : view Ties

Multinational enterprise (MNE) : Firm with branches and divisions in different countries.

Relative distance (indicator) : Distance measured as a ratio relative to another distance. (view table 2)

Research & Development (firm activity) : The (scientific) research department of a firm, involved in the study and development of new ideas, knowledge and materials.

Sales Marketing & Support (firm activity) : Division involved in activities for (domestic) marketing and sales of the products or services of a firm.

Sector (industry) : A division of the economy based upon the economic or industrial activities in which firms are involved.

Source city (of FDI) : City where the MNE is global headquartered; origin of FDI.

Ties : Connections (links) between firms / cities based on the source-destination relationship of FDI.

1. INTRODUCTION

Background

In the last two decades we have seen a globalization of the economy due to new technologies, a transformation stated by Manuell Castells as:

> *"A technological revolution, centered around information technologies, began to reshape, at accelerated pace, the material basis of society. Economies throughout the world have become globally interdependent, introducing a new form of relationship between economy, state, and society, in a system of variable geometry."*
>
> (Castells, 1996, p.1)

Firms and Multi National Enterprises (MNE's) are competing for market shares within this new global economy. As stated by Michael Porter, competitiveness of firms is nowadays one of the driving forces of the economy (Porter, 2000). Also city-regions worldwide are competing in attracting these firms, investments (FDI), people, and knowledge. Competitiveness of a city-region might be regarded as the success factor in which regions or cities succeed in attracting market shares, capital and workers (Kitson et al., 2004). This attractiveness depends on the soft and hard capitals or competitive advantages of a region. Although the concept of competitiveness is subject of debate in it's usefulness for regional policies and urban development (e.g. Bristow, 2005), many policy-makers and politicians believe that competitiveness can be influenced by good policy-making: many countries and cities have adapted a plan or policy to enhance their economic competitiveness.

The idea of competitiveness is in policy-making often combined with the ideas on the creative class, as introduced by Richard Florida in his influential book The Rise of the Creative Class (Florida, 2002). Also the aspects of being an attractive cultural and consumer city is widely believed to be of influence of the competitiveness of cities (among others: Glaeser et al., 2001; Rosenthal and Strange, 2004). In these aspects of attractive cultural, creative and consumer cities, the main focus is on the quality of the location.

Problem Statement

In firm location theory, the mantra is still "location, location, location": location still matters in a globalizing world. However, firms are not only looking for the most effective location to their production process, transport costs, or their input or output market. Firms are looking for business environments with a quality that enhances their global connectivity, their company image, the productivity of their employees, and the possible knowledge spillovers and innovation with other firms (e.g. McCann, 2008; de Hoog, 2012).

In economic geography there has been much published on the location factors of cities and regions that attract firms. These theories however tend to be quite abstract and non-spatial, although the notion that spatial structure and planning is important has been put forth by Leslie Budd & Amer Hirmis:

> *"The importance of the spatial structure to regional competitiveness cannot be under-estimated. (...) The spatial structure can therefore be considered as part of the regional production function, in addition to the conventional inputs of labour, capital and land. The analogy is with the physical layout of an industrial plant: the more efficient the use of space, the higher the output (Parr, 1979). (...) The greater the scale of urban and metropolitan areas in a region, the greater the degree to which agglomeration economies can be realized (...)."*
>
> (Budd and Hirmis, 2004, p. 1026)

In urban design and planning theory there is less information and knowledge on firm location. The science uf urban design and planning tends to be more practical, and rather involved in designs and plans themselves than in the reasons why consumers (people, firms) locate in any area regarding their spatial wants and needs. Considering the aspect that quality is an important aspect in location for consumers (Glaeser et al., 2001, Rosenthal and Strange, 2004) and regarding firms as location consumers, we can question: where do firms locate and what physical assets and qualities are they looking for? What are the places that firms decide to locate within a city-region? Do they decide to be in the Central Business District (CBD), at a businesspark near the Airport, at a science park connected to the University, or at a businesspark near the highway? In a city strategy for development and attracting firms and investments, it is important to consider the aspect of place and firm location. This field of research combines different aspects and concepts of economic geography and of urban design and planning to enhance the competitiveness of a city-region and the quality of life for their citizens.

The case of Rotterdam

Rotterdam has an economic base that for a long time has been relying on the harbour and seaport activities. Due to this dependency on the former labour-intensivee harbour-activities, the population of Rotterdam still consists to a large extent on low-skilled employees (source: CBS online 2013). Although the harbour used to be a labour-intensive industry in the past (manually handling of freight), since the introduction of automatized freight handling and ICT, most of the ship handling is done by automatized systems. Nowadays most of these activities have moved out of the city to the specialised port and industrial areas towards the North Sea, and are no longer connected to the urban structure and the urban life. In the Urban Vision for 2030, the Municipality of Rotterdam has formulated two main keystones: 1. a strong economy with more employment opportunities; and 2. an attractive residential city with a balanced population (Municipality of Rotterdam, 2007). The broader goal of this Urban Vision is to be more competitive and enhance the position of the population in terms of welfare and well-being.

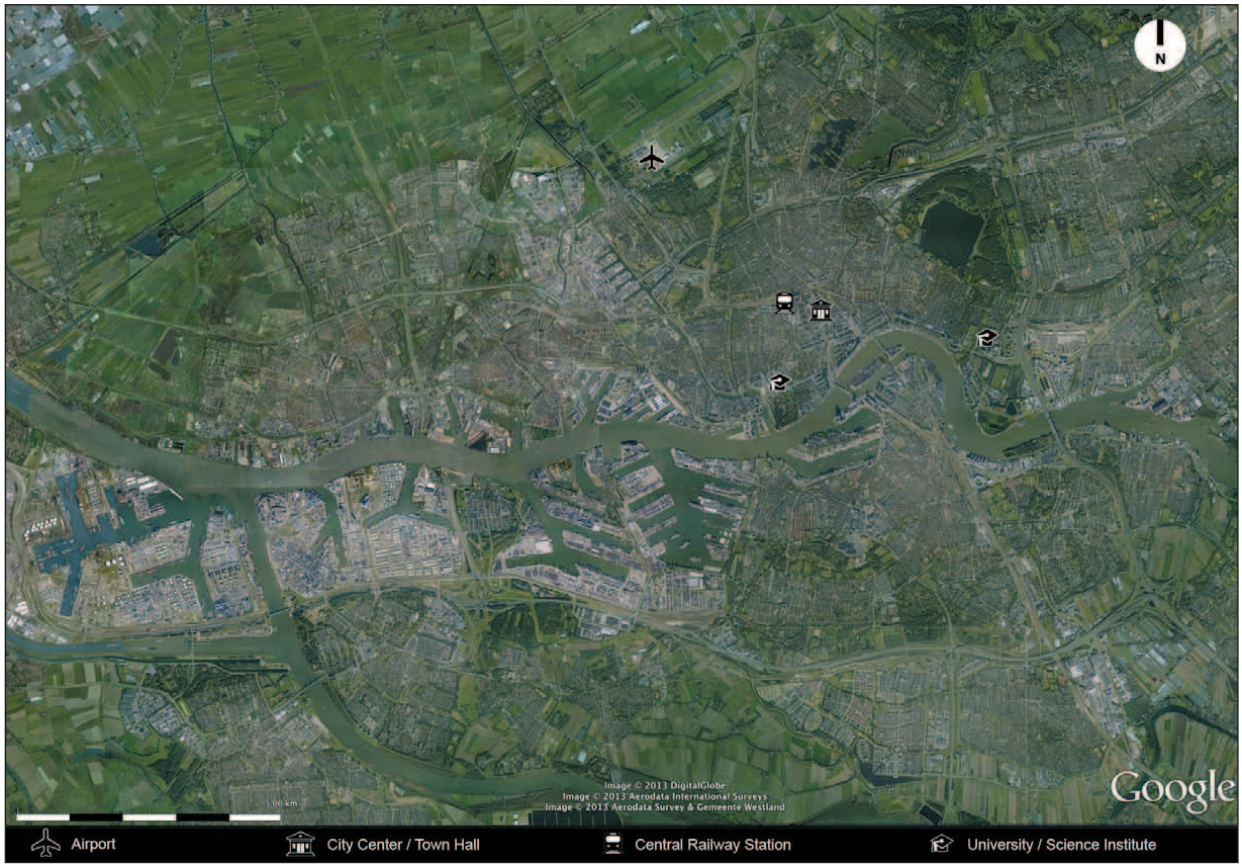


fig. 1 : City of Rotterdam. *(source: Google Earth; adaptation by author)*

Considering labour capital and accessibility, the city has already made quite some progress over the last years. Data from the Economic Outlook Rotterdam 2013, show that the number of higher educated people is growing (Municipality of Rotterdam, 2013). Also the international connectivity of the city has improved over the last years with the opening of the High Speed Track to Brussels and Paris, and with the growing number of flights to business destinations (such as London and Munich) from Rotterdam-The Hague Airport. However, the overall economic advantage of the city has not been strengthened yet (Municipality of Rotterdam, 2013), although the economic crisis is logically partly due to this.

Attracting new firms to the city, especially knowledge intensive firms, is meant to offer economical climate and business district characteristics different to the existing harbour areas and manufacturing districts. Although the city also has a reasonable downtown Central Business District (Weena and surroundings), a new international highrise location at Wilhelminapier, and considerable office parks in the surroundings, the city doesn't offer techno parks, science parks or other specific environments to attract international firms and businesses in a broader range of firm activities. This study, by combining spatial quality dimensions of urban design and planning with location characteristics of economic geography, will define the spatial conditions of an attractive international business environment, in hardware and software. And hereby the spatial elements to enhance the competitiveness of a city, in this case: Rotterdam.

Research objectives and question

As described in the previous paragraph this study has the objective to combine the study fields of economic geography and urban design and planning, and within this aims to:

a. describe the different types of business districts as a combination of spatial qualities and location characteristics.

b. explore the relation of district-types and the attraction of firms/investments, looking at differences in industry sector, firm level and activity, and investment origin.

c. make policy recommendations for municipalities how to use urban design and planning to influence urban competitiveness and attract FDI.

The research focuses on the relation between different types of business districts, and their ability to attract firms and investments. Considering the aspect of globalization and the global competition in attracting firms, the focus will be on international firms (multinational enterprises) and greenfield foreign direct investments (FDI). The main research question is:

To which spatial aspects are Foreign Direct Investments related, considering different types of business districts in the city?

Related to the main question and the research objectives, three subquestions are formulated:

1. What is the spatial typology of business districts in North- and West-Europe?

2. Where is FDI for knowledge intensive firm activities allocated within these cities?

3. What is the relation between spatial characteristics and the location of FDI?

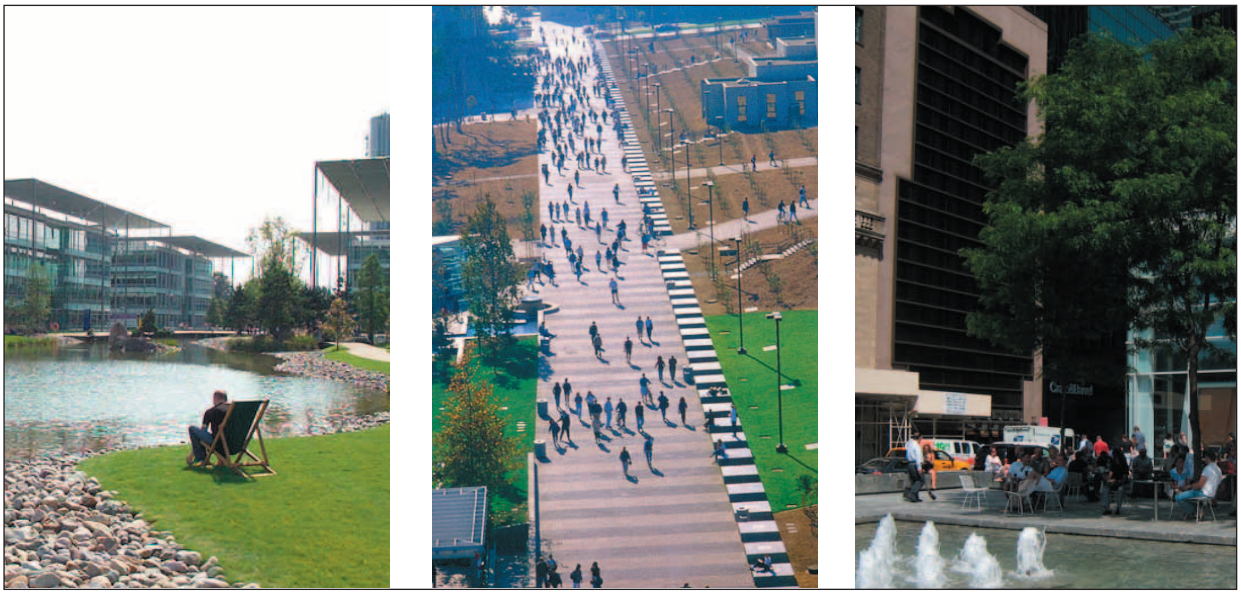


fig. 2 : Different types of Business Districts*. Displaying specific spatial characteristics.*

Research methodology, data and techniques

Flows of FDI are an important measure of firm investment and city development within the globalizing world. It is also an indicator of attractiveness of a city: the FDI data show where firms decide to locate their subsidiaries. The advantage of FDI as a source of data is that the data is quantified and measured in the same way for all firms and cities worldwide, and available for a range of years. The database of fDi Markets provides information on global investments of MNE's across the world over the last 10 years.

The research is essentially quantitative and spatial. Using the fDi Markets-database with data on industry sectors and activities combined with the location data of firms of the ORBIS database, research has been done on districts in a number of cities in North- and West-Europe with the following research aspects:

- descriptive research of trends in FDI flows and growth in knowledge intensive firm activities,
- descriptive spatial research of FDI allocation into business districts of cities,
- explanatory research into the relation of city districts with location indicators: general and district-specific on proximity, accessibility, built and area characteristics, amenities, and spatial quality, and
- exploration of a typology of business districts: qualitative description of types.

Reliability of the research data is provided by the use of secondary data of the databases of fDi Markets and ORBIS, and the fixed spatial dimension of these data (post codes). Validity will be done by triangulating the findings of the quantitative data correlation and statistic regression with the results of the qualitative description of the districts.

Significance and relevance

Scientific significance: The research will add knowledge to the subject of firm location, economic development and environment quality. It integrates aspects of urban and regional economics, economic geography and urban design and planning. This cross-over will help to understand specific elements of both firm characteristics and dynamics as spatial characteristics and urban dynamics.

Policy relevance: The research will help municipalities to gain insight in the location choice of firms related to quantitative economic and qualitative spatial aspects. Understanding the background of their choice and spatial needs, will help to plan and design better business districts. These districts will enhance the competitiveness of the city and the economic strength. For the case of Rotterdam policy implications will be formulated.

Limitations

1. The research involves only FDI, limiting the scope on foreign MNE's:

MNE's of the home country and investments by national and local SME's are not accounted for. Because the share of foreign investments is smaller than domestic investments, this is a limitation. However, the trend of foreign MNE's

will forecast national trends, either because they follow or lead these trends. Domestic and foreign trade, investments and economy are nowadays so much related that the trends will be alike.

2. The sample of cities is restricted to North- and West- European cities

The findings of this research will be influenced by social and cultural characteristics of NW-European countries, and the results will not be entirely applicable to other countries and regions. However, within the globalizing world and international characteristics of FDI and MNE's, the findings will show trends in other countries and regions.

3. Database limitations

The research uses professional secondary databases which should the strengthen the reliability of the used data. However missing data and missing information (post codes and addresses of locations of firms) are a restriction. The assumptions is that although the actual number of data might be different, the provided data gives enough valid information to have reliable and valuable results, that cover the errors made by the missing data.

2. THEORETICAL FRAMEWORK

This chapter covers the theoretical concepts of economic geography and urban design, that together form the conceptual framework of this research. The concepts covered are:

- Competitiveness: cities competing in attracting firms, people, knowledge and investments (FDI),
- Global urban networks: cities taking part in global networks of flows (investments, information),
- Local clusters: within cities (regions) specialised local clusters influence the competitiveness,
- Interaction: networks and clusters are influenced by interaction of flows and in places,
- Foreign direct investments (FDI): investments from abroad, bringing capital, jobs and knowledge, and seen as a measure for the attractiveness of cities,
- Firm activities: the different activities of a firm, that can be located independently,
- Location factors: hard and soft characteristics of a location in attracting different firm activities,
- Business district typology: classification of city districts in different types.

Globalization and Urban Economics

We live in an age of urbanisation and globalization. Both trends are interrelated, caused by the new economic order and system of the world due to new technologies and lower costs in transport and information technology (Castells, 1996). The post-Fordism economic order consists of many multinational enterprises (MNE's) with networks around the world, competing (and some times collaborating) with each other for inputs and resources, labour, and knowledge. In certain sectors and firm activities, this competition results in a proximity of firms according to Scott (2001). In the present economy, spatial transaction costs are sometimes very high (in case of face-to-face contacts) or extremely low (e.g. monetary flows):

> *"Where the multifaceted transactions costs associated with these networks are high per unit of distance (above all where they involve frequent, unpredictable, and constantly shifting face-to-face encounters), producers and other economic agents will have strong incentives to locate in close proximity to one another. By contrast, it is often the case that the distribution of the final products of these sectors incurs only low costs per unit of distance, which means that they can span a relatively extended geographic range"*
>
> (Scott, 2001, p. 818)

Cities and city-regions are the place where global competition between firms is strongest due to agglomeration economies, as already explained in the classic agglomeration theory of Marshall. This applies to places of innovation-processes, control and services, and labour-intensive manufacturing - all firm activities will concentrate not around

the firm but around the same activity within cities (main exception for natural resource based industries). Scott explains that cities and city-regions are thus the geographic outcome of the global economic order, and also these regions are in competition with each other (Scott, 2001).

Competitiveness

Ever since trade started cities and countries have been trading products and goods, not always on a world scale but at least on a regional scale. To explain this process of international trade Ricardo introduced in 1817 the theory of comparative advantage. This theory is based on the specialisation of countries due to local endowments (labour, capital, land, resources). Because of the difference between two countries in relative costs of producing goods, a country gains by specialising in the good in which it has comparative advantage and trading that good for the other.

In the last decades, the concept of competitive advantage has become more influential. This concept is not based on comparative advantage of costs in producing, but is based on innovation and economic dynamics. The concept was first applied to firms in the micro-environment. According to Michael Porter, firm competitiveness is conceived of in terms of productivity, firms that are capable of producing more output with fewer units of input than rivals generate a 'competitive advantage' (Porter, 2000). Competitiveness is a result of firm dynamics, innovation, and the ability to change and improve. Porter has argued that whilst it is firms that compete, it is governments that create the market conditions to allow firms to exploit each economy's competitive advantage. Regional competitiveness and productivity are equivalent terms to him.

According to Bristow (2005) policy-makers have tended to favour the definition of competitiveness which equates it with regional prosperity. However this ignores the possibility that regional prosperity might be achieved by, for example, the development of firms serving local and national markets and not just international ones, or by the development of community or social enterprises which meet broader social and environmental, as well as economic objectives. As a consequence, policies tend to prioritise rather narrow, private-sector orientated agendas at the expense of broader regeneration initiatives. The modern socio-economic system has to also achieve a number of other basic social objectives, such as income redistribution and basic level of health care. Bristow criticizes the concept of competitiveness for policy-making by arguing that it uses the language of business community: it is about interests rather than ideas. Most scholars however define regional competitiveness in a broader sense, including the aspect of sustainable growth. In most debates the definition of Storper has been accepted as the best description:

> *"Competitiveness [refers] to the ability of an economy to hold stable or increasing market shares in an activity while sustaining stable or increasing standards of living for those who participate in it."*
>
> (Storper, 1997, p. 264)

Within the studies of competitiveness, the focus is mainly on two influential concepts of economic geography that determine the competitiveness of a place: Global Networks, as the concept of centrality of a city, and Local Clusters as the agglomeration concept of a city.

Global City Networks

Already in 1966 Peter Hall published his book The World Cities, but it was not until 20 years later that the study and debate on global cities and networks really got started. The debate got a new starting point with the studies by John Friedmann on the World City Hypothesis in 1986, that was intended as a framework for research:

> *"My purpose in this introduction is to state, as succinctly as I can, the main theses that link urbanization processes to global economic forces. The world city hypothesis is about the spatial organization of the new international division of labour. As such, it concerns the contradictory relations between production in the era of global management and the political determination of territorial interests."*
>
> (Friedmann, 1986, p.69)

In this article, Friedmann states seven theses on World Cities, that would be leading aspects of World City research over the years. He argues that some cities are base points in the global organisation of capital and markets while their linkages arrange themselves into a complex global hierarchy. These world cities have the control functions of global production and they serve as the concentration places of international finance. Also they serve as the main destination of migration and are central points of class polarization (Friedmann, 1986).

In 1991 Saskia Sassen published her work The Global City that concentrates on New York, London and Tokyo as the three main global cities. She argues that finance plays an emerging role in the globalizing world of manufacturing and trade, while producer services have been externalised by firms because of the costs of employing in-house specialists full-time. These services tend to locate together due to agglomeration externalities and benefits of close proximity. These highly specialised services have concentrated in a few cities, mainly the financial centres with a strong presence of stock exchange. Due to new telecommunications technologies, financial markets have been able to grow and control their firms from central headquarters, based in a few cities. Sassen concludes by arguing that "a whole new arrangement has emerged for accumulation around the centrality of finance in economic growth" and that these global cities play a key role "based on finance and on the globalization of manufacturing" (Sassen, 1991, p. 344). Moreover, the combination of this new industrial complex together with sociopolitical forms is centred in major cities and "contains the elements of a new type of city, the global city" (Sassen, 1991, p. 344).

Peter Taylor provided in 2001 a detailed study of the World Cities Network, that until then merely had been a

theoretical idea and had not yet been specified. His study focuses on advanced producer services, that are the prime indicators for an interlocking network of world cities. This network specification gives possibilities to apply techniques of network analysis and further research (Taylor, 2001). Nowadays Taylor is director of the Globalization and World Cities (GaWC) Research Network, that provides much study in this field and on the continuing evolution of the World City Network (figure 3).

fig. 3 : Network of Global Cities 2010. *According to GaWC (source: GaWC, 2013)*

Other recent studies on the World City Network also look at the firm relations as the interlocking network of the world cities. In their study Wall and Van der Knaap (2011) look at the networks of both multinationals and advanced producer services. The analysis shows the multinational ties of cities: 84 percent of the multinational network occurs amongst cities, not within them. This indicates that cities are economically more connected to other geographies as their positions in corporate networks grow. Also the structure of the network is elaborated: global cities New York, Paris, London, and Tokyo mostly have hierarchical hub-and-spoke ties, indicating the headquarters control functions of these cities over subsidiary cities. However, the network diagrams show that the structure of the whole network among cities is a hybrid form of hierarchical and heterarchical connections, indicating the different principles of firm organization and locations of origin of multinational companies (Wall and Van der Knaap, 2011).

Local clusters

Many studies on competitive advantage focus on the agglomerations economies to explain the success of a city. The economist Marshall already explained with his theory in 1920 that by agglomerating, firms have the advantage of

shared input economies, information and knowledge spillovers, and labour market pooling. Hoover in 1937 classified three kinds of agglomeration economies: internal economies of scale (internal to the firm), location economies (for a specific industry sector), and urbanization economies (for all sectors) (Gordon and McCann, 2000). Also Jane Jacobs stated that large cities and agglomerations are more innovative in producing new work, caused by the proximity of different firms and related activities within the same city (Jacobs, 1969).

Michael Porter can be seen as the founding father of cluster research and policy. In his definition, clusters are:

> *"... geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate. Clusters, or critical masses of unusual competitive success in particular business areas, are a striking feature of virtually every national, regional, state, and even metropolitan economy, especially in more advanced nations."*
>
> (Porter, 2000, p. 15)

He argues that due to clustering, a main part of competitive advantage of the firm lies outside the firm and their industries. Clusters are geographical spaces of concentration of knowledge and production and are driving force in increasing productivity and attracting foreign investment. For the firms clusters are a combination of competition and cooperation, which can coexist on different dimensions or firm levels. Porter further states that "location is a powerful variable shaping the trade-offs between markets and hierarchies" and that clusters "offer obvious transaction cost advantages over other forms" while "repeated interaction and informality of contracts within the structure resulting from living and working in a geographic area foster trust and open communication" (Porter, 2000, p. 25).

Competitiveness is due to institutional, physical and cultural and social characteristics of local agglomeration externalities. According to Kitson et al. (2004) this can be improved by diverse factors, such as skills and education of the population (labour capital), accessibility and connectivity (infrastructural capital), existing firms and capacity (productive capital), institutions and networks (social-institutional capital), available knowledge and technology (knowledge /creative capital), and attractiveness / amenities of a place (cultural capital). These factors are now known as Kitson's Capitals for regional competitiveness (figure 4), but are partly derived from the earlier theories of Marshall and Jacobs on agglomeration and urbanization effects.

Apart from these mentioned aspects of agglomeration sources, Rosenthal and Strange (2004) show evidence that also natural advantage, home market effects, consumption opportunities and rent-seeking, all contribute to agglomeration. Further Glaeser et al. (2001) proved that consumption is a driving force for the economy and attractiveness of cities.

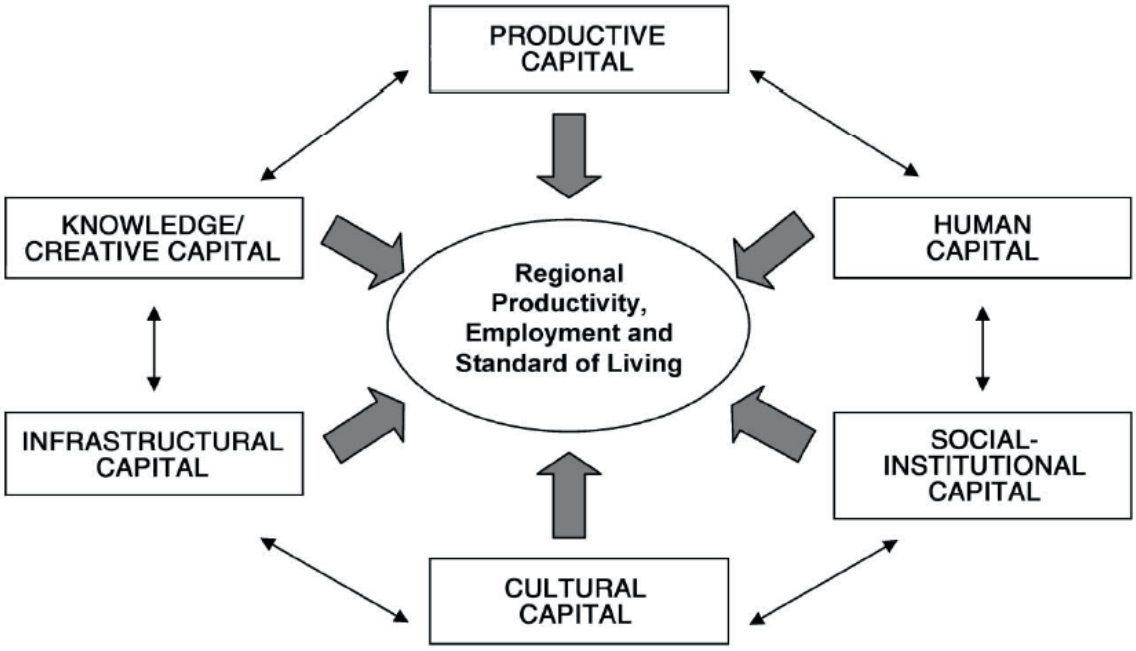


fig 4 : Kitson's capitals*. Bases of regional competitive advantage. (source: Kitson et al., 2004)*

FDI and the Multinational Firm

The opening of new markets for firms in a global economy, especially starting in the 1990s, have made enterprises look for the best place to conduct their activities, and while doing so transforming themselves into multinational enterprises (MNE's). By exploiting new activities outside their home country, firms invest abroad - these investments being called foreign direct investments (FDI). Within the FDI three types are distinguished: greenfield investments (development of new locations), brownfield investments (redevelopment of existing locations), and merger & acquisitions (transfer of ownership of existing facilities) (Meyer and Estrin, 2001). The first two types of FDI involve capital investments and (often) new employment and knowledge for a location, while with the latter one only the owner of the location changes.

The reason for a firm to internationalize are described in the OLI-paradigm by John Dunning (the development history of this paradigm is described in: Dunning, 2001). This framework explains that internationalization of a firm is due to Ownership advantages (based on transferable firm specific assets for ownership of production), Location advantages (non-transferable characteristics of foreign locations) or Internalization advantages (by coordinating multiple economic activities internally). The FDI is either characterized as horizontal (duplicating their home country activities to foreign countries, and thus reducing their trade costs) or as vertical (spreading their firm activities over different locations, in order to reduce development and production costs).

Due to globalization and the rise of new communication technologies, variables have changed that influence the location of FDI. Dunning (1998) distinguishes four kinds of motives for foreign direct investments by MNE's: resource seeking, market seeking, efficiency seeking and strategic asset seeking - the latter one gaining more importance over

the last decades. This mechanism has led to a concentration of the same activities (e.g. manufacturing, research, services) in different regions around the world, as described in the theory of the global network and global cities.

Besides the benefits for the MNE, FDI will lead to benefits for the receiving host country or city. The main advantages for the host city are inflow of capital, increase of labour, and mostly inflow of knowledge and technology: "FDI is an effective way to update technology and skills (… and) may improve institutions, open up the economy, and motivate other firms to catch up to the world technology frontier" (Poelhekke and Van der Ploeg, 2009 p. 751). The economic cluster theory of Porter strengthens the importance of attracting FDI, because by attracting investments a city will be more attractive for other firms and people (in the same sector or activity).

Spatial dispersion of firm activities

Due to the globalization of firms, the activities of firms are spatially dispersed around the world. Each activity of the firm has its own locational needs and allocational decision process. Some activities need to be located together, other need locations near central nodes or connections (airports), or are in need of knowledge interactions:

> *"Different business functions have different locational needs and, because these needs can be satisfied in various types of geographical location, each part tends to develop rather distinctive spatial patterns. Some functions tend to be geographically dispersed; others are geographically concentrated and co-located with other parts of the firm."*
>
> (Dicken, 2011, p. 134)

There is much evidence on the existence of clusters (Porter, 2000; Florida, 2005; Storper and Venables, 2004), however much of this research focuses on cities and regions as a whole competing for general investments and firms. Burger et al. (2012) criticize this aspect: "Nevertheless, in the discussion on urban and regional competition, it remains unclear which territories are competing with each other over which types of investments. In other words, most studies that present performance rankings of cities and regions implicitly assume that all cities and regions compete to the same extent with each other and little attention is paid to identifying the scope and intensity of territorial competition" (p. 2).

Interaction in Networks and Clusters

Despite their difference in nature and spatial level, both Global Networks and Local Clusters have the common characteristic that they are influenced by interaction. Manuell Castells (1996) stated that the world would exist of a Space of Places (the physical places of interaction and meeting face-to-face) and a Space of Flows (the virtual places of interaction of data-streams and information, forming global networks).

Interactions in Networks: Global Networks of firm activity are mainly formed by Global Value Chains of producing goods and products, but also networks of investments and knowledge are playing an important role in the global system. These networks are formed by inter-firm-linkages, intra-firm-linkages, firms and subsidiaries on the horizontal and vertical axis of firm activities. "Especially in the leading economic sectors (innovation, services, high-tech), firms form networks of specialization or complementarity with synergies due to mutual interaction" (Scott, 2001). Within these networks connections are maintained for control, interaction, and cooperation. According to Bathelt et al. (2004) these connections are Global Pipelines of information and knowledge. Mainly based on codified (or tangible) knowledge, these pipeline serves as providers of direct information and control.

Interactions in Clusters: Interaction in local clusters is mainly based on tacit knowledge, for which Face-to-face-contacts are highly important (Storper and Venables, 2004). This aspect of knowledge and information spillovers of Marshall agglomeration externalities, are the local buzz according to Bathelt et al. (2004) that will be stimulated by meetings, accidental encounters and interaction by different agents involved in related or distinct firm activities. Innovation, investments and knowledge are based (Jacobs, 1969; Bathelt et al., 2004).

These theories of spatial and urban economics are examined in the field of Urban Design by Dutch urbanist and professor Maurits de Hoog. Although scientific research on this topic is still small, his study shows that concentration of similar functions attract visitors and thus serve as interaction environments: 'a spatial environment with facilities for meeting and exchange of people, goods, capital and /or information' (de Hoog, 2012, p. 32). De Hoog focuses on three kinds of interaction environments: cultural clusters, congress clusters, and knowledge clusters. For each environment a typology of the spatial quality characteristics is determined. The research is mainly spatial and does not involve many aspects of economic geography, however it provides a spatial background to study interaction environments. And although the study does not especially focus on working environments, this background has been a guideline for the research on this topic in this thesis.

Typology of business districts

The shift in economic geography to global networks and local clusters, has had its impact on the spatial form of city and business location:

> *"Today there is no longer a straightforward relation between centrality and such geographic entities as the downtown or the CBD. (....). The spatial correlate of the centre [i.e. of the network. MH] can assume several geographic forms."*
>
> (Sassen, 1991, pp. 122-123)

What is the new typology of these business districts and what is the new form of the city? In 1994 Castells and

Hall already researched the new spatial form of the Information Technology Age and Industry. They described several types of Information and Knowledge districts as clusters where the importance of interaction and face-to-face-contact is huge. Distinct types of these technopoles are the High-Tech Industrial Complexes, Science Cities, Technology Parks, and the Metropolis itself. Moreover the range of a knowledge or information cluster is also to be seen at the regional level, as do the case studies show of Silicon Valley and Boston's Highway 128, both with a distinct spatial dispersion and evolution (Castells and Hall, 1994).

Around the same time Joel Garreau published on the phenomenon of Edge Cities: the new cities on the fringe of the old metropolis. Both to mass use of the automobile, and new ways of communication between head-offices and back-offices, it was possible to have "moved our means of creating wealth, the essence of urbanism - our jobs - out to where most of us have lived and shopped for two generations. That has led to the rise of Edge City." (Garreau, 1991, p. 4). Cities create around the nodes and connections of the transportation device of that time, so most Edge Cities are created along the crossings of tangentials and radials of a city, and near airports. According to Garreau the Edge City is further characterised by a closer connection to the suburbs (home of the employees) than the CBD's, enough space for car parks, and a modern architectural look (glass and atriums) - although the latter might be a more temporal design feature than really attributed to the Edge City itself.

A decade later Peter Hall described the geographical structure of the global city regions, which he characterizes as 'quintessentially polycentric' (Hall, 2002). The structure is highly complex due to electronic and face-to-face exchanges. And while 'traditional face-to-face locations retain their power, they are increasingly supplemented by new kinds of nodes for face-to-face-activity'. While Garreau had written his study of the Edge City in the perspective of an American City (focussed on the car), Hall seems to have written the essay with the European City in mind (also related to public transport). These new places of business activity in cities according to Hall are described in table 1.

District	**Characteristics**	**Business Activities**
1. Traditional downtown centre	walking distances, radial public transport centre	older informational and business / financial services
2. New business centre	old prestige quarter	new corporate headquarters and business services
3. Internal edge cities	development of industrial areas and transport land	
4. External edge cities	often located on the axis of the main airport	
5. Outermost edge cities	typically at major train stations	back offices and R&D
6. Specialised subcentres		education, entertainment, sporting, exhibition etc.

***table 1 : Taxonomy of District Types**, Characteristics and Business Activities by Peter Hall (source: Hall, 2002)*

Related to the downtown centre, Michael Porter has argued that the intercity centres provide main areas for local business support and amenities, and are specialised clusters for (local) services in itself (Porter, 1995). Appold & Kasarda have researched Airport Cities, that in their opinion are not any more on the edge but in the middle of the city region (Appold & Kasarda, 2013). Airport cities are in favour of firm location, especially for the activities of management and control, because they link a firm to the global network of airlines. Moreover the image of airports as a global and mondain place, is a location factor why businesses locate near airports. Also Lang & Knox researched the (American) city-region as the new spatial form of the metropolis. This Megapolis - or edgeless cities as Robert Lang called them in 2003 in his book Edgeless Cities: The Elusive Metropolis - consists of a polycentric structure with decentralized clusters of employment. Besides the districts already mentioned by Garreau and Hall of CBD and Edge City within the urban realm, they see the rise of edgeless cities in de mid metro realm, and new micropolitan areas outside this realm (Lang & Knox, 2009). However, this study of the urban spatial form is more applicable to the car-based system of the American metropolis.

The new districts and spatial dimension of the European contemporain metropoles are described by Aspa Gospodini in her article Portraying, classifying and understanding the emerging landscapes in the post-industrial city (Gospodini, 2006). This study shows the emergence of new kinds of city districts for services, commerce, residence, leisure and culture. The post-modern urban landscape is being formed by 'eclectic clustering of particular flourishing urban economic activities' (Gospodini, 2006, p. 313). In her classification of this post-industrial urban landscape, three types can be seen as part of an international business districts typology:

1. **Entrepreneurial epicentres**: urban islands within the inner-city of high-level financial services, technology-intensive and knowledge-based firms and institutions;

2. **Waterfront epicentres**: redevelopment of industrial harbour areas for culture, leisure, commerce (including housing and offices);

3. **Exurban new centralities**: diffused urbanity of commerce, leisure and offices in the urban fringe, close to motorways and motorways junctions.

The study by Gospodini signifies factors such as mixed-use, density, cultural heritage, design schemes, public space, architecture and distance as possible indicators for a typology of districts.

Also Maurits de Hoog has looked at the spatial characteristics of new kinds of city districts, with a focus on interaction environments. These are places where large numbers of people from different places gather and meet, intended or unintended. Examples of interaction environments are cultural districts such as museum quarters, leisure clusters, and congress and expo centres (de Hoog, 2012). Knowledge clusters are part of his typology of interaction environments, but he has not included other economic clusters such as central business districts or financial clusters.

Within the typology of knowledge clusters he recognizes different types: the inner-city court type, the inner-city research-center, the university quarter, the campus, the science park, and the urban district. All of these have in common that their design and structure is focussed on interaction and meeting places, but with different types of buildings, public space and green, and their distance to the city centre (de Hoog, 2012). In a recent study by Jones Lang LaSalle (2013) into the location choice of offices in Dutch cities, they recognised two important aspect of location: place-value (amenities and attractiveness of the location) and node-value (accessibility and connectivity of the location in the infrastructural network).

Conceptual Framework

The conceptual framework of this thesis uses theoretical concepts of Economic Geography and links them to aspects of Urban Design and Planning. Firms compete in a globalising world, and because of this firm competition they will specialise and disperse their activities spatially. Especially knowledge intensive activities of the firms are influenced by these processes, as was learnt from the literature review. The result of this process are the two geographic concepts of centrality (position in the global network) and concentration (agglomeration economies in local clusters), both determined by interaction in space and flows. The need for global networking, local clustering, and interaction, results in distinctive locational needs for knowledge intensive firm activities. Based on their needs, KI activities of firms will locate in business districts with different spatial characteristics in type and quality. This defines the business districts: Spatially bounded areas characterised by a combination of elements of Kitson's Capitals and with distinctive spatial qualities (definition by author). Although this process of locating and decision making is not measurable in itself, it can be derived from the FDI data that shows the preference of firm activities for different types of business districts in a city.

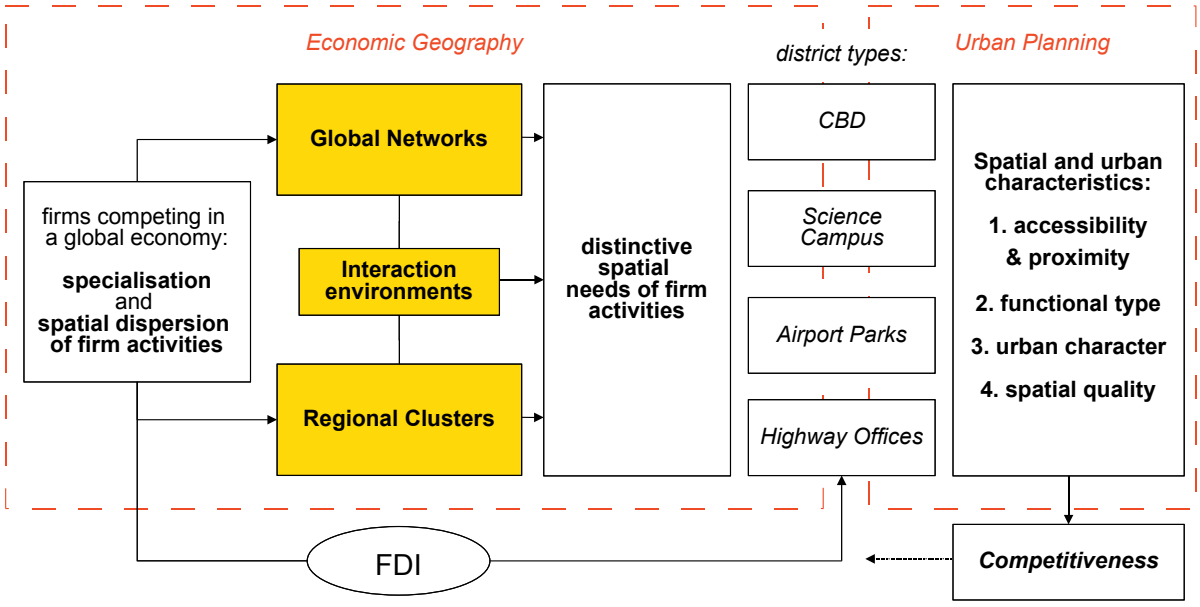


fig. 5: Conceptual Framework

As shown in the conceptual framework the attractiveness of business districts is determined by their spatial and urban characteristics: accessibility and proximity, functional typology, urban characteristics, and spatial quality. These aspects determine their position in the network (accessibility), in a cluster (proximity), and the potential for interaction (determined by both functional, urban and spatial characteristics and quality). Based on the main hypothesis a city can be (more) competitive by having a specialised, diversified or related supply of district types - depending on the needs of firm activities a city wants to attract. Cities that specialise in one kind of activity, can account for one or two types of districts, while only major and large metropolitan areas can account for a highly diversified supply and have a high differentiation in districts. Other cities might focus on a related supply of interdependent business districts with related activities.

Linking to economic geography, will focus the planning and design of districts to the location needs of firm activities. Although this is not the only factor for attracting firms (e.g. institutional and business environment, knowledge and education level, and corporate tax rate are important in FDI location), a business districts supply that answers to the needs of specific firm activities will lead to a higher competitiveness of a city and results in a higher number of received FDI in the referred knowledge intensive activity.

Working hypotheses

Main hypothesis of the study is that the attractiveness of a city for KI FDI depends on the number, quality, and quantity of the available business districts a city offers to the firms. Based on the theory and conceptual framework, three working hypotheses are formulated that will be leading for the design and methodology of the data analysis:

H1. Knowledge intensive activities of firms locate in different types of business districts.
Based on the nature of the activity (control, management, support, or research), activities have different spatial needs on accessibility (network position), proximity (clustering), and spatial characteristics (interaction potential). These needs are expressed in the type of business district they locate, for which a classification can be composed.

H2. The urban characteristic is a determinant for the type of FDI in knowledge intensive activities.
Because of the different spatial needs of KI firm activities, the urban and spatial characteristics of a city determines partly the kind of firm activities a city receives. Specific characteristics on accessibility, urban and functional qualities of a city will attract specific kinds of knowledge intensive firm activities.

H3. The availability of business districts in a city determines the number of FDI and the competitiveness of a city.
Cities with a high availability of a specific type of business districts, or with a wide range of types (high differentiation) are more likely to receive a higher number of FDI. This hypothesis assumes that other variables (education, knowledge, tax rates etc.) for these cities at least have a threshold value to receive FDI. However, the study will test to find out if these variables are of influence on locating of specific FDI.

3. RESEARCH DESIGN AND METHODOLOGY

Approach

This research has a quantitative and spatial approach, that is based on two kinds of data: network data on firms and foreign direct investments, and locational data of cities and districts. For the network data, two secondary databases have been used: fDi Markets (covers greenfield investments and includes information on firm, destination city, firm activity, year of investment) and Orbis (includes information on firm, address and postcodes, ownership). Annex 3 provides a more detailed explanation with information on these two databases and their contents. For the location factors, specific data on the spatial characteristics of the districts is collected in a virtual field work (internet-based location resources and online streetview websites), while general city data is used from secondary databases.

Operationalization: variables and indicators

The dependent y-variable in this research is the number of FDI in knowledge intensive activities, depending on the different location characteristics of business districts. The y-variable is available for the number of all FDI in knowledge-intensive activities, as well as for the various activities (HQ, BS, R&D, DDT, SMS, E&T, and ICT). The data on FDI is derived from the professional database of fDi Markets, and includes various characteristics of the firm involved (view table 2).

The x-variables are the various location characteristics of the business districts (accessibility and proximity, functional characteristic, urban characteristics, and spatial quality) and of the city in general (market size and infrastructure, costs of capital and labour, knowledge, institutional and living environment, availability of business districts). Table 2 gives an overview of the indicators being used for the mentioned variables. The spatial characteristic variables are an aggregate of the different location factors mentioned in the literature on urban design and quality. Quality indicators will be measured on a 0 - 4 scale (high = best). To measure the impact of the district characteristics on the location of FDI on the city level, also an analysis on the city level will be done. The variables for these analysis concern general city indicators that are derived from the correlated indicators in the research report Weerbare Regio; deelrapport De strijd om kapitaal (Wall and Burger, 2012) which provides a research into city location factors to attract greenfield investments in different business activities for the Province of South-Holland.

Data

Foreign direct investments exist of ‘greenfield’ investments, ‘brownfield’ investments, and ‘mergers and acquisitions’ (M&A) (Meyer and Estrin, 2001). M&A provides no clear impact on the regional or urban development, because the process concerns either firms deciding to go forward as a single new firm (merger), or taking monetary possession of

Name	*Description*	*Source*	*Unit*	*Data Type*
Y-variable (FDI data):				
– FDI dataset	contains:	fDi Markets	-	nominal
	- number of FDI	fDi Markets	-	ratio
	– year of Investment	fDi Markets	-	interval
	- economic sector	fDi Markets	-	category
	- firm Activity	fDi Markets	-	category
	– address: (street), postcode, city	ORBIS, own research	-	nominal
X-variable : Location data				
Proximity / accessibility				
- rdist Airport	relative distance to Airport, corrected for distance city center - airport	own research (batchgeo.com)	-	ratio
- dist Station	distance to Central Railway Station	own research (batchgeo.com)	km	ratio
- cdist Main Road	distance to Main Road (1: <1 km; 2: 1-2 km; 3: >2 km.)	own research (google earth)	-	ordinal
- rdist UNI	relative distance to closest University or Scientific Institute, corrected for average distance to city center	own research (batchgeo.com)	-	ratio
- rdist Center	relative distance to City Hall (as proxy for the center), corrected for average distance to city center	own research (batchgeo.com)	-	ratio
- N Firms	number of FDI investments in same cluster (proxy for number of firms)	own research (fDi Markets)	-	ratio
Functional characteristic				
- Functional Characteristic	functional characteristic of the location: Industrial; Office; Mixed-use; Green; Commercial; Techno district; Complex	own research (google earth)	-	category
Urban characteristic				
- Urban degree	degree of urbanisation of area: 1 = solitair building; 2 = low (sub-urban); 3 = medium; 4 = high	own research (google earth)	-	ratio
- N floors	average number of floors in area / building	own research (google earth)	-	ratio
- Amenities	presence of amenities in area / buildings (1 = yes; 0 = no)	own research (google earth)	-	dummy
- Waterfront	location on waterfront / river (1 = yes; 0 = no)	own research (google earth)		dummy

table 2: Variables and indicators

Name	*Description*	*Source*	*Unit*	*Data Type*
(continued)				
Spatial quality				
- Green	presence of green in area (1 = none; 2 = low; 3 = medium; 4 = high)	own research (google earth)	-	ratio
- Water	presence of water in area (1 = none; 2 = low; 3 = medium; 4 = high)	own research (google earth)	-	ratio
- Parking	type of car parking: S = street parking; L = parking lots; B = built parking	own research (google earth)	-	category
- Public Space Design	quality of public space: 1 = none; 2 = low; 3 = medium; 4 = high	own research (google earth)	-	ratio

X-variable : City data

Market Size and Infrastructure				
- GDP per capita ($)	Gross Domestic Product of the City per capita (in US dollars)	GUCR 2011	$	ratio
- accessibility by air	number of air passengers in 2012 of the (combined) airport(s) in millions	Wikipedia	-	ratio
- accessibility by road	relative accessibility ratio (EU27 = 100)	Eurostat	-	ratio
- quality internet infra	(not available on city level)	-	-	-
Costs of Capital and Labour				
- average montly wage	(not available on city level)	-	-	-
- unemployment rate	average rate of the period 2003-2009	Eurostat	%	ratio
- corporate tax rate	tax percentage on the national level (mean value if different percentages apply)	Wikipedia	%	ratio
Knowledge				
- higher education rate	percentage of people with tertiairy education	Eurostat	%	ratio
- rate of R&D expenses	national rate of R&D expenses	Eurostat	%	ratio
- top university score	Scores applied on basis of World Rank of Top University (highest rank = highest score)	Webometrics	-	interval
Institutional and Living Environment				
- capital city	(not enough variance in the city sample)	-	-	-
- size of horeca-sector	(not available on city level)	-	-	-
- temperature in January	average daily meain (degree Celsius)	Wikipedia	ºC	interval
- green space proportion	area percentage of green space in the region	Eurostat	%	ration
Availability of Business Districts				
- presence	presence of the different kind of business districts (0 = none, 4 = high)	own research	-	interval
- differentiation	number of bussiness district types in a city	own research	-	ratio

indicator excluded

other firms (acquisition). Although brownfield investments involve capital investments and development of existing locations, the impact and change of brownfield investments on the urban development differs and his hard to measure as well. Greenfield data on the other hand are investments from parent companies into a new subsidiary that didn't exist before. These investments are traceable developments of firms and thus are useful in studying their impact on urban development (Wall and Burger, 2012). For this reason this research is based on greenfield data.

The data is derived from the Financial Times 'fDi Markets' database (Financial Times, 2012) and covers greenfield data over the period 2003 to September 2012. A problem with these data is that around 60% of the investment values are not known and have been estimated by fDi Markets. By using these estimated data would result in a distorted and misleading analysis. However the number of investments that a region receives, is as a reliable unit of analysis. Earlier studies on correlation analysis between the number of investments and the value of these investments, show that very high correlations exists between the two forms of data (Wall and Burger, 2012). This means that the numbers of investments, serves as a good proxy of the investment values.

Although the database provides lots of characteristics on the firm and the investments, it does not however contain locational data (address, postcodes). This data have been derived from the ORBIS database (Bureau Van Dijk, 2013) and from own internet research.

The data on the spatial characteristics of the locations have been collected during a virtual field work (using Google Earth). The description and type of these data are shown in table 2. The data on the general city characteristics have been derived from databases of Eurostat and other (internet) sources.

Geographical Scope and Selection: Cities and Districts

The geographical scope of the researched is determined from two points. The first is the intention of an academic research on North- and West-Europe, a region with a relative cultural proximity and shared development history. The second point is the aim to derive policy implications for the municipality Rotterdam. The research will focus on cities that are comparable to Rotterdam in the number of FDI they attract, and will study to which extent these cities differ in the kind of FDI activities and the characteristics of their business districts.

Within the countries of North- and West-Europe (view annex 1 for a definition of these regions as used by the UN statistics office), the number of countries is limited due to restrictions of detail of post codes. The Orbis database provides for each firm the postcode of its location, identifying their district withing a city. However this is only possible with postcodes, that are detailed on the district or street level. In some countries the postcode is only on level of the whole city or part of the cities, giving not enough information to locate a firm on district level. The necessary level of detail of postcode, can only be found in six countries within North- and West-Europe: the United Kingdom

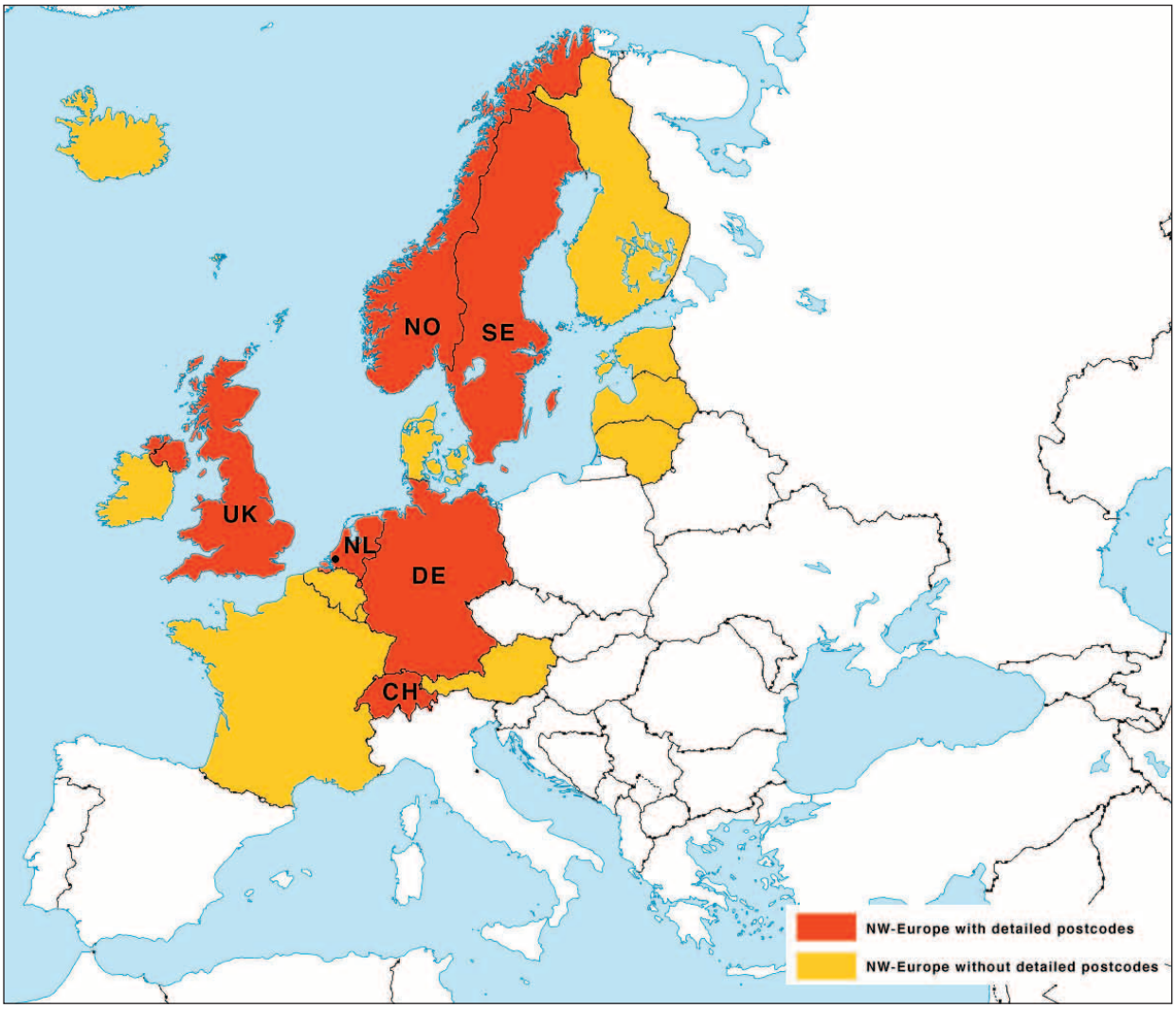


fig. 6: North- and West-Europe: countries and without with detailed postcodes

(UK), the Netherlands (NL), Switzerland (CH), Germany (DE), Norway (NO), and Sweden (SE). View annex 2 for more information on postcodes and their level of detail.

Based on a similarity-analysis of fDi Markets-data of the cities in these six countries, a selection is made of 15 cities that are similar to Rotterdam in number of investments. Within these cities FDI was geomapped into city districts (based on postcodes provided by ORBIS), leading to a sample of 93 districts (with more than one investment), and more than 250 single investment locations.

Data Analysis Methods

The data analysis consists of three different parts with a total of eight steps, each directed to a specific research question and using a different method. The first two parts of the research are both descriptive researches, on the city level and on the district level. The third part is an explanatory research on firm activity FDI and district

PART A. DESCRIPTIVE RESEARCH ON FDI AND CITY LEVEL

In the first part of the analysis the general trends of FDI development were studied, using the fDi Markets database. This research focussed on the seven knowledge intensive firm activities: Headquarters (HQ), Business Services (BS), Sales Marketing & Support (SMS), Research & Development (R&D), Design Development & Testing (DDT), ICT & Internet Infrastructure (ICT), and Education & Training (E&T). For this part of the analysis the selection of all cities within the selected 6 countries was used. The research is divided in four separate questions:

A1. What is the growth of FDI for the selected KI-activities?

Subject:	FDI-development over time to all cities in the selected six countries		
Result:	Overview of which firm activities are growing / declining in FDI.		
Data used:	*Method:*	*Software:*	*Outcome:*
fDi Markets	Trend analysis	Excel	Growth of FDI volume

For this question the growth trends of the FDi data over the years 2003-2011/2012 was researched, using line graphs and exponential trendlines in excel. The trendline equation gives the annual growth percentage over the years 2003-2011. Because the data was taken from the database in november 2012, the data for the year 2012 is not complete and thus not included in the yearly growth trend.

A2. What is the hiërarchy of cities in attracting FDI for the selected KI-activities?

Subject:	Ranking of NW-European cities FDI attraction		
Result:	Position of Rotterdam and identification of its league (cities with same FDI volume)		
Data used:	*Method:*	*Software:*	*Outcome:*
fDi Markets	Indegree analysis	Excel	Position: ranking of cities

This analysis uses excel to see what the total number of FDI in KI activities is for each city in the years 2003-2012, what the annual growth percentage is, and what the share is of KI activities related to the total volume of inward FDI.

A3. In attracting KI FDI, which cities are similar to and competing with Rotterdam?

Subject:	Competition for Rotterdam		
Result:	Comparison of similarity and competition to Rotterdam		
Data used:	*Method:*	*Software:*	*Outcome:*
fDi Markets	various	Excel / Ucinet	Similarity and competition in FDI

To know which cities are competitors to another city, we can look at the similarity of the investment portfolio: when the investments take place in the same activities, the two cities are bidding for the same kind of investments (Burger

et al.,2012). The first kind of measure for Similarity is the Manhattan Distance, that calculates the absolute distance (difference) between the number of investments for two cities X and Y in the different activities (or sectors) i .

Formula 1 :

$$Manhattan\ Distance_{xy} = \sum_{i=1}^{n} |x_i - y_i|$$

In this formula x_i represents the number of inward investments in activity i in city X and y_i the number of investments in activity i in city Y. Cities X and Y with the same number of investments in the activities i_1, i_2, etc. will have a Manhattan Distance of zero, meaning a total similarity in their inward investment portfolio. It is a two-way measurement with an equal outcome for both cities. The Manhattan Distance however considers (large) differences in number of investments in the same activity, as a measure of dissimilarity and not as a measure of competition. Moreover this index does not weigh the dependence of a city on a unilateral investment portfolio composition.

In Burger et al. (2012) is proposed to use a weighted Relative Manhattan Distance, that gives a compositional overlap of the investment portfolio. This Relative Manhattan Distance, also called Index of Dissimilarity, uses value zero when there is a maximum compositional overlap (competition) and a maximum value when there is no overlap (dissimilarity). The Index of Dissimilarity is related to the Finger-Kreinin index for measuring the competitive threat one country poses to another in international trade (Loyd, 2004). For this research the Similarity Index is used, that is the reversed value of de Dissimilarity Index and differs in the use of the value 1 as similarity value (instead of 0).

Formula 2 :

$$Index\ of\ Similarity_{xy} = 1 - \frac{1}{2} \sum_{i=1}^{n} \left| \frac{x_i}{x_n} - \frac{y_i}{y_n} \right|$$

This measures the similarity between two cities X and Y in their inward investment portfolio, with x_i being the number of investments in activity i in city X and x_n being the total of investments in city X. An outcome of one means total similarity (competition), and an outcome of zero is total dissimilarity (no competition at all). Like the Manhattan Distance this is a two-way measurement, where the index outcome is the same for both cities. However this measure only looks at the similarity of two cities in their portfolio composition, not looking at the difference in the number of investments which is a major drawback when comparing two cities different in size (Burger, 2012).

Thus a measure for the competitive threat that city Y poses city X should include the difference in the number of inward investments as well as the investment portfolio of city X. This can be best explained by an example of a big city Y that has a number of investments in different activities, and a small city X with only a small number of investments in one activity i. While their dissimilarity is quite big (difference in number of investment and portfolio) city Y will have more competitive power over city X with a larger number of investments in activity i than city X. The bigger the market share of city Y in the major investment activities of city X, the stronger the competition from city Y over city X; at the same time city X will not pose any competition to city Y. The following index measures

the competition city Y poses to city X in activities *i*, considering:

i) the share of that activity as part of the total investment portfolio into city X, and

ii) the concentration ratio or relative market share of that activity in city Y related to the total of investments in that activity in both cities X and Y.

Formula 3 : $$Index\ of\ Competition_{xy} = \sum_{i=1}^{n} \left(\frac{x_i}{x_n} \times \frac{y_i}{x_i + y_i} \right)$$

In this formula x_i is the number of inward investments in activity *i* in city X, x_n is the total number of inward investments of city X, and y_i is the number of inward investments in activity *i* in city Y. This index is a relative measure with a value between zero (no competition) and one (heavy competition); an index of 0,5 means that city Y is as strong as city X in attracting investments in the activities of city X. This index is one-way (asymmetric) measurement, because it only measures the competition from city Y over city X.

A4. For the selected 15 cities what are the general trends and characteristics on KI FDI?

Subject:	KI FDI charactics in 15 selected cities.		
Result:	Overview of FDI growth, sectors, activities, source cities and ties.		
Data used:	*Method:*	*Software:*	*Outcome:*
fDi Markets	various	Excel	General overview
	Core - periphery analysis	UCINET/Netdraw	Linkage structure

This last question gives a general overview of the inward knowledge intensive FDI characteristics for the selected cities (outcome of questions 2 and 3). In both Excel and Ucinet (Netdraw) the FDI structure and network researched in a city-to-city network as well as in a activity-to-city network.

PART B. DESCRIPTIVE RESEARCH ON DISTRICT LEVEL

The second part of the data focusses on the 15 cities derived in part A, and researches in what locations and districts FDI is located in these cities. Furthermore this part investigates the different location factors and indicators of these locations and districts.

B1. In which locations in the selected 15 cities is the FDI for KI activities located?

Subject:	Location of FDI within city districts		
Result:	Label of FDI-data on city district level (-> adjusted database: fDi Markets.2)		
Data used:	*Method:*	*Software:*	*Outcome:*
fDi M. + ORBIS	Postcode geo-mapping	batchgeo.com	GIS of FDI-locations

The total number of FDI for these cities was 1468 entries. Combining the FDI data of fDi Markets with the ORBIS database, resulted in the addresses and / or postcodes of 460 entries. Another 664 addresses and postcodes were found by searching on internet (company website, local chamber of commerce). This resulted in 76,6% found FDI

addresses to be used in the geo-mapping. Using batchgeo.com the locations were mapped, and of each location the distance to the city hall, the main railway station, the universities and institutes was calculated. The result for each city can be found in annex 4.

B2. What are the characteristics of the FDI locations (single locations and districts)?

Subject:	Spatial characteristics of FDI locations		
Result:	Variables for FDI attraction on location / district level.		
Data:	*Method:*	*Software:*	*Outcome:*
GIS-locations	Virtual Field Work	Google Earth	location factors database (LFD)

For each location (single FDI, or a cluster of multiple FDI) the characteristics are collected on a virtual field work by means of Google Earth / Streetview. These location factors are the indicators on district level, as shown in tabel 2. In a FDI cluster the characteristics are the mean of the whole area.

The output of part B of the research is a database consisting of the GIS-located KI FDI in the selected 15 cities with all location variables.

PART C. EXPLANATORY RESEARCH ON FIRM ACTIVITY FDI AND DISTRICT CHARACTERISTICS

In the last part of the analysis, the research focusses on which characteristics are determinant as location factor for the attraction of KI FDI in general, and for the specific activities (SMS, BS, HQ, R&D, DDT). Also on the city level an analysis has been made, to see if spatial characteristics and availability of specific business districts are more explanatory than general city characteristics for attracting FDI to a city.

C1. Which location factors are determinants for attracting KI FDI?

Subject:	Causality between location (district) characteristics and FDI attraction		
Result:	Overview of FDI attracting spatial determinants for KI firm activities.		
Data:	*Method:*	*Software:*	*Outcome:*
LFD Districts	Multiple Lineair Regression (stepwise)	SPSS	Causality

For the second regression analysis, general city indicators will be cross-examined with the availability of specific business districts in the cities.

C2. Which factors are determinants for attracting KI FDI at the city level?

Subject:	Causality between city characteristics and FDI attraction		
Result:	Overview of FDI attracting city determinants for KI firm activities.		
Data:	*Method:*	*Software:*	*Outcome:*
LFD Cities	Multiple Lineair Regression (stepwise)	SPSS	Causality

Validity and Reliability

The used databases, indicators and methods have proven to be consistent and operational in earlier scientific research. The quantitative data is collected from official sources, guaranteeing the reliability of the data. For check and control of validity and reliability, there will be a triangulation of the results of the regression analysis with evidence of the emperical findings in the business districts, and with findings in theory and other studies.

To run the multiple regression model the data is tested on the following assumptions that are required to give a valid result of the analysis:

1. Check for significant outliers of data.
2. Check for multicollinearity (correlation of the x-variables) with a VIF-test (Variance Inflation Factor) in SPSS. Variables with a VIF>10 have been excluded.
3. Check for heteroscedasticity (skewness), if so the data will be logged (natural logarithm ln).

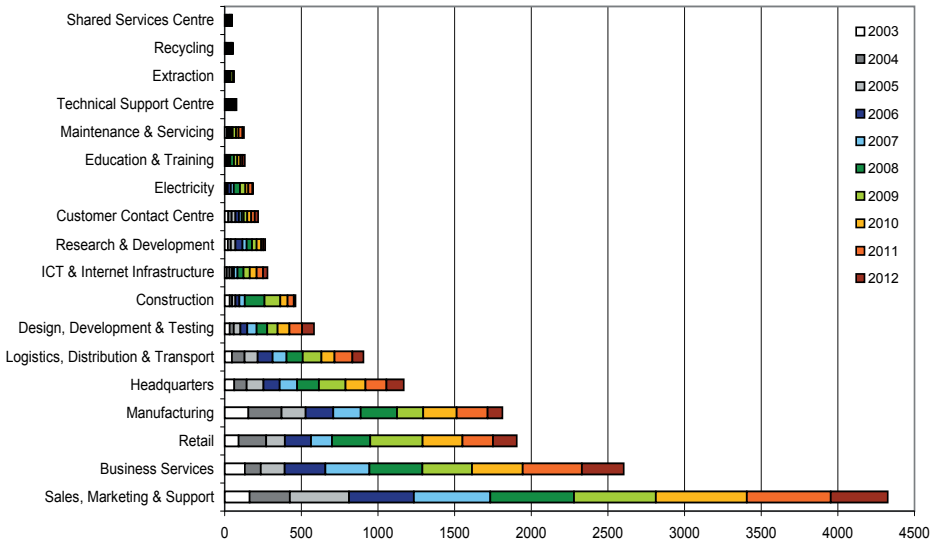
4. DATA ANALYSIS AND RESULTS

PART A. DESCRIPTIVE RESEARCH ON FDI AND CITY LEVEL

Trends and growth in FDI for (KI) firm activities in NW-Europe

The data used in this analysis, consisted of the fDi Markets Database for the NW-European countries Norway, Sweden, Germany, the Netherlands, United Kingdom, and Switzerland in the years 2003-2012, altogether 15.233 entries on FDI in all firm activities. Based on these data, the spread of the number of investments over the different firm activities (as given by fDi Markets) is shown in chart 1. It's clear that Sales Marketing & Support is the activity in which most FDI takes place (4.326 investments, 28%), followed by the activities Business Services, Retail, and Manufacturing with all more than 1.500 investments. These top 4 activities account for around 70% of all FDI in the mentioned countries. The activities of Headquarters, Logistics Distribution & Transport, and Design Development & Testing have investments between 500 and 1.500, and account for around 17% of all FDI. All other activities have less then 500 investments and account for 13% of all FDI in number, four activities even less than 100 investments.

chart 1:
Number of FDI for various firm activities in six selected North- and West-European countries (CH, DE, NL, NO, SE, UK) in the period 2003 - 2012



For the year 2012 only the data until September were available in the fDi Markets database at the moment of retrieving, and for matters of equal annual comparison, the year 2012 has been excluded in the growth analysis. Looking at the growth of FDI in the period 2003-2011, we see an overall growth of 10,7%. Although the number of investments is growing considerable in most activities, in some activities the number of investments is declining (chart 2). Firm activities Recycling, Maintenance & Servicing, Education & Training, Electricity, ICT & Internet Infrastructure, Design Development & Testing, Business Services, and Sales Marketing & Support have growth percentages of more than 10%. For some activities this high growth can be explained by the low starting number of FDI in 2003 (e.g. E&T, Recycling, and Electricity). Changing industrial development related to globalization

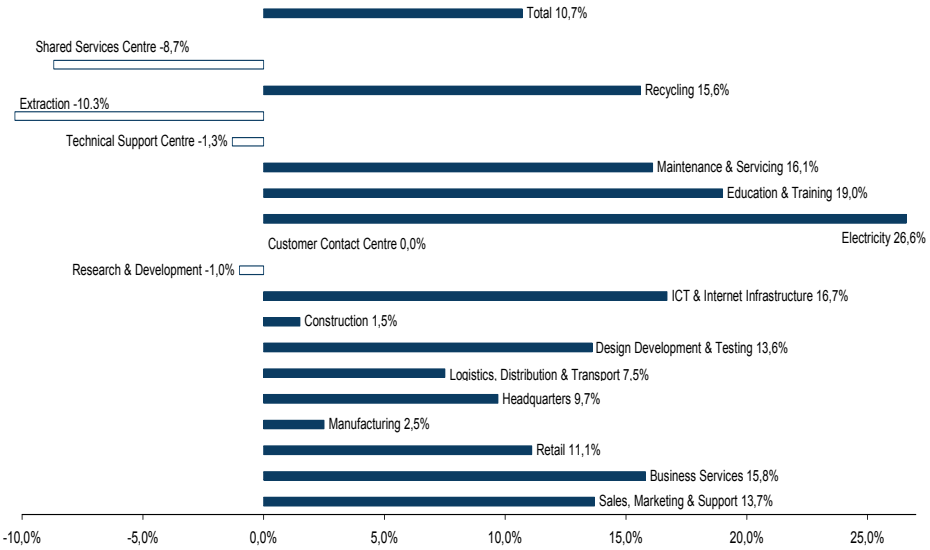


chart 2:
Growth percentages of FDI in firm activities *in 2003 - 2011 in the six selected North- and West-European countries (CH, DE, NL, NO, SE, UK)*

and sustainable development, can also explain the growth of both Recycling and Electricity in this period. The ongoing high demand for control, finance and communication in the global economy and multinational networks of enterprises, are visible in the growth of ICT and Business Services, while the need to keep up with the technological frontier for MNE's can be seen in the growth of investments in DDT.

In the same period, the investments in the capital intensive industries have been low or even declined in NW-Europe, such as Manufacturing, Construction, and Extraction, also due to the global financial crisis and the recession in Europe. Interesting is that investments in R&D declined by 1% over this period, while the related activity of DDT has been growing. One explanation might be that R&D-investments require high investments and bring long-term financial insecurities, while DDT is more directed on testing new products. Another explanation might be a change in registration by fDi Markets of Development activities after 2006. The growth trends for the knowledge intensive activities is elaborated in charts 3a and 3b. Most FDI numbers are growing, Research & Development however shows a decline after 2006 and especially after 2008. Also Headquarters and Education & Training decline in the number of FDI after 2008, which might be explained by the financial crisis.

The importance of knowledge intensive activities for the economies in North and Western European countries is visible in the growing share of these activities in the FDI over the years. The share of KI activities shows an increase of just above 50% in 2003, to a share of almost 70% in 2011 (chart 4).

The hierarchy of NW-European cities in attracting FDI for KI-activities

Within the six mentioned countries, there are 1 114 cities that received FDI in one or more knowledge intensive activity in the period 2003-2013. More than half (618 cities) only received one investment and around 92% of the cities received less than 10 investments. The remaining 8% (90 cities) however received the largest number of FDI,

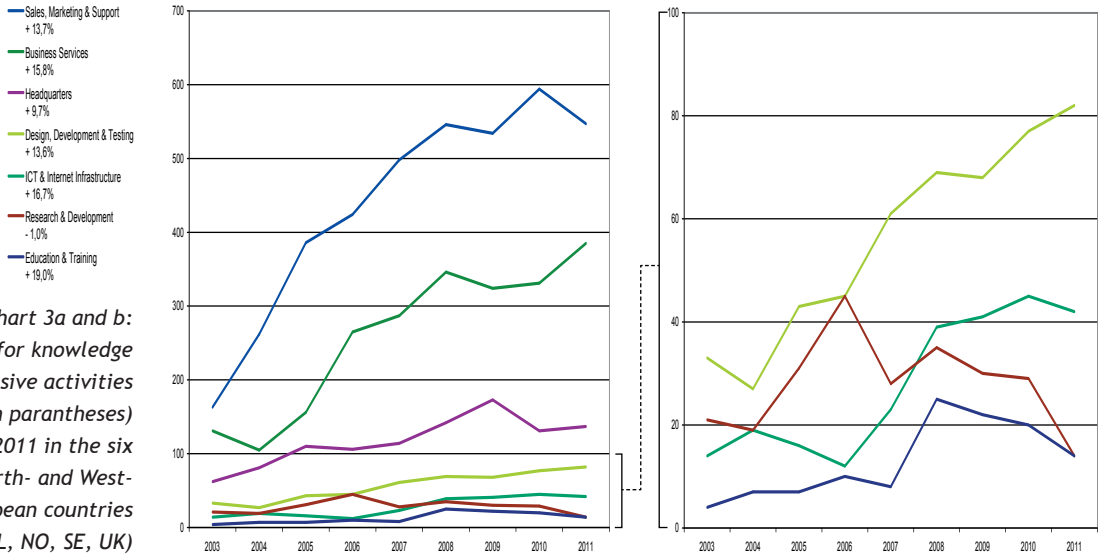


chart 3a and b: Number of FDI for knowledge intensive activities (growth in parantheses) in 2003 - 2011 in the six selected North- and West-European countries (CH, DE, NL, NO, SE, UK)

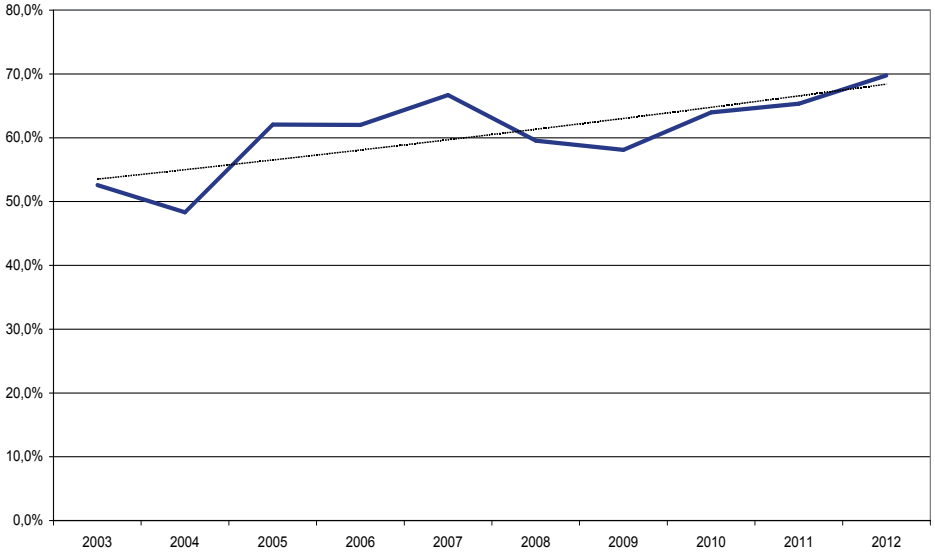


***chart 4: Share of knowledge intensive activities in all FDI** in the period 2003 - 2012 in the six selected North- and West-European countries (CH, DE, NL, NO, SE, UK)*

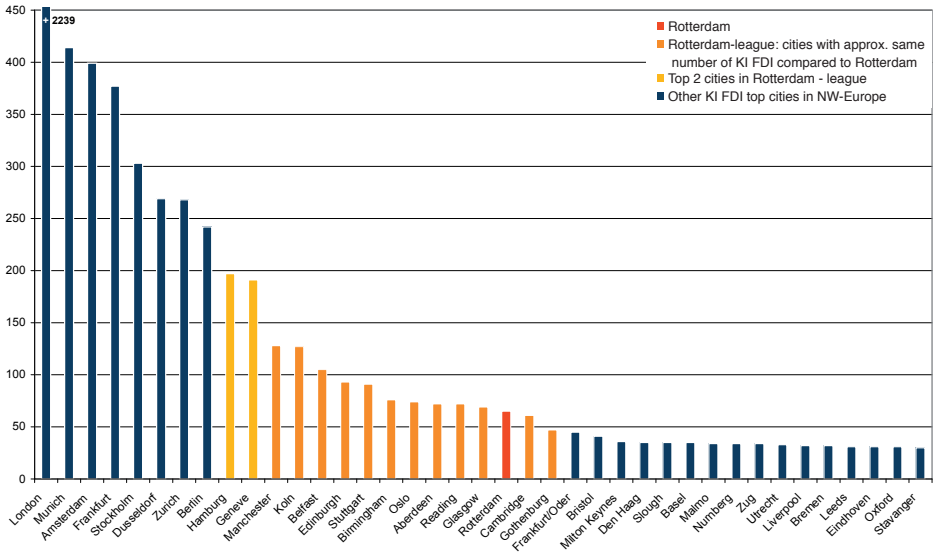


***chart 5: Number of KI FDI for top cities** in 2003 - 2012 in the selected six North- and West-European countries (CH, DE, NL, NO, SE, UK)*

i.e. 7 351 investments or almost 79% of all KI activity FDI. This already shows that FDI is very concentrated in a few cities. Looking at the top cities, receiving more than 30 investments, it is clear that even in this top there are different leagues (chart 5). Top receiver is London with 2 239 investments (top of bar outside the chart), being 24% of all investments in the six countries. Based on this figure, one can regard London as a global star in KI FDI and outside the competition of the other NW-European cities. The best of the rest is Munich, followed closely by Amsterdam and Frankfurt. Also Stockholm, Düsseldorf, Zürich and Berlin are part of the top league for KI-FDI in Europe with between 200 and 300 investments. They form the regional stars of Europe.

The sub-top for KI investments is formed by 15 cities receiving 50 to 200 investments, Rotterdam being one of them in the end of the spectrum (65 investments). In this sub-top however there's quite a difference between the numbers 1 and 2 (Hamburg and Geneve with almost 200 investments) that might grow to be a regional star, and the remaining sub-top. For part B and C of the research this sub-top of cities (or league of Rotterdam) will be the focus, including both top cities in this league. Regarding the number of FDI most cities are comparable, and by including Hamburg and Geneve it might be interesting to find out why these are attracting considerably more investments than the rest of this sub-top. Besides Rotterdam, Hamburg and Geneve, this league consists of the cities of Aberdeen, Belfast, Birmingham, Cambridge, Edinburgh, Glasgow, Gothenburg, Köln, Manchester, Oslo, Reading and Stuttgart.

Not only the number of KI FDI is a measure for the position and strength of a city, but also the growth percentage and the share of KI FDI is a measure to take into account. Chart 6 gives an overview of the highest ranking cities (more than 30 investments) measuring the growth and share of the FDI in knowledge intensive activities. In this chart the cities are grouped on their position in growth and share of KI FDI. The share of KI FDI considers the actual state of a city's investment portfolio and gives insight into the type of economy of a city: the larger the share of KI FDI, the more a city depends on knowledge, information and highly educated people in the economy. The cities with the largest share of KI FDI are Zug, Reading, Geneve, Munich, Zurich, Utrecht, Cambridge and Stuttgart. The presence of three Swiss cities in the top of KI FDI share, seems related to the specific financial / banking and tax conditions offered by Switzerland. The other cities are either university cities or have high technology industries. The cities with the lowest share of FDI are Liverpool, Rotterdam, Glasgow - all cities with an economic background in low-tech / capital-intensive industrial and harbour related activities.

To investigate the investment and development potential of a city in the long term, the growth of the KI FDI is a better measure for the change in the investment profile and economic characteristic of a city. The cities of Düsseldorf, Frankfurt, Köln, Aberdeen have a large growth percentage of more than 20%. On the other hand the cities of Oxford and Nurnberg have a declining number of KI FDI - although the share of KI FDI is still considerable high. Stockholm and Zug also have a high share of KI activities in their FDI, however with a low growing percentage. Bristol and Malmö have a low growth and share of KI FDI. Also in growth, Rotterdam is not doing very well: it's growth percentage (6,9%) is just below average (10,4%) - although the other Dutch cities do not perform very well either.

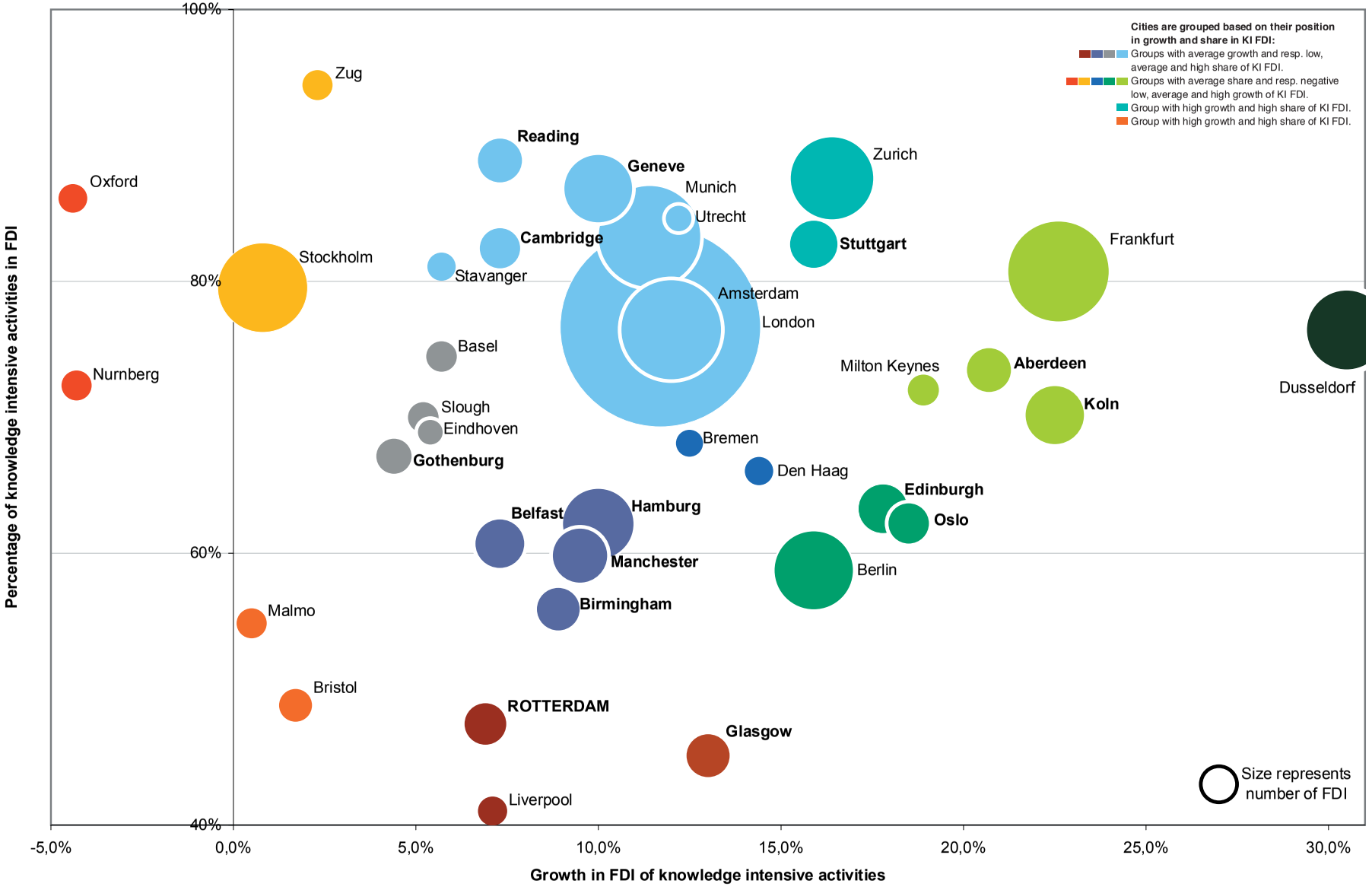


chart 6: Size, growth and share of FDI. *FDI in knowledge intensive activities of top cities in six selected North- and West-European countries (period 2003-2012)*

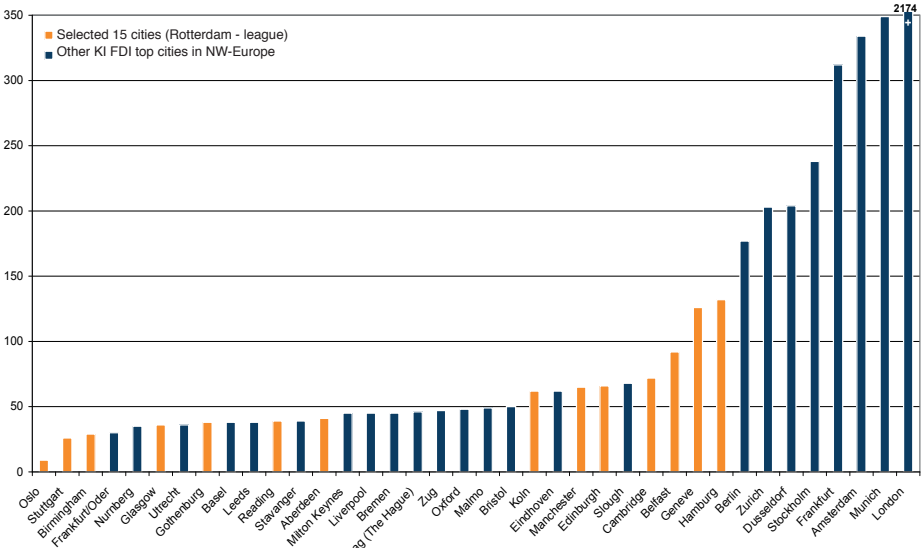


chart 7a:
Manhattan Distance
to Rotterdam for FDI portfolio in knowledge intensive activies (period 2003 - 2012)

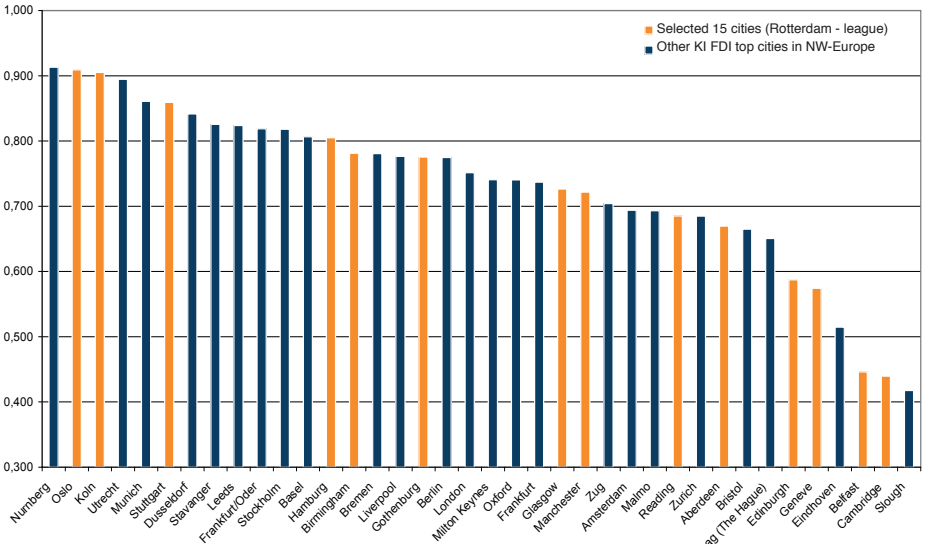


chart 7b:
Index of Similarity
to Rotterdam, based on portfolio composition of FDI in knowledge intensive activities (period 2003 - 2012)

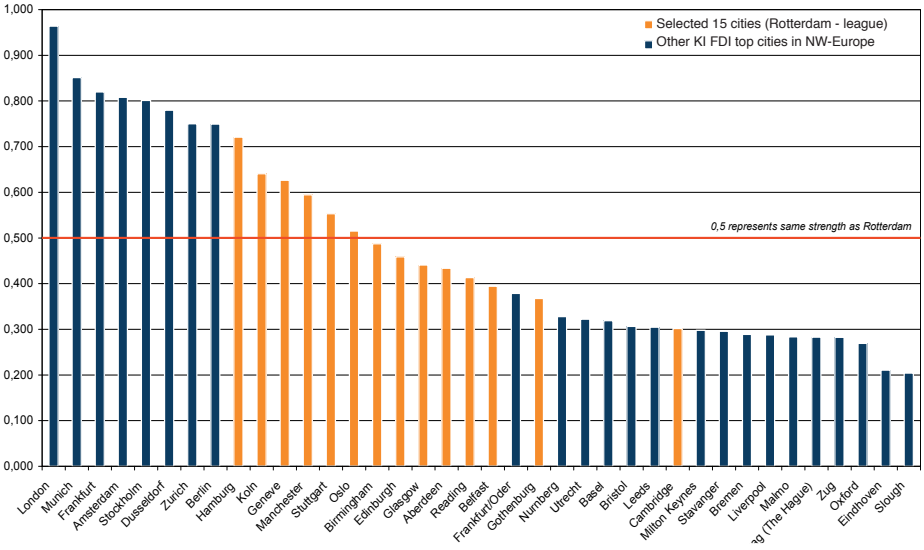


chart 7c:
Competition
for Rotterdam, based on FDI in knowledge intensive activities (period 2003 - 2012)

Similarity and competition for Rotterdam in attracting KI FDI

Within the global economy cities compete to attract knowledge, people, firms and investments. To learn which cities compete with eachother for FDI, one can look at their sectors or activities. The advantage of looking at firm activities, is that they're closely related across different sectors - especially within the KI activities. Cities in the developed countries compete as a location for either headquarters, business services, sales and marketing, or research & development. Some cities focus on all kinds of activities, others specialize in specific activities (e.g. R&D or DDT). As explained in chapter 3, there are various methods to measure competition between cities. The Manhattan Distance measures the (dis)similarity between two cities, expressed in a number from zero to infinite. A number close to zero, expresses a similarity in kind and number of investments. Chart 7a shows that Oslo is most similar to Rotterdam regarding KI investments, and London is by far dissimilar. Since (large) differences in number of investments influence the Manhattan Distance measure, the Similarity Index provides insight in the cities that are comparable to Rotterdam in their KIA investment portfolio (chart 7b). The Similarity Index is a number between zero (dissimilar) and one (similar); based on this index Nurnberg, Oslo and Köln are the biggest competitors of Rotterdam in the KI activities, and Belfast, Cambridge, an Slough are Rotterdam's least competitive cities.

The Similarity Index however does not take into account the specific investment portfolio profile of a city and is a two-way symmetric measure. To see which cities are the biggest competitors to Rotterdam, the Index of Competition was used, an a-symmetric measure. This index measures the relative market shares of a city in the total investment for the different KI activities in that city and Rotterdam, weighed for the importance of that activity in the investment portfolio of Rotterdam. The result (chart 7c) shows that within NW-Europe, London is the biggest competitor for Rotterdam, having more than 95% market share of the mutual market for the activities Rotterdam attracts FDI in. Cities with a Competition Index of 0,5 show equal strength to Rotterdam in competition over FDI (they have a 50% share of the mutual market). Cities with a lower index are weaker competitors to Rotterdam. The chart shows that the same cities in the sub-top in number of investments (chart 5) also form the league of competition for Rotterdam. These 15 cities are the focus of the remaining part of the research.

General trends and characteristics on KI FDI for the selected 15 cities

Focussing on the 15 selected cities that together form the sub-top for KI FDI in NW-Europe, they altogether received 1 468 knowledge intensive activity investments over the years 2003-2012. As showed in chart 8, the main part of these investments was within the sectors Software & IT Services, Financial Services, and Business Services, receiving more than half of all investments. The changes in these sectors are very volatile, which can be a reason for many investments. One of the limitations of de fDi Markets Database however is that only new investments are registered, and not how long these investments persevere in existence or are obsolete after a year. In chart 9 is shown that Sales Marketing & Support and Business Services are the main knowledge intensive activities for investments, followed by Headquarters and Design Development & Testing. In figure 7 the activity source of the FDI for the 15 cities is

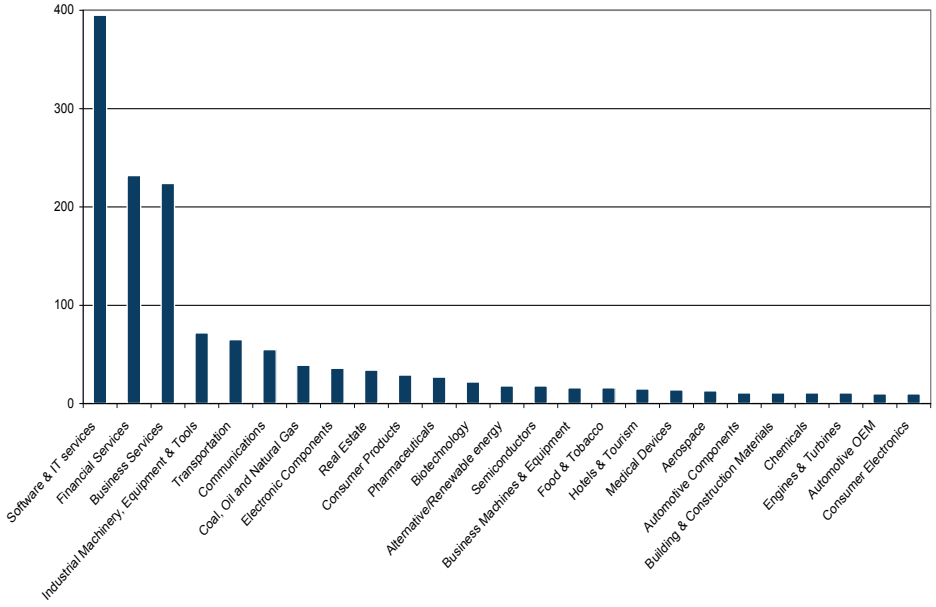


chart 8:
Number of FDI over the industry sectors
for the 15 selected cities
(period 2003 - 2012)

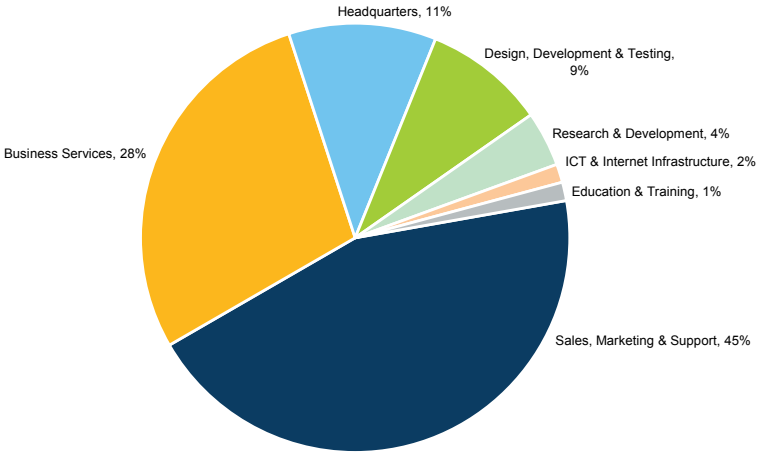


chart 9:
Share of firm activities in KI FDI
in the 15 selected cities
(period 2003 - 2012)

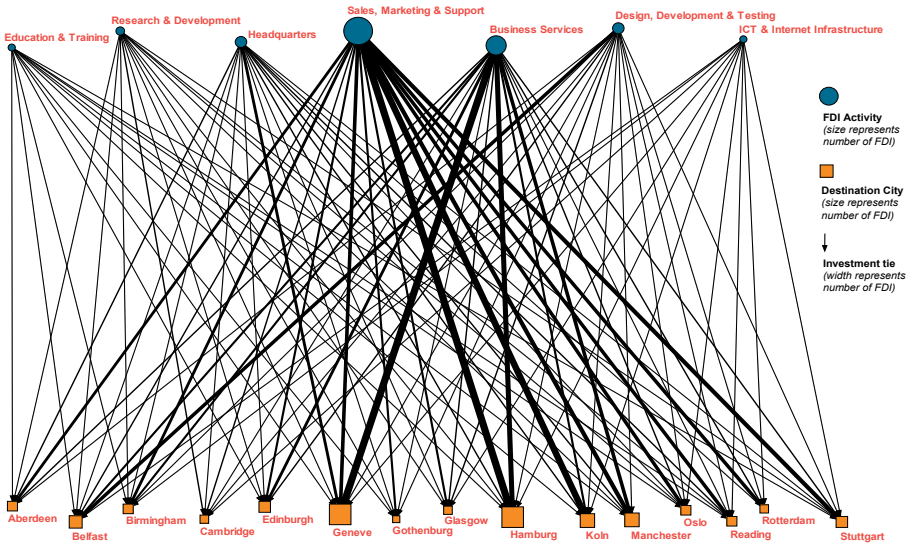


fig. 7:
Ucinet city-network graph by activity
in the 15 selected cities
(period 2003 - 2012)

shown in a network diagram. This gives insight in the economic profile of each of these cities: Geneve receives most FDI in Business Services, Hamburg in Sales Marketing & Support, and Belfast in Design Development & Testing.

The 15 cities receive their FDI from 511 cities around the world. Figure 8 shows the abstract geographical city-to-city network of the top source cities (more than 10 outward investments) and the 15 European cities. The top source cities are to be found in the USA, Europe and South-East Asia. New York, London, Paris and Dublin are the largest source cities. The investments from New York are more evenly directed to all 15 cities, while London is very strongly connected to Hamburg and Geneve and to a lesser extent to Köln. Also Paris is strong connected to Geneve and to Stuttgart. Economic specialisation of cities is visible in the network of Aberdeen, best connected with Houston and Stavanger: all cities with an economic dependency in the oil industry. The importance of spatial (and cultural) proximity is visible in the strong connection of Dublin (in Ireland) to Belfast (in Northern-Ireland, UK). Since the database of FDI only consists of foreign investment, no domestic connections between cities are visible in this figure.

Although the number of investments gives insight in the strength of a city, the number of connections / ties of a city shows if a city is more central or more peripheral in the global FDI-city network. In chart 10 the number of FDI and number of ties for the 15 cities are given. Hamburg and Geneva are the best connected cities and thus more central in the global network. Glasgow, Aberdeen and Gothenburg have the smallest number of ties and are least connected.

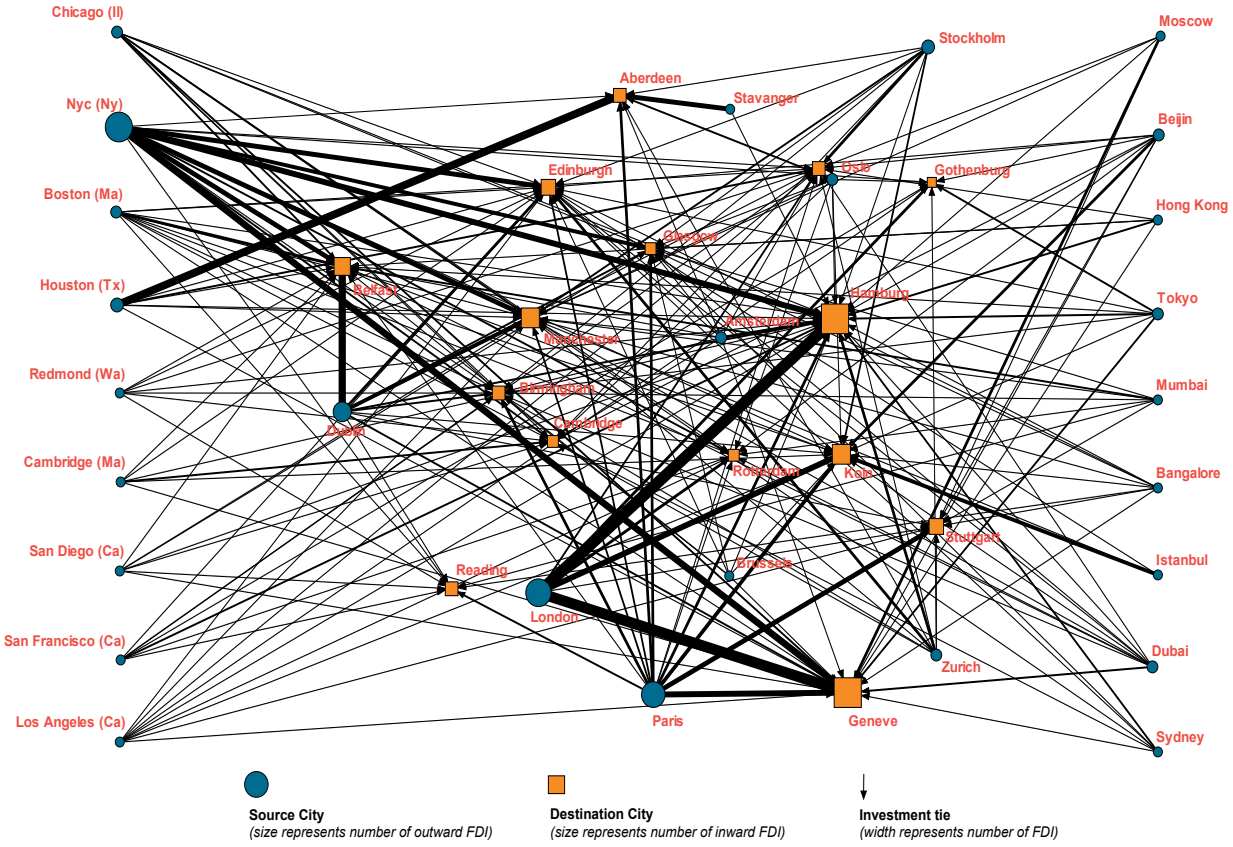


***fig. 8: Ucinet city-to-city network graph in KI FDI** for the 15 selected cities and top source cities (period 2003 - 2012)*

The average ratio between number of ties and number of investments is 1,5 (based on these 15 cities and their KI FDI). For Aberdeen and Belfast however this ratio is 2,0 : they receive many investments from the same source cities (as can be seen in fig 10), which might be related to their specific economic profile and that of their source cities. On the other hand, cities like Cambridge, Reading, Rotterdam and Stuttgart have a ratio of 1,2 and thus are better connected in relation to the number of FDI they receive.

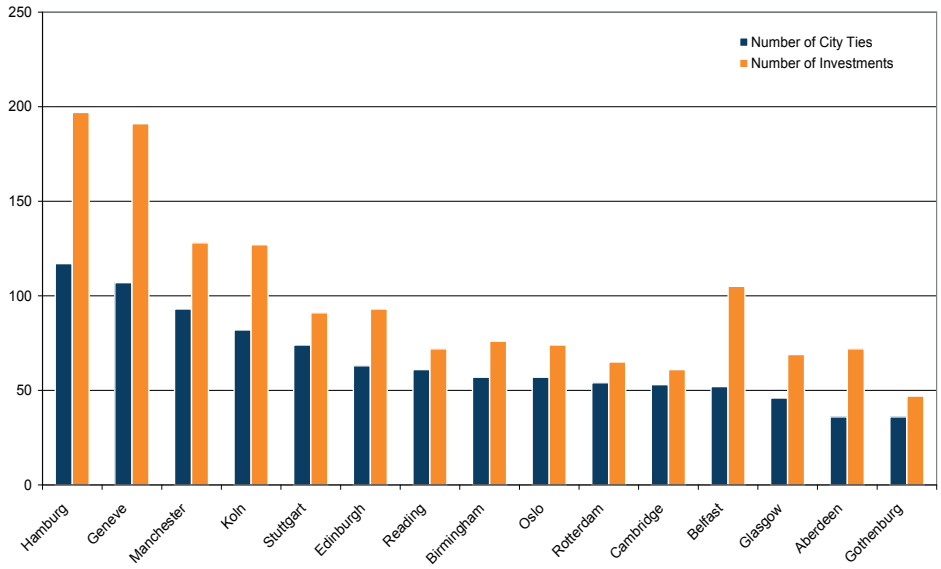


chart 10:
City Ties and FDI
Number of city ties and number of KI FDI in the 15 selected cities (period 2003 - 2012)

PART B. DESCRIPTIVE RESEARCH ON DISTRICT LEVEL

Locations and characteristics of KI FDI

By geo-mapping the KI FDI within the selected 15 cities, a specific spatial-economic investment pattern emerges for each city. These FDI spatial maps provide insight in the clustering and location attractors of KI FDI. Some of the FDI is located in a single location, but most FDI is concentrated in clusters within the city: these clusters can be small (2-5 investments), medium (6-10), large (11-20) or extra large (>20). For each city the clusters have been identified and indicated on the map; figure 9 provides an example of such a city data map, i.e. Aberdeen (all city data maps can be found in annex 4). In the maps different kinds of clusters can be identified, most common is the inner-city cluster in the heart of the city. Also airport clusters, research parks, and highway office parks can be identified amongst others.

For each location (single or cluster) the distance, urban and spatial characteristics have been identified. This provides an insight into the different location factors for the FDI in the knowledge intensive activities. Table 3 shows the average characteristics of all KI FDI combined and for each activity. For all FDI can be concluded that there's no specific proximity to the centre, the airport, the university, or the main road. The average number of firms on a location is almost 17, leading to an average concentration ratio of 0,26 for all cities and activities. Most KI FDI

fig. 9: City FDI-map of Aberdeen. *Geo-mapped locations of FDI and clusters (source: Google Earth; adaptation by author)*

is concentrated in Mixed-use (56,0%) and Office locations (22,0%), with a fair number of FDI also concentrated in Industrial Estates (10,9%; mostly influenced by location of SMS and HQ in these districts). The average urban characteristics of all KI FDI has an Urbanity Degree of 3 (medium urban), a building height of 5 floors, and half of them provide amenities (shops and restaurants) in the ground floors. Regarding the public space the average quality is 2,75 (below medium). Also the amount of water and green area is quite low for all FDI, which can be explained by the overall medium urbanity that provide less space for water and green. This urban factor also explains the high presence of built parking in all KI FDI (42,6%).

Looking at the different activities, some remarkable differences between them and the average characteristics of all FDI can be found. The characteristics of the locations of Sales Marketing & Support resemble the averages of all KI FDI, which can be explained by the fact that the SMS locations on the city maps show a very distributed pattern of both concentrations in clusters as well as single locations all around the city. For FDI in Business Services the characteristics indicate a more urban and concentrated character: the relative distance to the city centre is below average, and the number of firms (23,6) and concentration ratio (0,32) are above average. Also the functional and urban characteristics show this: 73% of Business Services are located in Mixed-Use areas, with an Urbanity degree of 3,41 and with a high presence of amenities (67,9%) and built parking (57,5%) characteristic to central urban areas.

The observed spatial patterns and characteristics for Headquarters show a more dispersed location: they have a low concentration ratio (0,19) and a higher relative distance to the city centre (1,22), also they more than average are to be found in Office locations (29,8%) and less in Mixed-use areas (42,1%), although the latter one is still the highest. This proximity and functional characteristics also influences the lower presence of amenities (50,2%) and higher presence of parking lots (45,5%).

For Design Development & Testing the observed average characteristics indicate a location outside the centre (rd = 1,31), closer to the university (rd = 1,25). Like Headquarters, the preferred functional area is Mixed-use followed by Office locations. Also a relative high percentage of DDT is located in Complex areas: locations dedicated to a specific firm or university with access for other firms / activities. Following the same line of reasoning for Headquarters, the lower urbanity degree of the DDT locations also show a lower percentage of amenities and a higher percentage of parking lots.

The characteristics of Research & Development locations indicate smaller locations outside the inner-city fringe: a higher distance to the city centre (rd = 1,28), and closer to the university (rd = 1,01) and to a main road (rd = 1,81). Also the number of firms is considerably lower (9,64) and a concentration ratio above average. This distance characteristic is also visible in the functional characteristic of the area: most in Office locations (42,6%), less in Mixed-use areas (21,3%), and relatively more in Complex districts (17,0%). This translates in characteristics of a

firm activity	All	SMS	BS	HQ	DDT	ICT	R&D	E&T
total FDI investments*	1042	402	321	122	117	18	47	15
proximity								
rd airport	1,01	1,04	0,98	0,97	1,03	0,75	1,07	1,01
rd uni	1,74	1,90	2,14	1,19	1,25	0,73	1,01	0,94
rd center	0,97	0,94	0,70	1,22	1,31	1,45	1,28	1,32
cd main road	2,32	2,33	2,50	2,33	2,12	1,78	1,81	2,27
number of firms	16,67	13,51	23,58	15,72	13,59	11,44	9,64	12,27
concentration ratio	0,26	0,21	0,32	0,19	0,24	-	0,29	-
functional								
commercial	5,9%	5,5%	6,7%	7,4%	3,4%	11,1%	4,3%	6,7%
green	0,5%	0,5%	0,3%	0,0%	0,9%	0,0%	0,0%	6,7%
industrial estate	10,9%	14,1%	5,4%	14,9%	11,1%	16,7%	10,6%	6,7%
mixed	56,0%	55,2%	73,0%	42,1%	44,4%	27,8%	21,3%	60,0%
office	22,0%	21,5%	13,0%	29,8%	29,9%	38,9%	42,6%	13,3%
technical estate	2,2%	2,1%	1,6%	3,3%	1,7%	5,6%	4,3%	0,0%
complex	2,6%	1,0%	0,0%	2,5%	8,5%	0,0%	17,0%	6,7%
characteristics								
Urbanity (1-4 highest)	3,03	2,97	3,41	2,79	2,79	2,78	2,34	2,67
number of floors	4,87	4,77	5,55	4,58	4,26	4,42	3,81	4,14
amenities (yes)	50,2%	47,9%	67,9%	40,5%	39,3%	27,8%	19,1%	26,7%
waterfront (yes)	8,9%	10,3%	7,9%	7,4%	10,3%	16,7%	4,3%	0,0%
quality								
public space (1-4 highest)	2,75	2,75	2,89	2,66	2,52	2,75	2,53	2,77
green area (1-4 highest)	2,30	2,34	2,23	2,36	2,11	2,22	2,70	2,47
water area (1-4 highest)	1,81	1,91	1,80	1,81	1,47	2,06	1,74	1,60
street parking	26,3%	30,5%	29,8%	17,4%	17,9%	22,2%	6,4%	46,7%
lots parking	31,1%	30,0%	12,7%	45,5%	52,1%	38,9%	72,3%	26,7%
built parking	42,6%	39,4%	57,5%	37,2%	29,9%	38,9%	21,3%	26,7%

** FDI investments in knowledge intensive firm activities (2003-2012) in the cities of Aberdeen, Belfast, Birmingham, Cambridge, Edinburgh, Geneve, Glasgow, Gothenburg, Hamburg, Koln, Manchester, Oslo, Reading, Rotterdam, and Stuttgart with a tracked address or postcode.*

legenda: highlights highest averages | stronger than average | weaker than average | excluded in analysis (low FDI)

table 3: Average location characterictics of KI FDI. *Characteristics of various indicators for the FDI in knowledge intensive activities.*

lower urban degree (2,34), lower number of floors (3,81), a low presence of amenities (19,1%), and a high presence of parking lots (72,3%). Moreover, R&D locations have a higher presence of green areas (2,70) compared to the average (2,30).

Since the total number for ICT and E&T is too small, no conclusions have been drawn for these activities.

Spatial and economic characteristics of cities

The previous paragraph showed the difference of characteristics for the various KI firm activities. The characteristics also can be used to investigate the differences between the cities in this research. In annex 4 the data is provided for each city, while table 4 shows the variance between the values of the different indicators for the cities. In the table the highest, average and lowest value is given and compared with the value of Rotterdam. Based on these values one can make a difference between different kind of cities: compact cities, green cities, industrial cities, and mixed cities.

Compact cities have a high degree of urbanity, a high concentration ratio, a high percentage of FDI in Mixed-use areas, and the share of districts providing amenities is high. Because of their compactness they have a low share of green and water, but the quality of the public space is above average. Also the share of built parking is considerably high. Examples of compact cities are Geneve and Oslo.

For green cities the quality characteristics are provided by the presence of green areas and green business districts. These cities have a lower degree of urbanity, and a high percentage of FDI in green and office areas, and (of course) a higher share of green and water areas. They provide less districts with amenities, and are more concentrated near the main roads and less near the city centre. Green cities are also smaller than average, for example Reading and Cambridge.

Industrial cities have a considerable amount of industrial estates, a low urban degree, and lower scores on amenities, quality of public space, and green and water area. An example of such a city is Aberdeen.

The other cities have not been characterised (within the scope of this research) to a specific type, but they consist of elements of the three types above. These mixed cities provide areas with characteristics of a compact city (in the inner-city), they have green office areas near the main roads, and have business areas that are industrial districts with a lower quality. Within the comparison of these cities on spatial characteristics Stuttgart seems to be a special case, combining elements of the compact city with those of an industrial city, and can be characterised as a technical city.

	Highest	*City*	Average	Lowest	*City*	Rotterdam
total FDI investments*	197	*Hamburg*	98	47	*Gothenburg*	65
proximity						
rd airport	1,62	*Rotterdam*	1,01	0,86	*Aberdeen*	1,62
rd uni	3,80	*Stuttgart*	1,74	0,76	*Cambridge*	1,43
rd center	1,06	*Aberdeen*	0,97	0,83	*Oslo*	1,01
cd main road	2,84	*Hamburg*	2,32	1,68	*Glasgow*	1,98
number of firms	39,41	*Geneve*	16,67	5,76	*Reading*	6,04
concentration ratio	0,35	*Geneve*	0,26	0,18	*Rotterdam*	0,18
functional						
commercial	23,1%	*Gothenburg*	5,9%	0,0%	*various*	0,0%
green	4,8%	*Reading*	0,5%	0,0%	*various*	0,0%
industrial estate	44,3%	*Aberdeen*	10,9%	2,9%	*Oslo*	30,6%
mixed	81,1%	*Oslo*	56,0%	17,0%	*Cambridge*	38,8%
office	68,1%	*Cambridge*	22,0%	7,1%	*Koln*	26,5%
technical estate	38,2%	*Stuttgart*	2,2%	0,0%	*various*	0,0%
complex	10,3%	*Gothenburg*	2,6%	0,0%	*various*	0,0%
characteristics						
Urbanity (1-4 highest)	3,54	*Oslo*	3,03	2,19	*Reading*	2,77
number of floors	6,20	*Geneve*	4,87	2,51	*Aberdeen*	4,74
amenities (yes)	75,0%	*Koln*	50,2%	0,0%	*Aberdeen*	37,5%
waterfront (yes)	28,2%	*Belfast*	8,9%	0,0%	*various*	10,2%
quality						
public space (1-4 highest)	3,38	*Reading*	2,75	1,85	*Aberdeen*	2,73
green area (1-4 highest)	3,31	*Reading*	2,30	1,36	*Belfast*	2,50
water area (1-4 highest)	2,90	*Reading*	1,81	1,00	*Stuttgart*	2,35
street parking	64,3%	*Koln*	26,3%	2,4%	*Belfast*	34,0%
lots parking	78,6%	*Reading*	31,1%	11,5%	*Oslo*	21,3%
built parking	73,8%	*Geneve*	42,6%	4,9%	*Aberdeen*	44,7%

** FDI investments in knowledge intensive firm activities (2003-2012), including FDI without tracked address or postcode*

table 4: Average location characterictics of cities. *Characteristics of indicators for the 15 cities, including average, highest and lowest score, and score of Rotterdam.*

In chart 11 the relation between number of FDI and number of locations / clusters is provided for the 15 cities, resulting in different city groups with concentration ratios*. This ratio is a measure for the economic compactness (not to be confused with spatial compactness) of a city. A high ratio means a concentration of FDI in a few clusters, while a low ratio means a diffuse pattern of smaller clusters and single locations across the city. The chart shows that Geneve and Belfast have a very high economic compactness, while Hamburg, Rotterdam and Cambridge have a low economic compactness with smaller districts and/or many single investment locations. The graph also shows that this is only a city characteristic and does not necessarily influence the number of FDI.

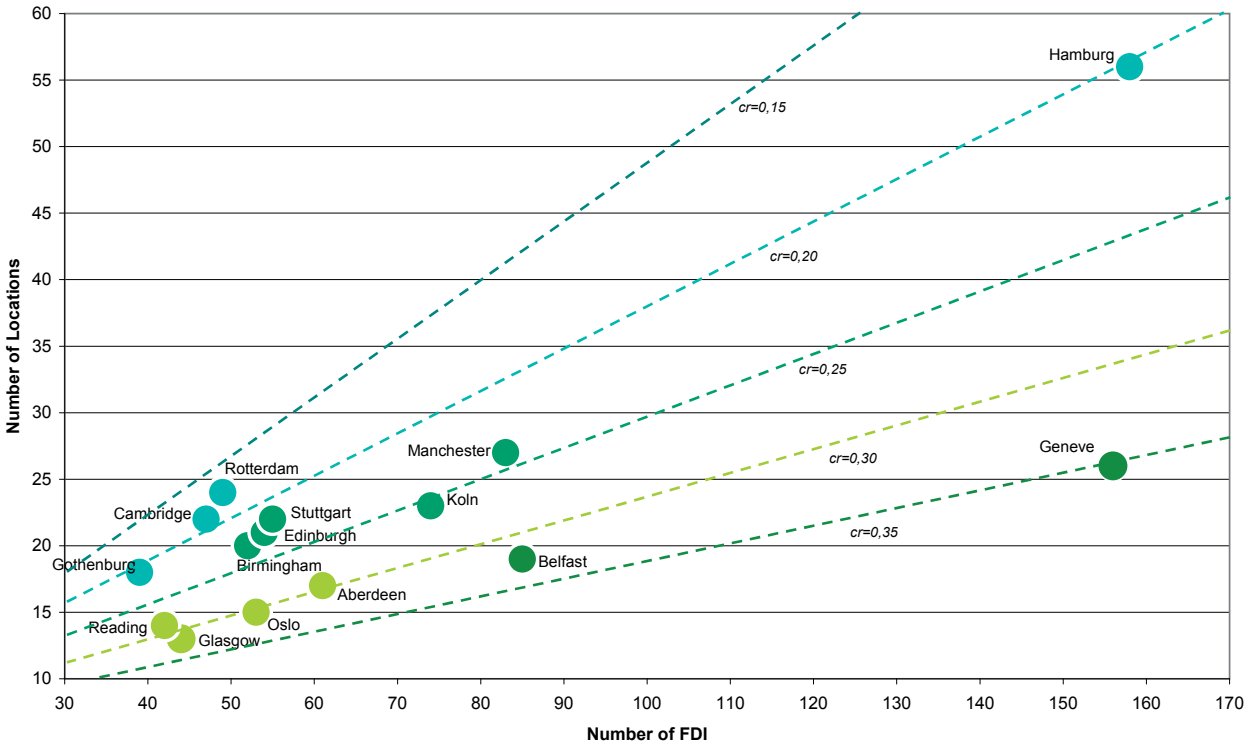


chart 11: Concentration ratio of Cities. *Number of FDI and Number of locations for all 15 cities.*

* In economic geography different measures for spatial concentration have been developed, such as the CR-concentration index for markets, the Herfindahl index, the Ellison-Glaeser geographic concentration index, and the Gini index. These indices however user market shares or income as a measure for concentration of economic power (dominance) of firms, they don't measure spatial concentration. To analyse spatial concentration of locations in cities Point Pattern Analysis (PPA) gives a better understanding of the distribution of points (FDI-locations) in an area: either concentrated, random distributed or equal dispersed. PPA offers several analyse tools, with two primary approaches: 1. Point Density approach using Quadrat Analysis (based on observing the frequency distribution or density of points within an area), and 2. Point Interaction approach using Nearest Neighbor Analysis (based on distances of points one from another). In this study a different measure has been developed, related to the Point Density approach from PPA. This concentration ratio measure the number of FDI over the number of location in which this FDI is located: **cr = 1 - { (ln N locations) / (ln N FDI) }**. When the number of locations equals the number of FDI, meaning every location receives 1 FDI and all FDI is dispersed, the concentration ratio is 0. In the case of total concentration of all FDI in 1 location, the ratio is 1. When there is only 1 FDI investment the ratio does not apply (1 point can not be concentrated).

PART C. EXPLANATORY RESEARCH ON FIRM ACTIVITY FDI AND DISTRICT CHARACTERISTICS

The third part of the research is focussed on finding which characteristics are determinants of the location of KI FDI in a city. This part consists of two analyses, the first is a Multiple Regression Analysis in SPSS on the location / cluster characteristics as a determinant for the location of specific KI FDI. This analysis has been done on the four themes of spatial characteristics: distance / accessibility, functional characteristics, urban characteristics, and spatial quality. The second analysis is a Multiple Regression Analysis in SPSS for FDI determinants on the city level, with general indicators and specific types of business districts as an indicator.

Spatial characteristics as determinants for KI FDI

The significant results for the Multiple Regression Analysis for All KI FDI are shown in table 5. In the analysis the indicator of proximity to the central station was excluded due to multicollinearity. For all FDI combined, a negative relation was found to the relative distance to the city centre and the airport: an increase in (relative) distance to the centre or the airport leads to less investments. However, a positive relation was found to the relative distance to the university: an increase in relative distance leads to more investments. This explains that in general, FDI is located relatively close to the city or to the airport. In relation to functional districts a negative relation was found to Industrial estates: FDI is less likely to be located in industrial areas than other types of business districts. On urban characteristics, a positive relation was found to the degree of Urbanity and the presence of amenities, meaning that medium and high urban areas with amenities on the ground floors attract more FDI than other districts. On the quality aspect of the district, a positive relation was found to built parking and the quality of public space: more investments take place in areas with these qualities. All results, including non-significant indicators, are shown in annex 5, table I.

Characteristic	**B-value (Unstand. Coefficient)**	**p-value**
Proximity / accessibility (model fit: Adj R sq = ,085)		
rdist_Cntr_ln	-,175	,001
rdist_Airport_ln	-,209	,012
rdist_UNI_ln	,141	,031
Functional characteristic (model fit: Adj R sq = ,037)		
funct_Industr	-,410	,001
Urban characteristic (model fit: Adj R sq = ,146)		
Urbanity	,319	,000
Amenities	,429	,002
Spatial Quality (model fit: Adj R sq = ,048)		
B-Parking	,340	,008
PublicSpace	,134	,040

Dependent Variable: FDI_ln

table 5: Results Multiple Regression Analysis on all KI FDI and Spatial characteristics.

For the activity of Sales Marketing & Support, the results of the analysis are reported in annex 5 table II. For FDI in this activity, a negative relation was found to the relative distance to the city centre and the distance to the main road: an increase in distance leads to less investments, meaning that most FDI in SMS tend to locate near the centre and highways / main roads. Conversely, again a positive relation to the relative distance to the university was found: most SMS FDI is located further away from the university, which is likely since there seems to be little relation between the activity of SMS and that of a university. Most SMS FDI seems to locate in different functional districts, only a negative relation was found to Complex districts (Firm or University areas). As for all FDI, on urban characteristics also a positive relation was found to the degree of Urbanity for SMS, and (surprisingly) SMS locations have a higher chance for the presence of water areal as a spatial quality.

Business Services FDI locate closer to the city centre and the airport, as can be concluded from the negative relation on relative distance to the centre and airport. Again a positive relation was found on the relative distance to the university (increase in relative distance leads to more investments). In functional characteristic, Business Services have a positive relation with Mixed Use districts and a negative relation with Complex districts and Industrial Estates. On urban characteristics a positive relation was found to the degree of urbanity and presence of amenities, indicating a more urban location for FDI in Business Services. Corresponding with this finding, on spatial quality a positive relation was found to built parking, and a negative relation to parking lots. Table III in annex 5 shows the significant results of the multiple regression analysis for FDI in Business Services.

For FDI in the activity of Headquarters, a negative relation was found to the relative distance to the airport, indicating a closer location to airports in general of HQ FDI. On the aspects of functional characteristics and spatial quality, no significant relation were found. On urban characteristics however, the regression analysis showed a positive correlation with presence of amenities. For FDI in Design Development & Testing, only a positive relation was found to the presence of parking lots. On the other aspects no significant results were reported. Results are shown in annex 5.

FDI in Research & Development locates in general closer to highways / main roads, as a negative relation was found to the distance to the main road. Further a positive relation was found in the analysis to functional characteristics of complex districts and technical districts, areas that are related to firm or universities or technical activities. On spatial characteristics only a positive relation was found to parking lots. All significant results can be found in table VI in annex 5.

Classification of business districts

Based on the observed and valued characteristics of the business clusters in the cities studied, combined with the information and theories from the background literature, a classification of business districts is found as shown in table 6. This classification is used in the final regression analysis on the city level, to research if the presence of a specific business district can be an indicator for specific investments in FDI. For each city the presence of each kind of business district is indicated on a scale of small, medium, large, or extra large (indicating one large, or multiple smaller districts of the same kind).

1. Inner City District 	*Characteristic:* High Urbanity Degree Distance to Center < 2 km Mixed-use area Presence of Amenities Street and Built Parking *Main KI Firm Activities:* Business Services Sales Marketing & Support
2. Prestige Quarter 	*Characteristic:* Medium Urbanity Degree Distance to Center < 3 km Mixed-use area Street Parking *Main KI Firm Activities:* Business Services Sales Marketing & Support
3. Epi Centres 	*Characteristic:* Medium to High Urbanity Degree Mixed-use / Commercial area (Waterfront development) High quality of Public Space Built Parking *Main KI Firm Activities:* Business Services Sales Marketing & Support Headquarters

table 6: Classification of Business Districts

4. Science / Techno Complex

Characteristic:
Low - Medium Urbanity Degree
University or Firm Complex
Street or Lots Parking

Main KI Firm Activities:
Design Development Testing
(Research & Development)

5. (Highway) Office Parks

Characteristic:
Low Urbanity Degree (Suburban)
Office Location
Distance to Main Road < 2 km
Lots Parking
High Amount of Green Areal

Main KI Firm Activities:
Headquarters
Sales Marketing & Support

6. Research Park

Characteristic:
Low Urbanity Degree (Suburban)
Office Location
Relative Distance to University < 1,5
Lots Parking
High Amount of Green Areal

Main KI Firm Activities:
Research & Development
(Design Development & Testing)
Headquarters

7. Airport District

Characteristic:
Office Location
Relative Distance to Airport < 0,5
Lots and Built Parking

Main KI Firm Activities:
Business Services
Sales Marketing & Support
Headquarters

table 6: Classification of Business Districts (continued)

City characteristics as determinant for KI FDI

In the analysis on city characteristics several indicators had to be excluded, due to reason sof multicollinearity (VIF>10); these indicators were: GDP per Capita, Road Accessibility, Temperature in January. Also Corporate tax rate and Level of R&D expenses were excluded, because these are indicators on a national level and showed too few difference among the sample of cities.

Analysing the data on city level by multiple linear regression analysis in SPPS showed that in city characteristics, Air Access is the major determinant for location of KI FDI. For all KI FDI, as well as for FDI in Business Services and Headquarters a positive correlation was found for air access (measured in number of passenger / year of the nearest airport(s)) as is shown in tables 7 - 9. Since these investments are all subsidiaries of Multinational Enterprises with branches outside the country and probably over the world, it's logic that they want to connect - not only by means of modern telecommunications but also with eye-to-eye meetings. A location in a city or region with good air accessibility is thus a benefit of even a condition for most investments. This relation between air access and KI FDI is shown in a SPSS-scatterplot (chart 12).

Characteristic	B-value (Unstand. Coefficient)	p-value
City indicators (model fit: Adj R sq = ,326)		
AccesAir_ln	,337	,039
District availability (model fit: Adj R sq = ,662)		
PrestigeQuarter	,224	,001
CityCenter	,136	,016

Dependent Variable: FDI_ln

table 7: Significant results of Multiple Regression Analysis of all KI FDI and City characteristics

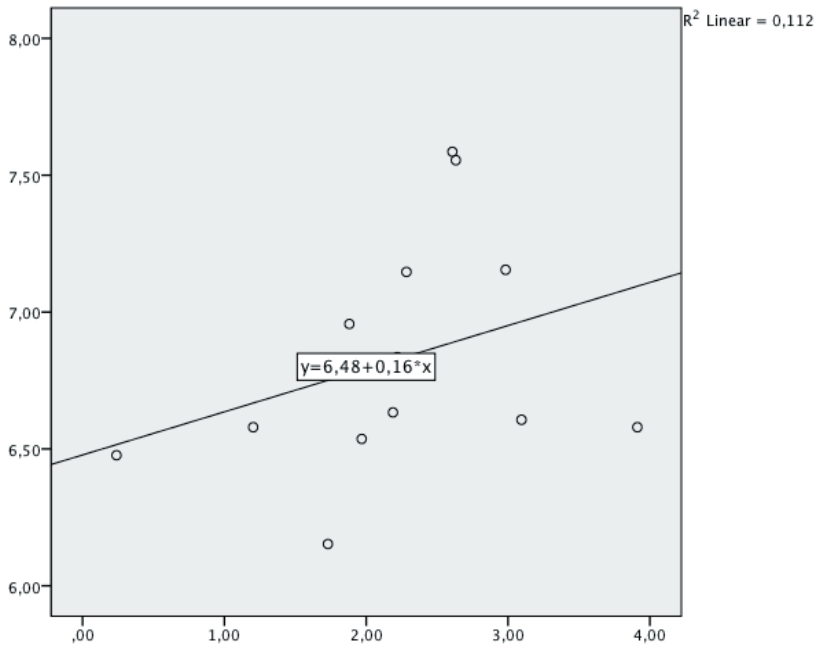


chart 12:
Scatterplot of Air Accessibility and FDI
x-axis: ln number of passengers
y-axis: ln number of FDI

For the other activities (SMS, DDT, R&D) no significant relations were found, neither to accessibility nor to education level / university performance, unemployment level or spatial characteristics of the city (such as green areal, or district differentiation). Either the number of data was too small to give enough evidence on the relation, or location of these activities is not related to one of the researched indicators, or the differences between the cities on these indicators were not large enough to show any relation.

Looking at the availability of the various types of business districts within a city-region, the regression analysis showed that for all FDI the Prestige Quarter and City Centre are determinant factors (table 7), meaning that these locations have the highest concentration of FDI. This aspect however is not found in the analysis on the separate activities: for Business Services was a positive relation was found between the number of FDI and the location of City Centre and Airport District, and a negative relation with Highway Office Parks. Business Services tend to locate in the heart of the city or in the business districts of Airports, and less within office parks near the main road. For Headquarters a positive relation was found between the number of FDI and the location of Prestige Quarters, the locations near the city centre with a quality appearance.

Characteristic	**B-value (Unstand. Coefficient)**	**p-value**
City indicators (model fit: Adj R sq = ,309)		
AccesAir_ln	,474	,044
District availability (model fit: Adj R sq = ,795)		
HighwayOfficePark	-,437	,001
CityCenter	,317	,002
AirportDistrict	,259	,019

Dependent Variable: Act2_BS_ln

table 8: Significant results of Multiple Regression Analysis of FDI in Business Services and City characteristics

Characteristic	**B-value (Unstand. Coefficient)**	**p-value**
City indicators (model fit: Adj R sq = ,653)		
AccesAir_ln	,917	,002
District availability (model fit: Adj R sq = ,265)		
PrestigeQuarter	,466	.029

Dependent Variable: Act3_HQ_ln

table 9: Significant results of Multiple Regression Analysis of FDI in Headquarters and City characteristics

5. CONCLUSIONS AND RECOMMENDATIONS

Cities, Globalization and economic development

Within the global economy, cities compete over the attraction of people, firms and investments. By the worldwide relationships of these actors, cities are part of global urban networks while at a local scale the importance of clusters is stressed because of the high concentration of tacit knowledge and the spillovers that are connected to these clusters, especially for knowledge intensive firm activities (Castells, 1996; Sassen, 1991; Taylor, 2001; Porter, 2000). City competition in the new global economic paradigm is thus focussed on attraction of knowledge intensive firms and high educated people, to develop into sustainable and global and eventually richer cities. Studies (a.o. Kitson et al., 2004; Florida, 2002; Glaeser, 2001; Rosenthal and Strange, 2004) have showed that certain characteristics of a city or region will favour the attraction of people and firms, such as international accessibility, climate and amenities, education, institutions, political climate.

These studies however have not yet explained where firms will locate spatially, and if spatial characteristics of a location are of influence in the attraction of firms and investments. Studies on business districts and interaction environments suggest that some places within the city offer more benefit (soft and hard) for certain kind of activities (Hall, 2002; De Hoog, 2012; Gospodini, 2006). The research of this thesis was directed on the relation between attraction and location of knowledge intensive investments and the spatial characteristics of business districts in a city. Within the study, special attention was focussed on the city of Rotterdam to develop recommendations for future (spatial) developments to attract more FDI in knowledge intensive activities of firms.

Growing importance of KI FDI

The trend analysis of the KI activities over the years 2003-2011 shows an increasing share of these activities in all FDI for the six countries (from 50% to almost 70%). Although the number of investments does not equal the investment value, it is widely considered as a proxy for these values. The rising number of FDI in knowledge intensive activities, indicates the growing importance of attracting these kind of activities for cities and investing in the attraction of these activities. Most KI FDI is conducted in the activities of Sales Marketing & Support and Business Services, however these activities seem more volatile since not all of these investments locations in the period 2003-2011 could be refound in the actual databases. Investments in Headquarters, DDT and R&D might require a higher investment sum for capital investments, as they last longer over time.

Study on inward FDI for all cities in the six countries showed that London is the most outstanding performer as destination for more than 24% of all KI FDI within these countries. The finding of London as a global star, corresponds with other studies indicating London as one of the Global Cities (Sassen, 1991; Friedman, 1986; GaWC,

2012; Wall and Vd Knaap, 2011). Behind London a group of seven cities is found, that are considered as regional stars - corresponding with the study of GaWC (2012) that indicates most of these cities as alfa- or alfa-minus-cities. A larger group of cities with a wider range in the number of investments, together form the sub-top for attracting KI FDI. Also Rotterdam belongs to this group, however in the rearguard of the group. Looking at other Dutch cities, Amsterdam is a regional star, while only Rotterdam belongs to the sub-top; all other major cities (Den Haag, Utrecht, Eindhoven) are part of the next group of medium FDI attractors.

City differences in KI activities

Comparing the top 39 cities on the share of KIA in all FDI, considerable differences are found. Although Europe is part of the developed world, the differences show that some cities are more developed on knowledge intensive activities than other cities - a fact showing that the landscape for cities is indeed 'curved' (McCann, 2008) or 'spiky' (Florida, 2005). A high share of KI activities indicates a city economy that's already based on knowledge intensive activities, and less on capital intensive ones. Especially cities (and countries) specialised in finance (such as London, Amsterdam, Zürich, Frankfurt) or in science and high-tech development (Cambridge, Munich, Stuttgart) show a high percentage of KI FDI, although also oil-based cities like Stavanger and Aberdeen have a large share of KI FDI.

Looking at the growth of KI FDI for cities we see different patterns of rise and decline that indicate the development of the competitiveness of these cities over the long term. The cities of Frankfurt, Köln and especially Düsseldorf show a high growth over the years 2003-2011 and will rise in the future rankings of city competition for FDI. Oxford and Nurnberg however show a decline and also Stockholm (part of the sub-top in number of KI FDI) has only a very small growth percentage. Also Rotterdam does not perform too well on growth percentage (6,9%) compared to the average (10,4%) and the other Dutch cities (Den Haag 14,4%; Utrecht 12,2%, Amsterdam 12,0%) and only outperforming Eindhoven (5,4%) within the Netherlands.

The combined numbers for growth and percentage of KI FDI show that some cities are stable in their economic performance, while other cities are changing: a high growth combined with a low / medium share of KI FDI indicates transformation of the city economy into a knowledge based economy (like Glasgow, Oslo, Edinburg and Berlin). Other cities are inbetween development stages with a medium share of KI FDI (60%) and a growth of around 10% (like Manchester, Birmingham, Belfast, and Hamburg). And some cities will not keep up with the competition based on low growth and share of KI FDI (Malmö and Bristol). Also Rotterdam's future in economic transition seems not too bright yet, based on these numbers for growth and share of KI FDI - a situation that's also partly acknowledged by the Municipality of Rotterdam (2013).

Rotterdam and attraction of KI activities

Moreover the FDI analysis shows that the main KI activities of Rotterdam are in Sales Marketing & Support and in Business Services. On the one hand this is an advantage since most KI FDI investments are in these activities; on the other hand are these the activities in which Rotterdam can expect the most competition from other cities (including the global and regional stars in NW-Europe) such as London, Amsterdam, and Düsseldorf. Rotterdam could focus on specializing in a sector-niche within these activities related to the economic profile of the city (maritime logistics, chemicals, and life science) like Aberdeen specializes in the oil-sector. Furthermore Rotterdam could try to diversify into other activities that offer less competition from other cities; especially DDT seems a promising activity with a fair number of investments and growth percentage. The challenge for Rotterdam is to attract more investments in this activity, as the cities of Belfast, Edinburgh and Glasgow show that specialisation in the activity of DDT is possible by creating a specialised local cluster. Study by Duranton and Puga (2005) showed that there is a transformation of urban structure from a sectoral to a functional specialisation. Instead of sector cities (with different firm activities in one sector) they found a transformation to functional specialisation with headquarters and business services clustered in larger cities, and production clustered in smaller cities. Technological changes in transport and communication technologies, have made it less costly for firms to separate their activities. ‘’When the transmission cost for headquarter services is low, firms wish to locate their headquarter in cities where business service employment is abundant and their production plant in cities with a greater same-sector specialisation in final production. (...) As a result, some cities specialise in headquarters and business services and others in final and intermediate production.” (Duranton and Puga, 2005 p. 362). This results apply for the findings of the city of Geneve (specialised in HQ en BS), and although their research was not focussed on other firm activities, this thesis shows empirical evidence on city specialisation in other KI activities (e.g. Cambridge in R&D, Belfast in DDT). This change from sector to activity as the base of a city economic, requires an activitive policy on stimulating the development of requierd activities in th city of Rotterdam. Developing a related variety both in sectors as in activities, offers a broader economic base for future development for smaller cities and regions as studies have showed (Neffke et al., 2011).

When addressing the development of new KI activities, the city of Rotterdam should include in it’s analysis the existing city-to-city-network of KI FDI. The actual networks shows that Rotterdam is quite well connected in the overall network, both to cities in Europe, the Americas and Asia. By analysing the existing relationships and cooperations with these cities, it’s possible to learn about other possible connections with these cities and thus strengthen the position of Rotterdam in the global city network and attraction of FDI.

Spatial characteristics of KI FDI

Geo-mapping the KI FDI of the 15 cities results in different spatial pattern investments in all cities, related to local spatial and political characteristics and historic development paths of the cities. The presence and situation of a river / port, highways and airport near the city have determined the spatial development of a city over time just as

the presence of the sea or lake or hills do. Also the location of universities and scientific institutes have over time been subject to different policies and political decisions. However the location of FDI is determined by investment decisions of MNE's in the last 10 years: analysis of the spatial characteristics of KI FDI in the selected 15 cities gives information on the specific aspects of their locations. One major conclusion is that economic concentration does exist and that most of the FDI is located in specific districts within the cities. Since this research didn't study the relations between firms within these districts, it's not clear if we can speak of clusters (as defined by Porter (2000)) or if it's just a concentration of activities.

The results of the multiple regression analysis show that for each activity specific characteristics are desired related to proximity of transport and universities, functional characteristic of the districts, and the urban and spatial characteristics. Although some of the characteristics are interdependent, they offer a more specific profile of the location determinants for each activity. The most important (most common) indicators on proximity are relative distance to the city centre, to the airport, and to the main road. In this research the proximity to public transport (e.g. railway stations) was not studied, because presence of the main railway station coincides in most cities with the city centre (and thus gives collinearity in the multiple regression analysis) and investigating the locations of all stations did not fall within the scope of this research (restricted by time).

Also the functional aspect of a district (either Mixed-use, Office location, Complex or Techno District, etc.) are indicators for the type of FDI the district will attract. On the urban characteristics the two most important characteristics are the degree of urbanity and the presence of amenities. Regarding spatial quality there was a positive relation found for the number of all FDI and the Quality of Public Space, however this relation was not found for one of the various activities. The kind of parking seems a better determinant for the specific activities - although this characteristic is related to urbanity and functional characteristic.

Both the activities of Business Services and Headquarters are focussed on the international relation and control-aspects (management, coordination) of the MNE and thus have a preference for locating close to international access, explaining their low relative distance to the airport. This finding corresponds with the finding of Bel and Fageda (2008) that headquarters locate close to airports with non-stop flights. Furthermore it corresponds with the finding of the research by Strauss-Kahn and Vives (2009) on the location factors of headquarters, namely that these tend to locate in metropolitan areas with good airport facilities and a high level of business services, besides low taxes and low average wages. Contrarily, the activity of Sales Marketing & Support is more related to the domestic market and thus more focussed on domestic access, explaining the lower relative distance to the main road an the city centre (which is in most cases also the centre of public transport). R&D however is more focussed on knowledge production in clusters and on exchange of tacit knowledge by local buzz (Bathelt et al., 2004), and explains the relation that was found between FDI in R&D to Complex and Technical districts.

Specialisation and characteristics of Business Districts

Based on the empirical observed characteristics of the districts and combined with the typologies presented in the literature (Hall, 2002; Gospodini, 2006; Garreau 1991; Lang and Knox, 2009), a classification of business districts was found. This business districts are characterised by their spatial, functional and proximity aspects as well by the main firm activities to be found in them.

The Inner-city district (other names: CBD, Traditional downtown) is located in the city-centre and is characterised by a high urbanity, concentration ratio and presence of amenities. These specific characteristics provide a business environment with high possibilities for contact and interaction. It shows that the inner-city is still a great attractor for investments, offering presence of amenities and presence of other firms. This is in line with the theories of Storper and Venables (2004) on face-to-face contacts and buzz: firms concentrate where there is a high opportunity and possibilities of meeting. Need for direct contacts and face-to-face interactions is high in activities that require high levels of trust among the partners, especially for Business Services as the Multiple Regression Analysis found a positive correlation. De Hoog (2012) also named the inner-city of big cities an international metropolitan interaction environment for culture, congress and knowledge - although his study was not directed at business location.

The second district of Prestige Quarter (name and type derived from the taxonomy by Peter Hall (2002)) are the quarters around the city centre, also with mixed-use functions but offering a high stature and appearance of architecture and public space. The need for the grandeur of these districts was especially found for Headquarter locations, although the empirical research showed that headquarter activities are also to be found in other (less prestige) quarters. The Epi-centre districts (derived from Gospodini (2006)), offer also prestigious surroundings and amenities but are new developments and not yet settled in the spatial and economic mind of the city. Activities to be found in these districts are different in each city, but are connected to either Inner-city or Prestige Quarter district to take advantage of their economic opportunities for contact and networks.

Universities or firm complexes offering location for (outside) business and economic development on their grounds, are named as Science and Techno Complexes. Most of these districts are located in the fringe of the city and have their own spatial development history. Most to be found in these districts are the activities of Design Development & Testing. The activity of Research & Development however is more to be found in separate Research Parks, although this finding was not supported by the Multiple Regression Analysis. The Research Park is an office location with a high concentration of research firms, and although not directly spatial connected to the university, it has a low relative distance to the university.

The Office park is most to be found near the main roads, offering quick access for cars, and mostly offering high levels of green and water areal. Main firm activities here to be found are those of Headquarters and Sales Marketing

& Support. This district is related to the business locations along highways defined as Edge Cities by Garreau (1991) and Hall (2002).

The last type is the Airport district of even Airport city (Appold and Kasarda, 2013), that is focussed on firms and activities with a relationship with the airport, being it either quick air access, the international business environment, or as supplier of air transport services. For Business Services there was a positive relation found in the multiple regression analysis for this district, besides the Inner-city district.

Design and planning of Business Districts

The study in this thesis provides information for the planning, development and (re-) design of existing and new business districts in cities. The classification-overview (table 6) shows the main characteristics of the different kinds of districts and to which KI firm activity they are most related. In the field of Urban Design and Planning nowadays a lot of attention is paid to the design of urban districts for the creative class and cultural districts, encouraged by the Richard Florida's book The Rise of the Creative Class. However much of these planning and design studies are not focussed on the broad Creative Class but mainly on cultural districts. This studies learn that planning and design should include the provision of urban amenities, a high spatial quality and flexibility of space - most of these areas are either gentrification or transformation areas in a city with historical elements and close to the city centre (e.g. Smits, 2012). However this kind of planning, focusses on the interests of a small group of people (relating to clusters on a small scale) rather than on firms, not linking it to a broader economic framework of accessibility to the international network of firms which is most important in the attraction of international firms as this study shows.

Many cultural business districts also can bee as tourism business districts: districts offering an environment with amenities, culture and business for tourists and firms (and residents). According to Getz (1993) these districts are developed around a combined interest in services for both tourism and business. Mostly they can be found in the historic inner cities but also new developed waterfront areas or commercial areas provide these combination of attractions (culture, entertainment), businesses, and services (transport, catering, information). This combination of two distinct activities with a shared interest in (consumer) services and amenities, strengthens the district and the quantity of amenities. This feature of an international district was also recognized by De Hoog (2012), expressing the importance of interaction and cultural amenities for the attractiveness of a district and the city as a whole.

In regard to the design and development of new business districts, there is a trend in creating green business parks, for both sustainability and inspiration / recreational purposes of employees. These green office parks are regarded as a new type of work environment that share the principle of "Enjoy Work". The public space consist of a combination of green space, public space for interaction, sports and recreation (before and during work) and amenities (van Dinteren, 2007), examples of these type of districts are: Chiswick Park in London, GreenPark in Reading, and

the High Tech Campus Eindhoven. However the results of this study show there's no relation found between firm location and the presence of green space. Further research could access this aspect to study if specific green or recreational characteristics are indeed of influence, or if this is merely a trend in design and marketing of business locations.

The aspect of green areas and need interaction is also observable in the attention paid to the development of campus districts. Both De Hoog (2012) and Hoeger and Christiaanse (2007) wrote on the relation between the campus and the city: the campus being a place for interaction and exchange of ideas and knowledge, thus profiting the city and the economy. Also many cities have focussed their policies on the development of campuses around universities, businesses, and other institutes. However, the campus (or complex district in this study) has not yet showed to be a major type of business district, although it showed a positive correlation to FDI in R&D. This is though only one activity of the knowledge intensive economy and, as this study show, other activities (such as SMS, DDT and BS) have a larger growth rate of FDI. The number of complex districts (campuses) in this study was however not very large, so a more extended study focussed on cities with these type of districts might show more significant results.

A last trend in Urban Planning is in development of Airport Cities, the new economic centre point of the economy. Or as coined by Maurits Schaafsma, chief planner at Schiphol Airport: ''The airport leaves the city. The city follows the airport. The airport becomes a city'' (in Appold and Kasarda, 2013). The main concept of the Airport City is that the airport is not a terminal for air transport, but it is a place for interaction of people (travellers, business people, tourists, commuters, shoppers). The available amenities at an airport together with their high accessibility modus, attract people for various reasons - creating a new kind of city environment, controlled by the airport. Businesses depending upon air transport increasingly prefer locations near air interchanges, although also the cosmopolitan feel of the area is an attractive characteristic (Appold and Kasarda, 2013). As stated before, this attraction of firms (FDI) airports is found in this and other studies - especially for Headquarters and Business Services. However it takes more for airports to grow into new "downtown" with meeting places, amenities, entertainment and services. This requires more than the logistic and transport oriented development of airports, and asks for a development and design directed on the human scale and the human needs - not only commercial but also cultural and other amenities. Since this development had only started since the end of last century, urban planning and design should focus on the needs of people and firms to improve the quality of airport districts.

City characteristics as determinants for KI FDI

Looking at city characteristics as determinant for KI FDI, only air accessibility was found as a major predictor for the number of FDI in Business Services and in Headquarters. This aspect corresponds with theory on international infrastructure as a main determinant for competitiveness, and the global urban network of international firms linked by city ties (shown by the connection line of international flights). The study of Bel and Fageda (2008) also found

that Headquarter locations in European cities are more likely to be found in regions with a higher number of direct intercontinental flights, providing 'empirical evidence of the importance of exchanges of tacit information between cities' (Bel and Fageda, 2008 p. 492). International (and intercontinental) access by air is thus a main overall determinant for city competitiveness in attraction of FDI.

Differences in unemployment percentage, in higher educations degrees, in the regional percentage of green area, or presence of a top university where not found to be related to the number of receiving FDI. Theory (a.o. Kitson, 2004) suggests that the aspects of human capital and knowledge capital influence competitiveness of a city, which should attract a higher number of FDI. Also other studies (Burger et al., 2012; Wall and Burger, 2012) showed that these characteristics influence the competitiveness of a city or region for number of investments. One reason, why these results were not found in this study could be argued that the sample of 15 cities was based on their similarity in number of KIA investments and thus also have similar characteristics for the mentioned indicators. However the characteristics on these aspects show much difference (view annex 4 for an overview for each city) and they also have quite a difference in number and kind of investments activity. Secondly it can be argued that although these aspects are considered to be of influence for competitiveness and the attraction of investments, the main determinant for KI FDI from MNE's is the air accessibility indicator for the mentioned six countries. A third reason, it can be argued, is that either the number of data (sample of cities) was too small to show other significant results, or that other kinds of variables not included in this analysis will give more results.

Further research implications

Limited by the scope of this research, several aspects have not been studied that might be of influence for the economic development of cities and the attraction of FDI by the spatial and urban characteristics of business districts. In future research, the availability, kind and location of public transport for business districts can be investigated, as well as other spatial characteristics such as heritage and historical components, presence of cultural amenities (museums), and the potential for interaction within a district (length of roads, number of crossings, street design, presence of squares or parks). Also a broader sample of cities can be researched: broader by geographical scope (outside the six countries of this research), broader by number of FDI investments (cities with a higher and lower number of FDI than the 15 cities in this study), and broader by researching the city-regions and including the surrounding municipalities. Because the size of city boundaries differ for the core-city, not all FDI in surroundings municipalities that are part of the city-region are taken into account. Registration of the data by fDi Markets however has also proved to contain errors on location and city names. A third implication for further research is to insert other variables on city characteristics to measure the competitiveness.

Recommendations for Rotterdam

Returning to the case of Rotterdam and it's need for a transition to a knowledge based economy, three aspects should be considered in a policy focussing on spatial and economic development to influence the competitiveness of the city in attracting more FDI in knowledge intensive activities:

1. Specialise and diversify

In the existing KI activities of Rotterdam, it receives high competition from other cities in NW-Europe. By specializing in Sales Marketing & Support and Business Services in niche sectors besides the overall sectors, the city can concentrate on a specific share of the market offering a highly specialised cluster for these activities and sectors. On the other hand, the city should adopt a strategy to diversify in knowledge intensive activities other than SMS and BS. The empirical results of this study show that the activity of DDT has a high growth and considerable number of FDI, offering good prospects for future development. When these activities are related to the existing economic base of the city (local clusters of port logistics, chemicals, and life sciences) the city can develop a related variety of economic activities, as study showed that this improves economic diversity and strength of a city or region (Neffke et al., 2011). The existing global ties of Rotterdam in the city-to-city network can identify complementarity with other cities and help to identify and develop these new activities.

2. International air accessibility

In the global network of multinational enterprises and firm activities, there is a major role for international connectivity of people. New communication technologies facilitate contacts over a distance, however face-to-face contacts and meetings are still important especially for activities that require a high level of trust between partners and activities that involve the transfer of tacit knowledge (Storper and Venables, 2004). Moreover, face-to-face meetings get more important as most other management and control related activities are handled electronically. Staying connected to the global network requires close access to the international network of air transport. A strategy for Rotterdam to improve it's international air access should address two aspects:

a. improvement of Rotterdam The Hague Airport as a European regional airport with more connections to major cities (such as Stockholm, Zürich, Dublin, Berlin, Oslo). This provides direct connections to firms headquartered in these cities, and benefits from the intercontinental flights of these airport hubs.
b. development of frequent high speed train connections to Schiphol Airport, as well as to Brussels Airport and Charles de Gaulle AIrport (Paris) and Germany. The high speed rail already links Rotterdam to Schiphol (Fyra), however this is not yet a highly frequent link. Moreover the city should not depend on this connection alone, but also try to link to other continental airports (linked by High Speed Rail) and cities by train.

3. Development of business districts

Regarding the urban, spatial and functional characteristic demands of the different knowledge intensive firm activities, the city of Rotterdam has a low score on both district diversity (different kinds of districts) and size of each district. Related to the first and second recommendations, a spatial-economic transition if the business environment should address the following points:

a. improvement of the inner-city district: a higher urbanity degree, resulting in more amenities, more possibilities for interaction and meeting (both inside and outside) - an aspect that already has been focussed on in the inner-city plan “Urban Lounge” (focussed on activities of Business Services and Sales Marketing & Support);
b. development of an airport district in the surroundings of Rotterdam The Hague Airport, connected to the airport and the inner-city districts of both Rotterdam and The Hague (focussed on activities of Business Services and Headquarters);
c. development of both a Science / Techno Complex related to the Erasmus Medical Centre (academic centre) and one related to both Port Logistics and Chemicals (both focussing on activities of Design Development & Testing).

For this development, the reported characteristics of the business districts should be taken into account.

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ANNEXES

ANNEX 1: DEFINITIONS

1A. North and West Europe

According to the United Nations Statistics Division Standard Area Classification, the following countries are part of the regions of North and West Europe:

Northern Europe:

Åland Islands	Channel Islands	Denmark
Estonia	Faeroe Islands	Finland
Guernsey	Iceland	Ireland
Isle of Man	Jersey	Latvia
Lithuania	Norway	Sark
Svalbard and Jan Mayen Islands	Sweden	United Kingdom

Western Europe:

Austria	Belgium	France
Germany	Liechtenstein	Luxembourg
Monaco	the Netherlands	Switzerland

source: United Nations Statistics Division; http://unstats.un.org/unsd/methods/m49/m49regin.htm#europe [Accessed 9 June 2013]

ANNEX 2: COUNTRIES AND POSTCODES

Methodology Mapping and Locating:

In the ORBIS database, the post code* of most companies is given. This information gives more detailed information on where a company is located in the city. However due to the different systems of postal codes in every country, not every system gives this detailed information. Some countries have a postal code that refers to the street, or part of it (e.g. in the NL, SE and UK), in other countries they're assigned to a city district (e.g. in DE and CH), or even to a whole town of city arrondissement (e.g. in FR and BE). When the geographical area of a postal code is too broad, it's not possible to use the code for a detailed location research. For this reason, only countries with a postal code that is at least bounded to a city district are incorporated in this research.

Overview:

Country	Postcode formatting	Format	Geographical level
Germany (DE)	5 digits	12345	City district
Netherlands (NL)	4 digits, and	1234	City district
	2 letter	1234 AB	Street
Norway (NO)			
Sweden (SE)	3 digits, and	123	City area
	2 digits	123 45	City district / street
Switzerland (CH)	4 digits	1234	City district
United Kingdom (UK)	2 to 4 characters, and	(A)A9(9/A)	Area / City district
	3 characters	AA9A 9AA	Street / property

Source: Wikipedia 2013; http://en.wikipedia.org/wiki/Postcode [Accessed 30 May 2013]

* A post code is a series of letters and/or digits appended to a postal address for the purpose of sorting mail. Once postal codes were introduced, other applications became possible mainly because they are assigned to bounded geographical areas. (source: Wikipedia 2013; http://en.wikipedia.org/wiki/Postcode [retrieved on 30 May 2013])

ANNEX 3: DATABASE DESCRIPTIONS

fDi Markets

fDi Markets is an online FDI database for market research and investment targeting. The tool is a product of fDi Intelligence, a division of the Financial Times, and is the market leading FDI database. Only new and expansion projects which lead to new jobs being created and capital being invested, are recorded i.e. greenfield investment. The team searches over 8,000 news sources to identify FDI projects. When a project is identified, the project is validated with company sources, which allows further company information to be captured, including decision making contacts, and is entered into fDi Markets.

The following information on each FDI project is captured: parent company name; investment company name; company profile; source country, region, and city; destination country, region, and city; jobs and investment amount, cluster, sector and business activity. A business activity is not sector-specific and shows the actual activity being conducted by the new investment. The database covers the activities below; activities in **bold** are considered as knowledge-intensive firm activities within this research:

– **Business Service**
- Logistics, Distribution & Transportation
– Construction
– Maintenance & Servicing
– Customer Contact Centre
– Manufacturing
– **Design, Development & Testing**
– Recycling
– **Education & Training**
– **Research & Development**
– Electricity
– Retail
– Extraction
– **Sales, Marketing & Support**
– **Headquarters**
– Shared Services Centre
– **ICT & Internet Infrastructure**
– Technical Support Centre

sources: http://www.fdimarkets.com [Accessed 7 June 2013] and http://www.slideshare.net/DamienBourles/fdi-markets-overview [Accessed 7 June 2013]

Orbis database

Orbis is a product of Bureau Van Dijk: Company Information and Business Intelligence. Orbis contains comprehensive information on companies worldwide, with an emphasis on private company information. Orbis has information on over 100 million private companies, both listed and unlisted. The data shows very detailed, direct and indirect, ownership information, a company's level of independence in relation to its shareholders, plus the global and domestic ultimate owners. The data includes companies' sector-activities, history, the countries they operate in and their main products and services. It also includes the city an postcode of both owner and subsidiary company.

source: http://www.bvdinfo.com/Products/Company-Information/International/Orbis-(1) [Accessed 7 June 2013]

ANNEX 4: CITY DATA SHEETS

ABERDEEN

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	72 (61)
Number of FDI in SMS	34 (24)
Number of FDI in BS	12 (12)
Number of FDI in HQ	12 (9)
Number of FDI in DDT	7 (6)
Number of FDI in R&D	3 (3)
Number of FDI in ICT	0
Number of FDI in E&T	4 (4)

Functional characteristic of FDI location	
Commercial	0,0%
Green	1,6%
Industry	44,3%
Mixed	32,8%
Office	14,8%
Techno	0,0%
Complex	6,6%

Proximity of FDI location	
Relative distance to Airport	0,86
Relative distance to University	1,05
Relative distance to Center	1,06
Categorical distance to MainRoad	2,28
Average number of firms in cluster	8,51
FDI concentration ratio	0,31

Presence of Business Districts (0–4 highest)	
Presence City Center District	0
Presence Prestige Quarter	2
Presence Epicenter	0
Presense Complex	0
Presence Highway Office Park	1
Presence Research Park	0
Presence Airport District	3

Urban characteristics of FDI locations	
Urbanity	2,36
Number of floors	2,51
Amenities (presence)	0,0%
Waterfront (presence)	0,0%
Public Space (1-4 best)	1,85
Green Areal (1-4 highest)	2,00
Water Areal (1-4 highest)	1,18
Street Parking	36,1%
Parking Lots	59,0%
built Parking	4,9%

General city characteristics	
GDP per capita ($)	49.575
Accessibility by air (mln pass)	3,33
Accessibility by road (EU27 = 100)	23
Unemployment rate	4,9%
Higher education rate	39,8%
Word Rank of top university	276
Temperature in january (ºC)	3,2
Green space proportion of the region	62,0%
Business District Differentiation	3

BELFAST

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	105 (85)
Number of FDI in SMS	18 (12)
Number of FDI in BS	24 (20)
Number of FDI in HQ	6 (5)
Number of FDI in DDT	43 (38)
Number of FDI in R&D	10 (8)
Number of FDI in ICT	3 (2)
Number of FDI in E&T	1 (0)

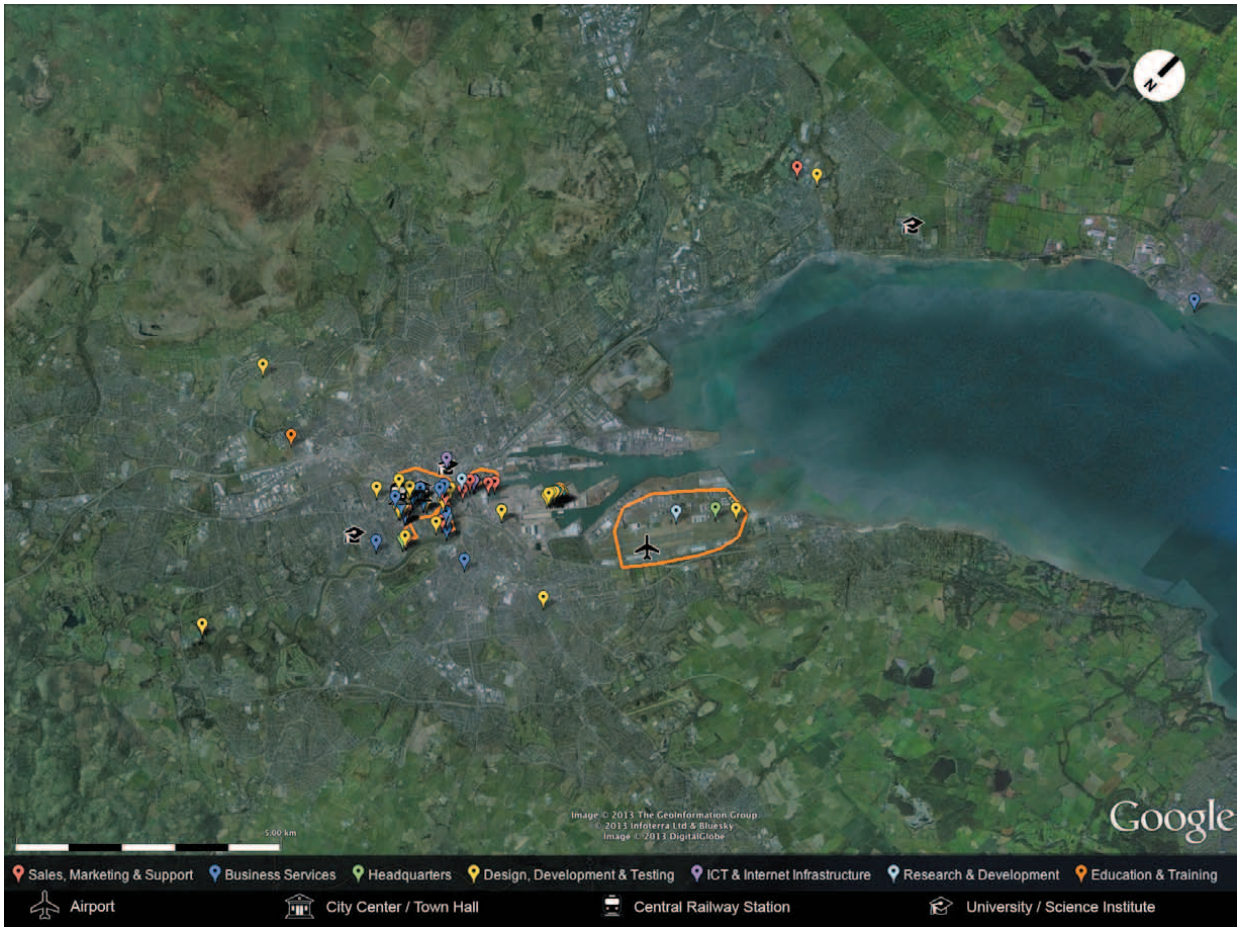
Functional characteristic of FDI location	
Commercial	7,1%
Green	0,0%
Industry	4,7%
Mixed	56,5%
Office	31,8%
Techno	0,0%
Complex	0,0%

Proximity of FDI location	
Relative distance to Airport	0,93
Relative distance to University	1,95
Relative distance to Center	0,95
Categorical distance to MainRoad	1,85
Average number of firms in cluster	21,54
FDI concentration ratio	0,34

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	0
Presence Epicenter	4
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	0
Presence Airport District	1

Urban characteristics of FDI locations	
Urbanity	3,11
Number of floors	5,29
Amenities (presence)	54,1%
Waterfront (presence)	28,2%
Public Space (1-4 best)	2,34
Green Areal (1-4 highest)	1,36
Water Areal (1-4 highest)	1,19
Street Parking	2,4%
Parking Lots	43,5%
built Parking	54,1%

General city characteristics	
GDP per capita ($)	57.152
Accessibility by air (mln pass)	6,56
Accessibility by road (EU27 = 100)	34
Unemployment rate	7,8%
Higher education rate	20,4%
Word Rank of top university	430
Temperature in january (°C)	4,7
Green space proportion of the region	42,2%
Business District Differentiation	3



BIRMINGHAM

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	76 (52)
Number of FDI in SMS	35 (24)
Number of FDI in BS	22 (15)
Number of FDI in HQ	7 (5)
Number of FDI in DDT	9 (5)
Number of FDI in R&D	1 (1)
Number of FDI in ICT	1 (1)
Number of FDI in E&T	1 (1)

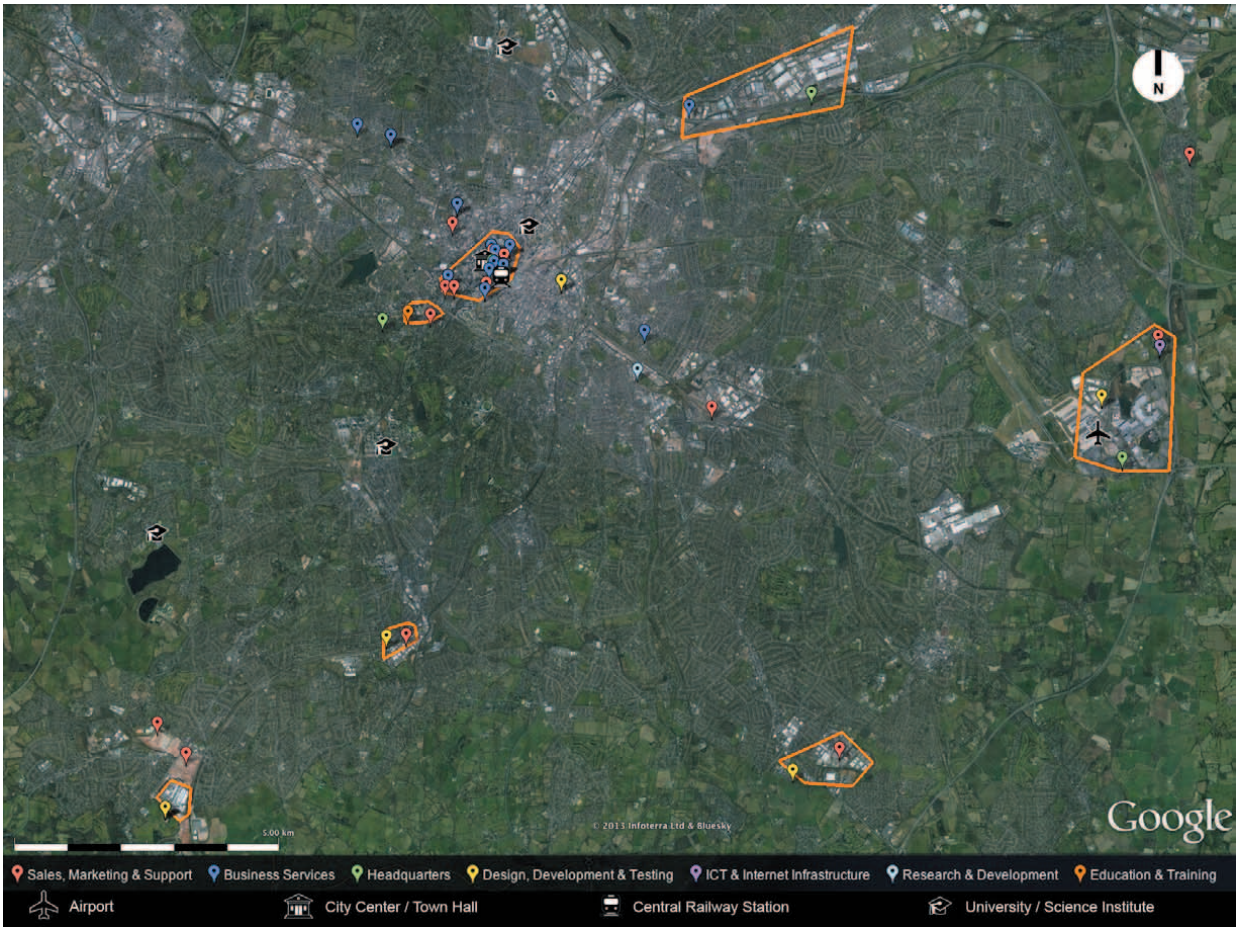
Functional characteristic of FDI locations	
Commercial	0,0%
Green	0,0%
Industry	13,5%
Mixed	57,7%
Office	21,2%
Techno	0,0%
Complex	7,7%

Proximity of FDI locations (average values)	
Relative distance to Airport	0,93
Relative distance to University	1,60
Relative distance to Center	0,98
Categorical distance to MainRoad	2,02
Average number of firms in cluster	9,23
FDI concentration ratio	0,24

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	0
Presense Complex	1
Presence Highway Office Park	1
Presence Research Park	0
Presence Airport District	2

Urban characteristics of FDI locations	
Urbanity	2,90
Number of floors	4,51
Amenities (presence)	55,8%
Waterfront (presence)	0,0%
Public Space (1-4 best)	2,29
Green Areal (1-4 highest)	1,50
Water Areal (1-4 highest)	1,06
Street Parking	15,4%
Parking Lots	42,3%
built Parking	42,3%

General city characteristics	
GDP per capita ($)	39.646
Accessibility by air (mln pass)	8,92
Accessibility by road (EU27 = 100)	129
Unemployment rate	10,1%
Higher education rate	22,7%
Word Rank of top university	264
Temperature in january (ºC)	3,9
Green space proportion of the region	34,3%
Business District Differentiation	4



CAMBRIDGE

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	61 (47)
Number of FDI in SMS	17 (12)
Number of FDI in BS	7 (5)
Number of FDI in HQ	10 (9)
Number of FDI in DDT	10 (8)
Number of FDI in R&D	16 (12)
Number of FDI in ICT	1 (1)
Number of FDI in E&T	0

Functional characteristic of FDI locations	
Commercial	0,0%
Green	4,3%
Industry	2,1%
Mixed	17,0%
Office	68,1%
Techno	0,0%
Complex	8,5%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,52
Relative distance to University	0,76
Relative distance to Center	1,00
Categorical distance to MainRoad	1,98
Average number of firms in cluster	7,00
FDI concentration ratio	0,20

Presence of Business Districts (0–4 highest)	
Presence City Center District	0
Presence Prestige Quarter	0
Presence Epicenter	2
Presense Complex	1
Presence Highway Office Park	1
Presence Research Park	3
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	2,26
Number of floors	3,11
Amenities (presence)	10,6%
Waterfront (presence)	0,0%
Public Space (1-4 best)	2,83
Green Areal (1-4 highest)	3,15
Water Areal (1-4 highest)	2,06
Street Parking	23,4%
Parking Lots	70,2%
built Parking	6,4%

General city characteristics	
GDP per capita ($)	37.800
Accessibility by air (mln pass)	
Accessibility by road (EU27 = 100)	128
Unemployment rate	5,3%
Higher education rate	51,1%
Word Rank of top university	20
Temperature in january (ºC)	4,5
Green space proportion of the region	46,3%
Business District Differentiation	4

EDINBURGH

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	93 (54)
Number of FDI in SMS	26 (10)
Number of FDI in BS	33 (19)
Number of FDI in HQ	8 (5)
Number of FDI in DDT	16 (15)
Number of FDI in R&D	9 (5)
Number of FDI in ICT	0
Number of FDI in E&T	1 (0)

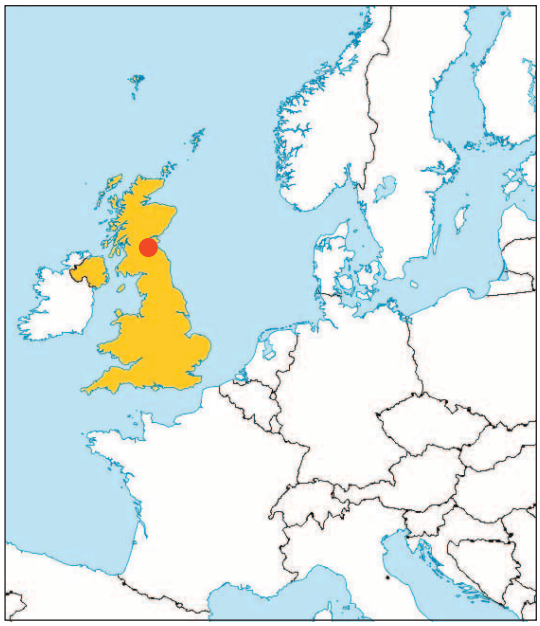
Functional characteristic of FDI locations	
Commercial	3,7%
Green	0,0%
Industry	9,3%
Mixed	72,2%
Office	13,0%
Techno	0,0%
Complex	1,9%

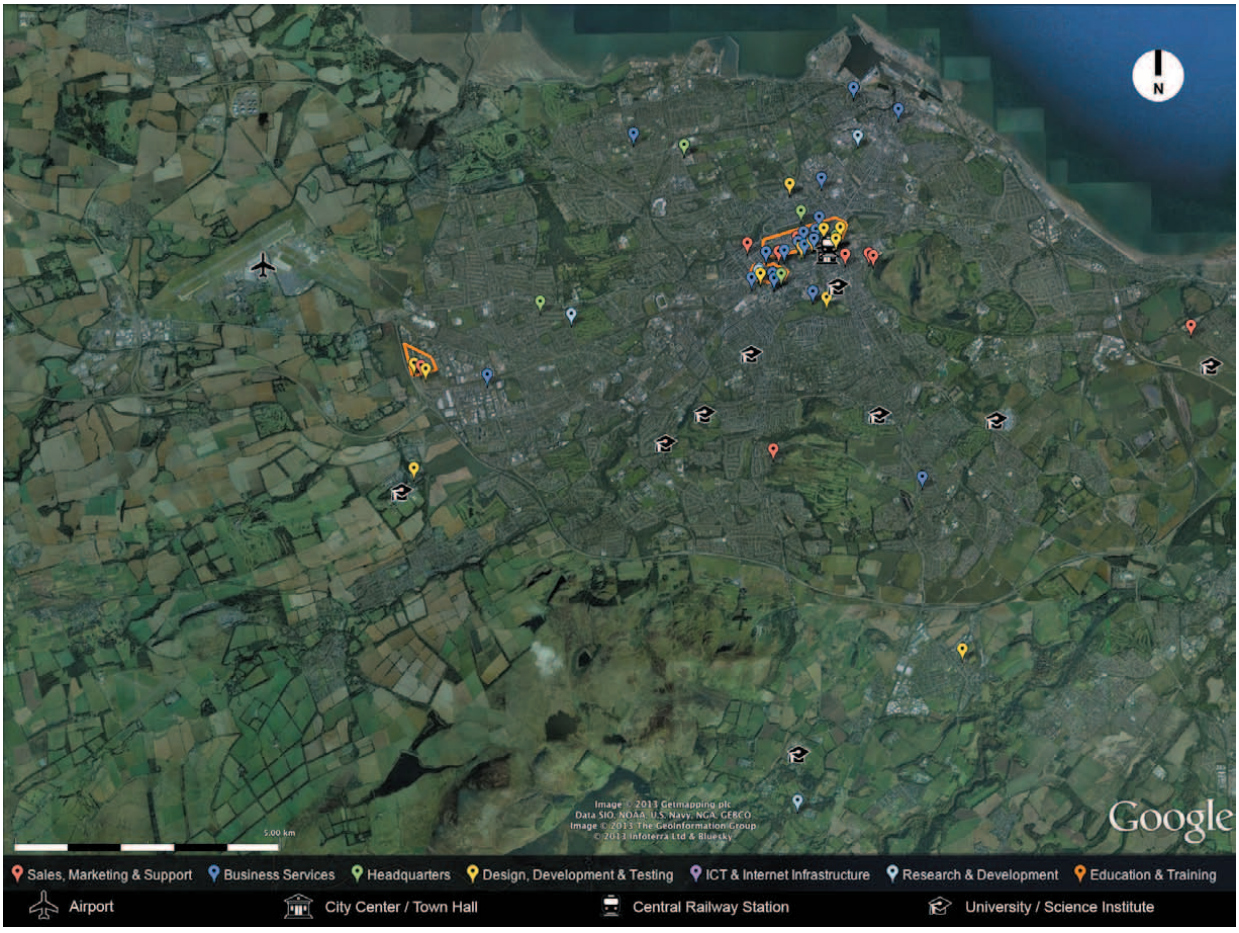
Proximity of FDI locations (average values)	
Relative distance to Airport	0,93
Relative distance to University	1,42
Relative distance to Center	0,92
Categorical distance to MainRoad	2,74
Average number of firms in cluster	11,91
FDI concentration ratio	0,24

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	2
Presence Epicenter	0
Presense Complex	0
Presence Highway Office Park	1
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	3,33
Number of floors	3,89
Amenities (presence)	64,8%
Waterfront (presence)	0,0%
Public Space (1-4 best)	2,91
Green Areal (1-4 highest)	2,91
Water Areal (1-4 highest)	1,37
Street Parking	51,9%
Parking Lots	24,1%
built Parking	24,1%

General city characteristics	
GDP per capita ($)	60.785
Accessibility by air (mln pass)	9,2
Accessibility by road (EU27 = 100)	48
Unemployment rate	4,9%
Higher education rate	44,1%
Word Rank of top university	52
Temperature in january (ºC)	4,2
Green space proportion of the region	63,5%
Business District Differentiation	3





GENEVE

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	191 (156)
Number of FDI in SMS	48 (35)
Number of FDI in BS	95 (67)
Number of FDI in HQ	35 (25)
Number of FDI in DDT	4 (3)
Number of FDI in R&D	1 (1)
Number of FDI in ICT	6 (5)
Number of FDI in E&T	2 (2)

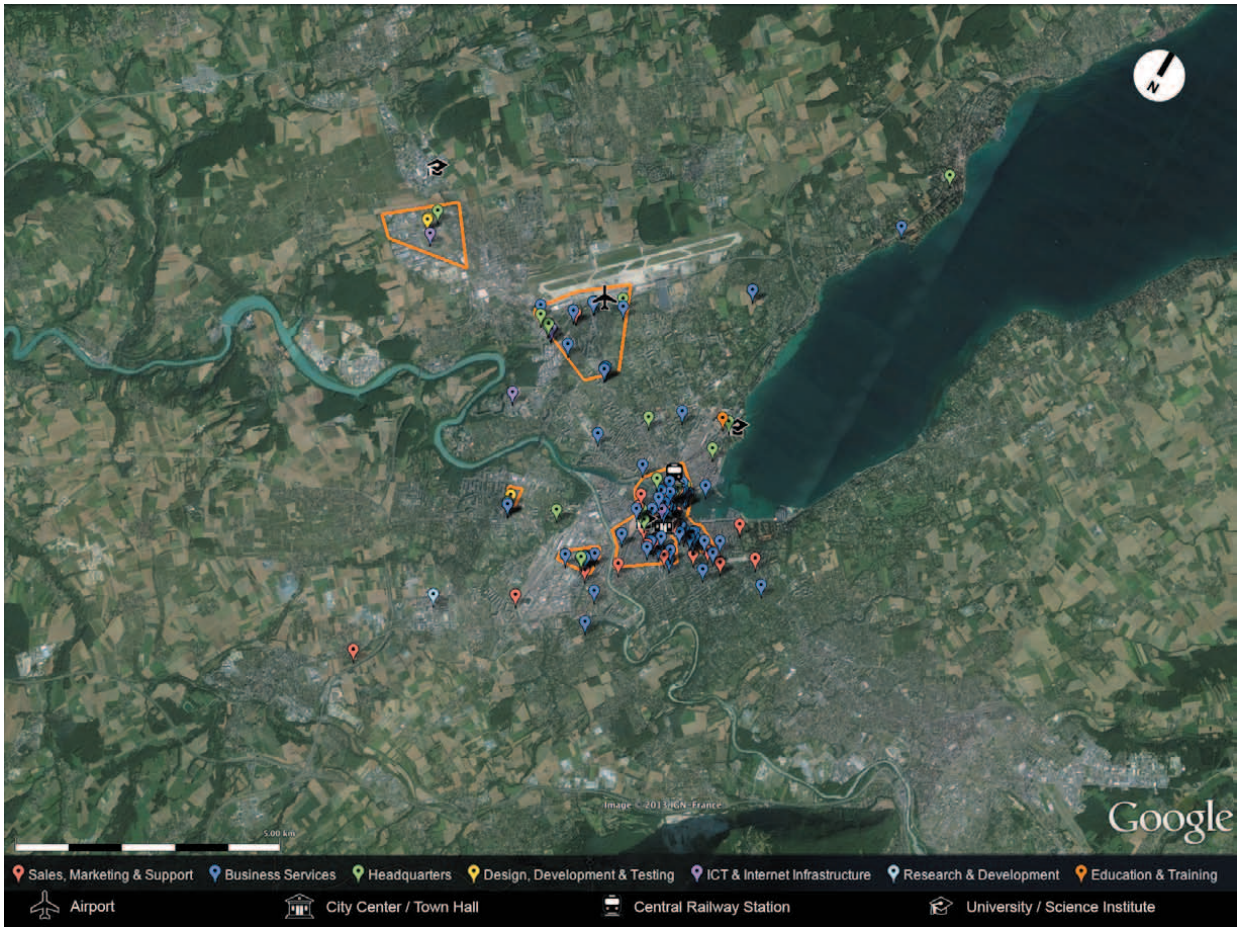
Functional characteristic of FDI locations	
Commercial	12,2%
Green	0,0%
Industry	3,2%
Mixed	75,0%
Office	9,0%
Techno	0,0%
Complex	0,0%

Proximity of FDI locations (average values)	
Relative distance to Airport	0,88
Relative distance to University	1,10
Relative distance to Center	0,97
Categorical distance to MainRoad	2,69
Average number of firms in cluster	39,41
FDI concentration ratio	0,35

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	3
Presence Epicenter	3
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	0
Presence Airport District	3

Urban characteristics of FDI locations	
Urbanity	3,42
Number of floors	6,20
Amenities (presence)	66,5%
Waterfront (presence)	5,2%
Public Space (1-4 best)	3,02
Green Areal (1-4 highest)	2,07
Water Areal (1-4 highest)	2,04
Street Parking	14,6%
Parking Lots	11,6%
built Parking	73,8%

General city characteristics	
GDP per capita ($)	65.280
Accessibility by air (mln pass)	13,9
Accessibility by road (EU27 = 100)	
Unemployment rate	8,2%
Higher education rate	39,4%
Word Rank of top university	124
Temperature in january (ºC)	1,6
Green space proportion of the region	
Business District Differentiation	4



GLASGOW

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	69 (44)
Number of FDI in SMS	28 (17)
Number of FDI in BS	19 (12)
Number of FDI in HQ	7 (4)
Number of FDI in DDT	12 (8)
Number of FDI in R&D	2 (2)
Number of FDI in ICT	1 (1)
Number of FDI in E&T	0

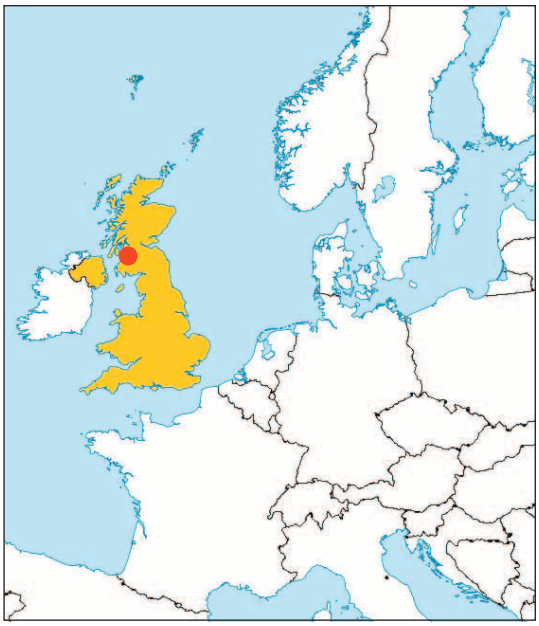
Functional characteristic of FDI locations	
Commercial	6,8%
Green	0,0%
Industry	15,9%
Mixed	56,8%
Office	20,5%
Techno	0,0%
Complex	0,0%

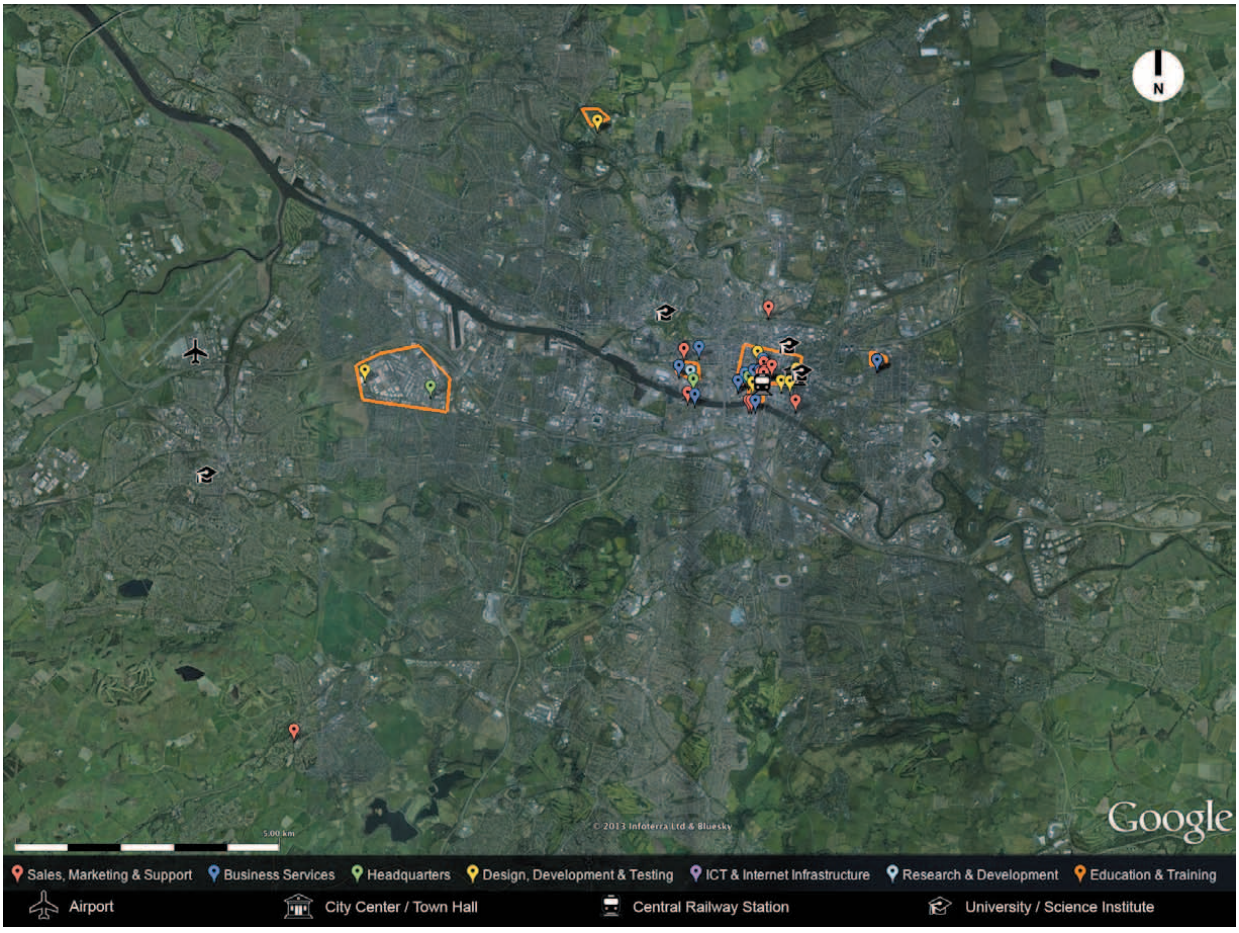
Proximity of FDI locations (average values)	
Relative distance to Airport	0,95
Relative distance to University	0,87
Relative distance to Center	1,01
Categorical distance to MainRoad	1,68
Average number of firms in cluster	11,23
FDI concentration ratio	0,32

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	2
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	1
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	3,32
Number of floors	4,55
Amenities (presence)	52,3%
Waterfront (presence)	11,4%
Public Space (1-4 best)	2,61
Green Areal (1-4 highest)	2,05
Water Areal (1-4 highest)	1,11
Street Parking	52,3%
Parking Lots	40,9%
built Parking	6,8%

General city characteristics	
GDP per capita ($)	50.734
Accessibility by air (mln pass)	7,16
Accessibility by road (EU27 = 100)	54
Unemployment rate	7,3%
Higher education rate	32,0%
Word Rank of top university	112
Temperature in january (ºC)	4,4
Green space proportion of the region	33,4%
Business District Differentiation	3





GOTHENBURG

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	47 (39)
Number of FDI in SMS	26 (20)
Number of FDI in BS	9 (8)
Number of FDI in HQ	4 (4)
Number of FDI in DDT	3 (3)
Number of FDI in R&D	4 (4)
Number of FDI in ICT	0
Number of FDI in E&T	1 (0)

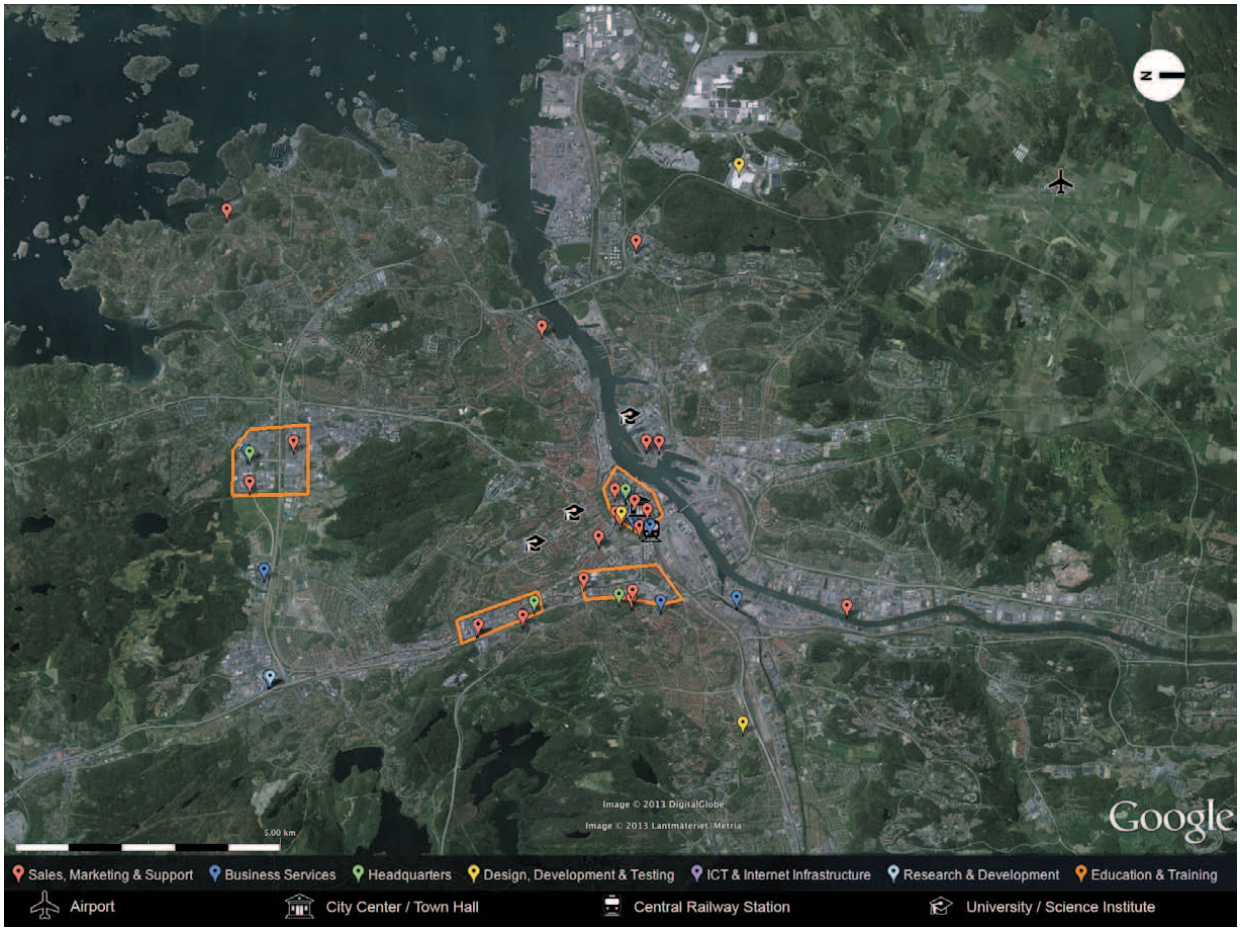
Functional characteristic of FDI locations	
Commercial	23,1%
Green	0,0%
Industry	7,7%
Mixed	38,5%
Office	20,5%
Techno	0,0%
Complex	10,3%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,11
Relative distance to University	1,99
Relative distance to Center	1,00
Categorical distance to MainRoad	1,79
Average number of firms in cluster	5,77
FDI concentration ratio	0,21

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	0
Presense Complex	0
Presence Highway Office Park	2
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	2,33
Number of floors	3,95
Amenities (presence)	46,2%
Waterfront (presence)	10,3%
Public Space (1-4 best)	2,33
Green Areal (1-4 highest)	2,05
Water Areal (1-4 highest)	2,18
Street Parking	35,9%
Parking Lots	53,8%
built Parking	10,3%

General city characteristics	
GDP per capita ($)	37.217
Accessibility by air (mln pass)	5,64
Accessibility by road (EU27 = 100)	29
Unemployment rate	8,8%
Higher education rate	33,6%
Word Rank of top university	229
Temperature in january (°C)	-1,5
Green space proportion of the region	64,7%
Business District Differentiation	2



HAMBURG

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	197 (158)
Number of FDI in SMS	96 (65)
Number of FDI in BS	67 (62)
Number of FDI in HQ	18 (18)
Number of FDI in DDT	7 (6)
Number of FDI in R&D	5 (3)
Number of FDI in ICT	2 (2)
Number of FDI in E&T	2 (2)

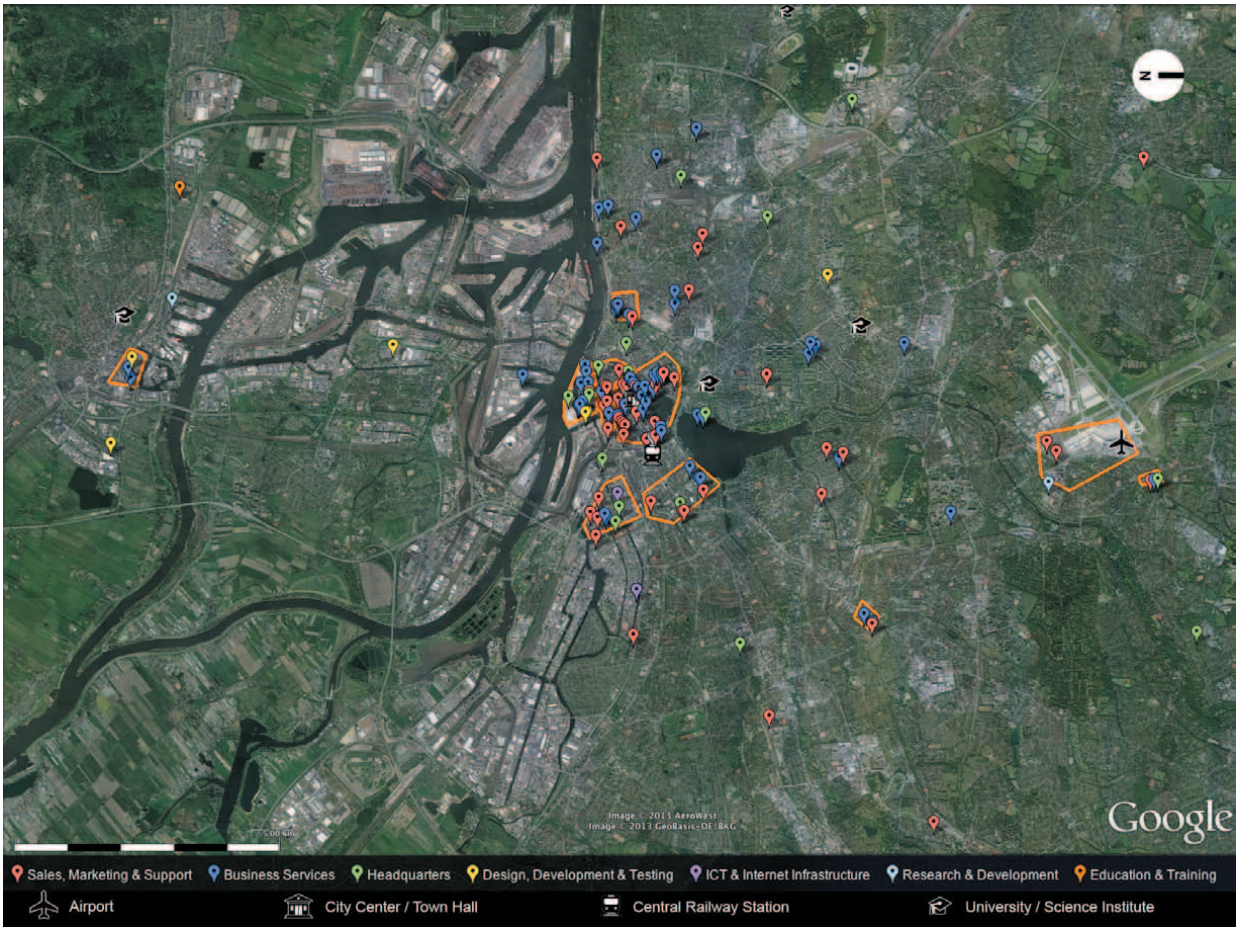
Functional characteristic of FDI locations	
Commercial	3,8%
Green	0,0%
Industry	5,7%
Mixed	69,4%
Office	18,5%
Techno	0,6%
Complex	1,9%

Proximity of FDI locations (average values)	
Relative distance to Airport	0,98
Relative distance to University	1,95
Relative distance to Center	0,94
Categorical distance to MainRoad	2,84
Average number of firms in cluster	20,27
FDI concentration ratio	0,20

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	3
Presence Epicenter	3
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	0
Presence Airport District	1

Urban characteristics of FDI locations	
Urbanity	3,28
Number of floors	5,54
Amenities (presence)	59,2%
Waterfront (presence)	14,5%
Public Space (1-4 best)	2,98
Green Areal (1-4 highest)	2,80
Water Areal (1-4 highest)	2,55
Street Parking	15,3%
Parking Lots	15,3%
built Parking	69,4%

General city characteristics	
GDP per capita ($)	40.554
Accessibility by air (mln pass)	13,56
Accessibility by road (EU27 = 100)	148
Unemployment rate	9,0%
Higher education rate	23,3%
Word Rank of top university	134
Temperature in january (ºC)	1,1
Green space proportion of the region	39,1%
Business District Differentiation	4



KOLN

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	127 (74)
Number of FDI in SMS	83 (42)
Number of FDI in BS	28 (23)
Number of FDI in HQ	13 (6)
Number of FDI in DDT	1 (1)
Number of FDI in R&D	0
Number of FDI in ICT	1 (1)
Number of FDI in E&T	1 (1)

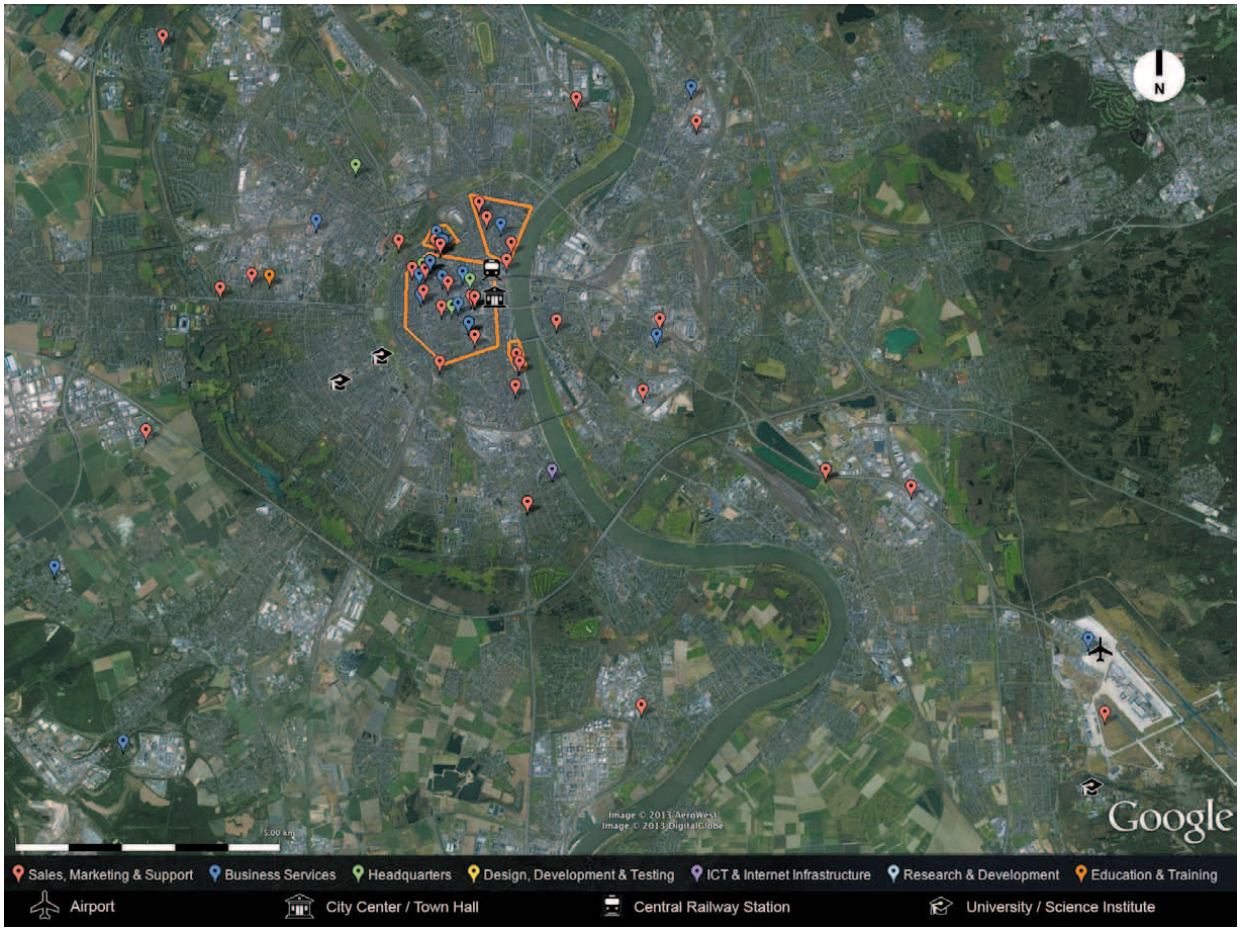
Functional characteristic of FDI locations	
Commercial	12,5%
Green	0,0%
Industry	14,3%
Mixed	62,5%
Office	7,1%
Techno	0,0%
Complex	3,6%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,03
Relative distance to University	1,73
Relative distance to Center	1,00
Categorical distance to MainRoad	2,70
Average number of firms in cluster	13,36
FDI concentration ratio	0,27

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	2
Presence Epicenter	3
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	3,30
Number of floors	5,25
Amenities (presence)	75,0%
Waterfront (presence)	10,7%
Public Space (1-4 best)	2,86
Green Areal (1-4 highest)	2,13
Water Areal (1-4 highest)	1,38
Street Parking	64,3%
Parking Lots	16,1%
built Parking	19,6%

General city characteristics	
GDP per capita ($)	33.503
Accessibility by air (mln pass)	9,81
Accessibility by road (EU27 = 100)	207
Unemployment rate	10,7%
Higher education rate	27,5%
Word Rank of top university	146
Temperature in january (°C)	2,6
Green space proportion of the region	42,5%
Business District Differentiation	3



MANCHESTER

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	128 (83)
Number of FDI in SMS	53 (22)
Number of FDI in BS	44 (26)
Number of FDI in HQ	18 (14)
Number of FDI in DDT	8 (7)
Number of FDI in R&D	3 (3)
Number of FDI in ICT	0
Number of FDI in E&T	2 (2)

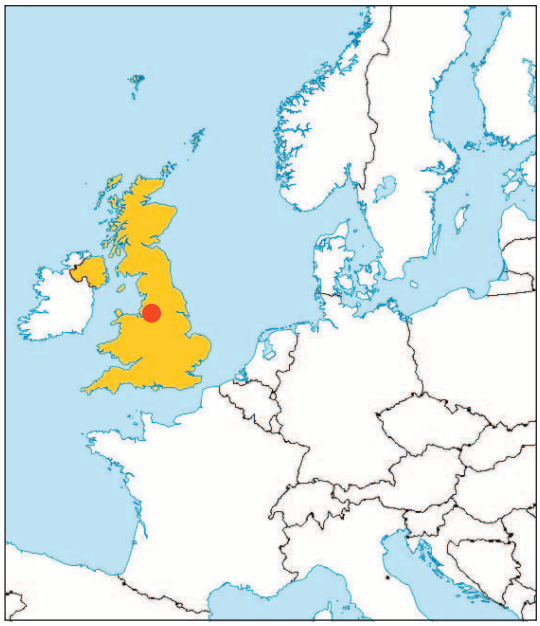
Functional characteristic of FDI locations	
Commercial	2,4%
Green	0,0%
Industry	14,5%
Mixed	51,8%
Office	27,7%
Techno	0,0%
Complex	0,0%

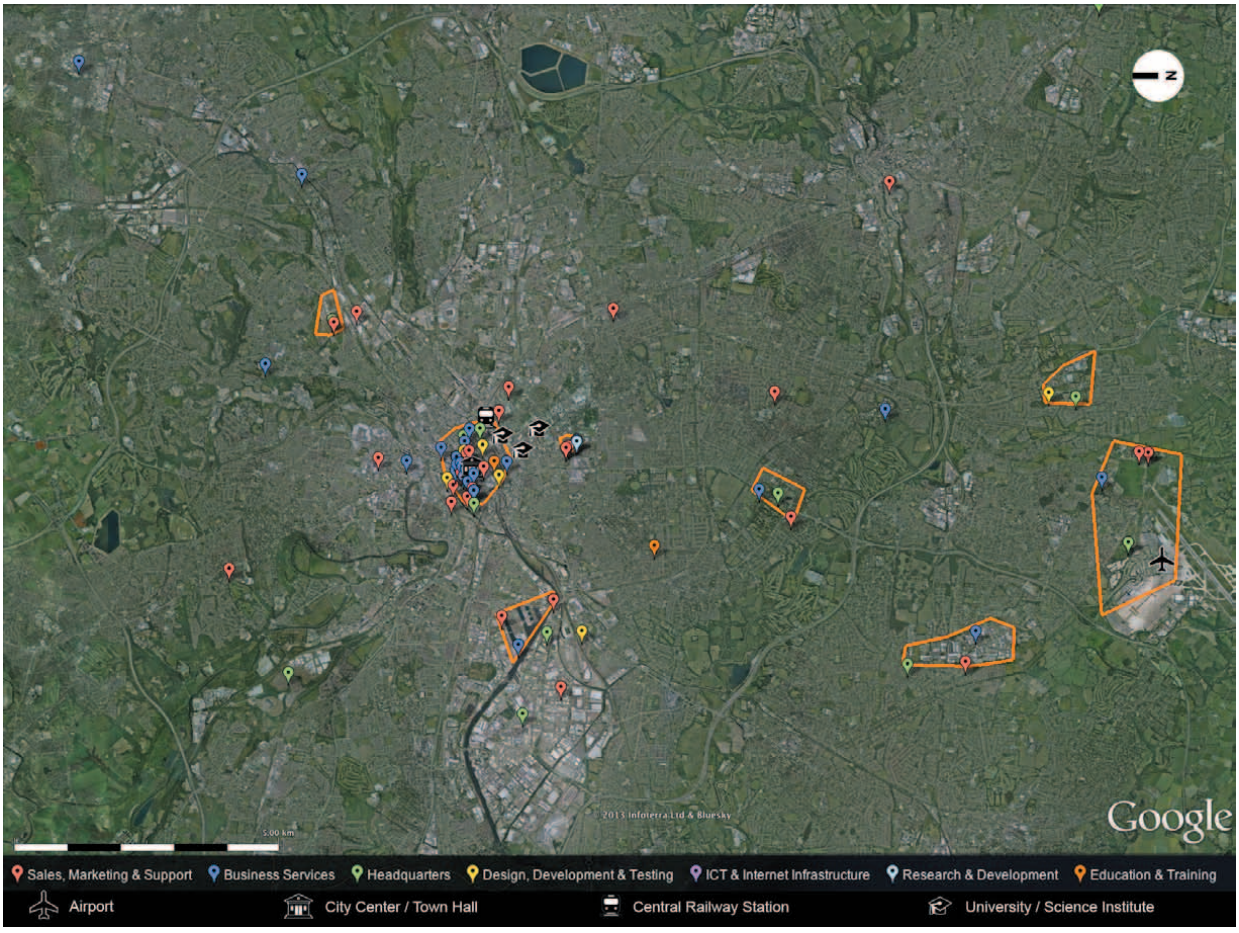
Proximity of FDI locations (average values)	
Relative distance to Airport	0,87
Relative distance to University	1,92
Relative distance to Center	0,99
Categorical distance to MainRoad	2,15
Average number of firms in cluster	17,59
FDI concentration ratio	0,25

Presence of Business Districts (0–4 highest)	
Presence City Center District	4
Presence Prestige Quarter	0
Presence Epicenter	1
Presense Complex	0
Presence Highway Office Park	1
Presence Research Park	2
Presence Airport District	2

Urban characteristics of FDI locations	
Urbanity	2,93
Number of floors	4,93
Amenities (presence)	48,8%
Waterfront (presence)	4,8%
Public Space (1-4 best)	2,68
Green Areal (1-4 highest)	2,22
Water Areal (1-4 highest)	1,07
Street Parking	11,0%
Parking Lots	37,8%
built Parking	51,2%

General city characteristics	
GDP per capita ($)	33.155
Accessibility by air (mln pass)	19,74
Accessibility by road (EU27 = 100)	113
Unemployment rate	9,7%
Higher education rate	26,5%
Word Rank of top university	129
Temperature in january (ºC)	4,5
Green space proportion of the region	35,3%
Business District Differentiation	5





OSLO

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	74 (53)
Number of FDI in SMS	45 (22)
Number of FDI in BS	19 (13)
Number of FDI in HQ	1 (1)
Number of FDI in DDT	5 (4)
Number of FDI in R&D	1 (1)
Number of FDI in ICT	2 (2)
Number of FDI in E&T	1 (1)

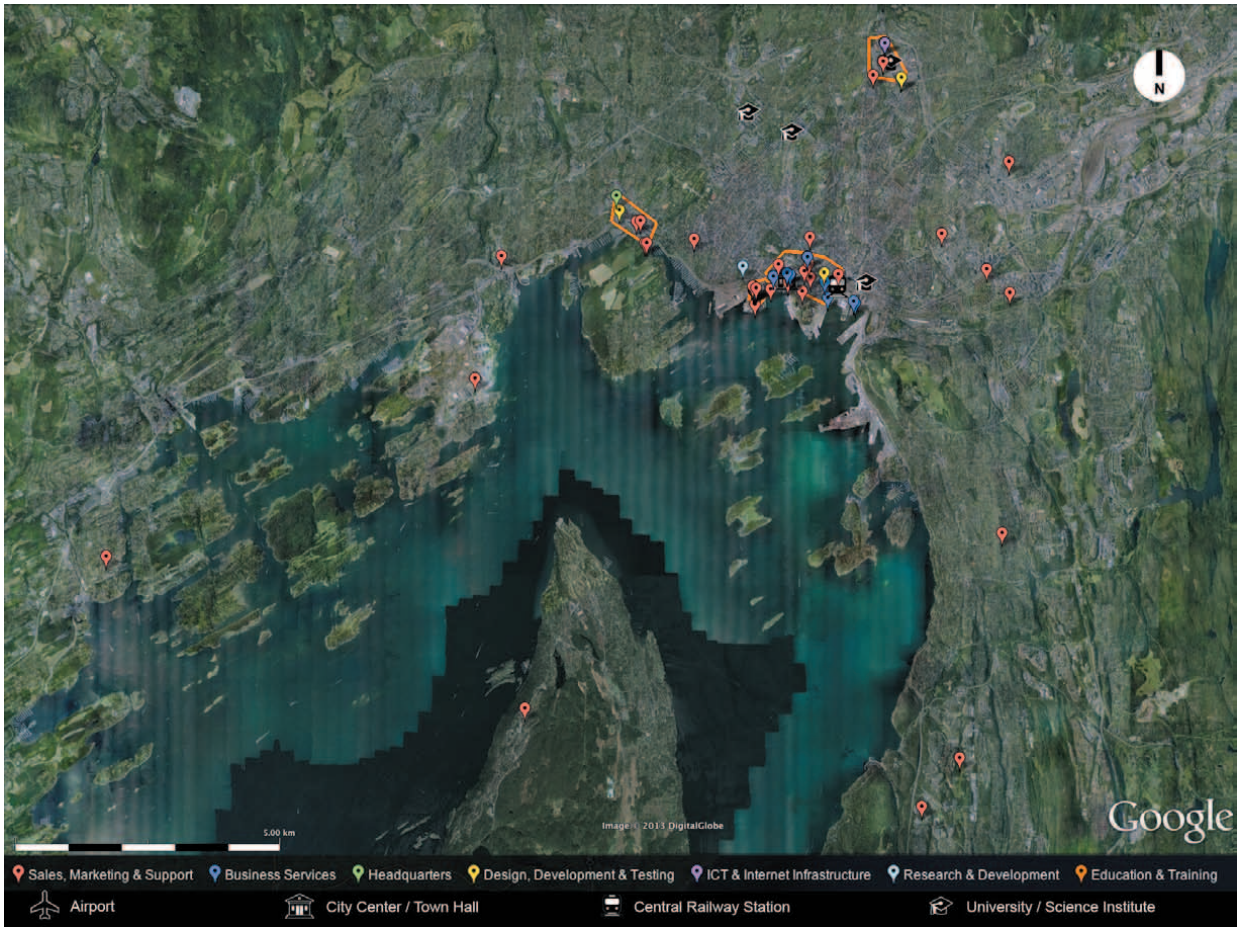
Functional characteristic of FDI locations	
Commercial	7,5%
Green	0,0%
Industry	1,9%
Mixed	81,1%
Office	7,5%
Techno	0,0%
Complex	0,0%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,00
Relative distance to University	3,37
Relative distance to Center	0,83
Categorical distance to MainRoad	1,81
Average number of firms in cluster	10,42
FDI concentration ratio	0,32

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	4
Presense Complex	0
Presence Highway Office Park	0
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	3,54
Number of floors	5,85
Amenities (presence)	69,2%
Waterfront (presence)	3,8%
Public Space (1-4 best)	3,25
Green Areal (1-4 highest)	2,27
Water Areal (1-4 highest)	2,54
Street Parking	36,5%
Parking Lots	11,5%
built Parking	51,9%

General city characteristics	
GDP per capita ($)	57.931
Accessibility by air (mln pass)	22,08
Accessibility by road (EU27 = 100)	
Unemployment rate	2,8%
Higher education rate	41,5%
Word Rank of top university	103
Temperature in january (ºC)	-4
Green space proportion of the region	
Business District Differentiation	2



READING

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	72 (42)
Number of FDI in SMS	43 (21)
Number of FDI in BS	3 (2)
Number of FDI in HQ	14 (9)
Number of FDI in DDT	6 (5)
Number of FDI in R&D	2 (2)
Number of FDI in ICT	3 (2)
Number of FDI in E&T	1 (1)

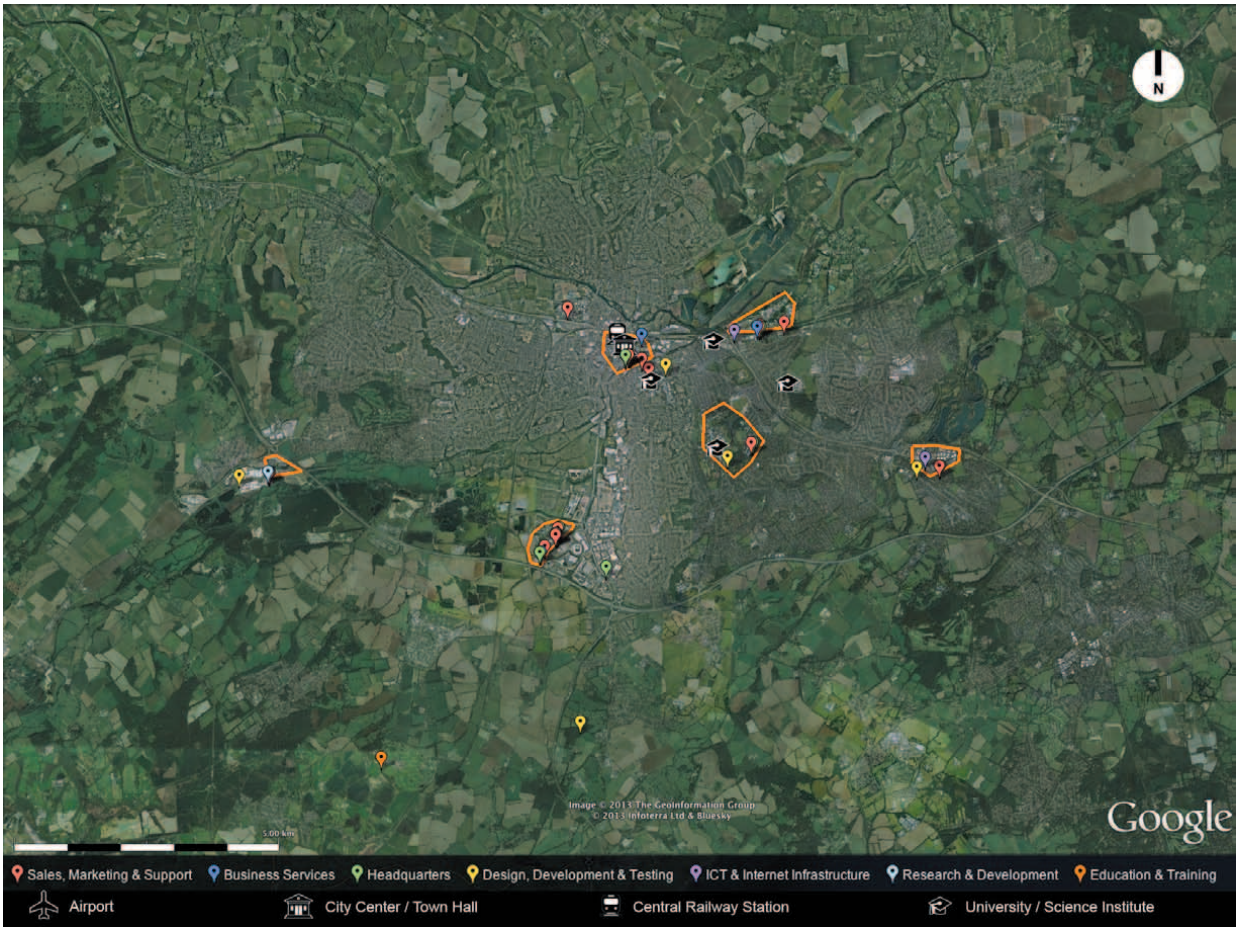
Functional characteristic of FDI locations	
Commercial	0,0%
Green	4,8%
Industry	9,5%
Mixed	23,8%
Office	54,8%
Techno	0,0%
Complex	7,1%

Proximity of FDI locations (average values)	
Relative distance to Airport	0,95
Relative distance to University	1,34
Relative distance to Center	1,00
Categorical distance to MainRoad	2,12
Average number of firms in cluster	5,76
FDI concentration ratio	0,29

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	0
Presense Complex	1
Presence Highway Office Park	4
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	2,19
Number of floors	3,36
Amenities (presence)	19,0%
Waterfront (presence)	0,0%
Public Space (1-4 best)	3,38
Green Areal (1-4 highest)	3,31
Water Areal (1-4 highest)	2,90
Street Parking	2,4%
Parking Lots	78,6%
built Parking	19,0%

General city characteristics	
GDP per capita ($)	47.516
Accessibility by air (mln pass)	70,04
Accessibility by road (EU27 = 100)	
Unemployment rate	
Higher education rate	
Word Rank of top university	548
Temperature in january (ºC)	4,5
Green space proportion of the region	
Business District Differentiation	3



ROTTERDAM

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	65 (49)
Number of FDI in SMS	44 (35)
Number of FDI in BS	18 (12)
Number of FDI in HQ	1 (1)
Number of FDI in DDT	1 (1)
Number of FDI in R&D	0
Number of FDI in ICT	1 (0)
Number of FDI in E&T	0

Functional characteristic of FDI locations	
Commercial	0,0%
Green	0,0%
Industry	30,6%
Mixed	38,8%
Office	26,5%
Techno	0,0%
Complex	2,0%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,62
Relative distance to University	1,43
Relative distance to Center	1,01
Categorical distance to MainRoad	1,98
Average number of firms in cluster	6,04
FDI concentration ratio	0,18

Presence of Business Districts (0–4 highest)	
Presence City Center District	3
Presence Prestige Quarter	0
Presence Epicenter	1
Presense Complex	0
Presence Highway Office Park	2
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	2,77
Number of floors	4,74
Amenities (presence)	37,5%
Waterfront (presence)	10,2%
Public Space (1-4 best)	2,73
Green Areal (1-4 highest)	2,50
Water Areal (1-4 highest)	2,35
Street Parking	34,0%
Parking Lots	21,3%
built Parking	44,7%

General city characteristics	
GDP per capita ($)	43.147
Accessibility by air (mln pass)	1,27
Accessibility by road (EU27 = 100)	164
Unemployment rate	7,7%
Higher education rate	23,1%
Word Rank of top university	373
Temperature in january (°C)	4,6
Green space proportion of the region	25,2%
Business District Differentiation	3

STUTTGART

Number of FDI *(with postcodes in parantheses)*	
Number of FDI	91 (55)
Number of FDI in SMS	56 (28)
Number of FDI in BS	18 (15)
Number of FDI in HQ	8 (6)
Number of FDI in DDT	3 (3)
Number of FDI in R&D	2 (1)
Number of FDI in ICT	2 (1)
Number of FDI in E&T	2 (1)

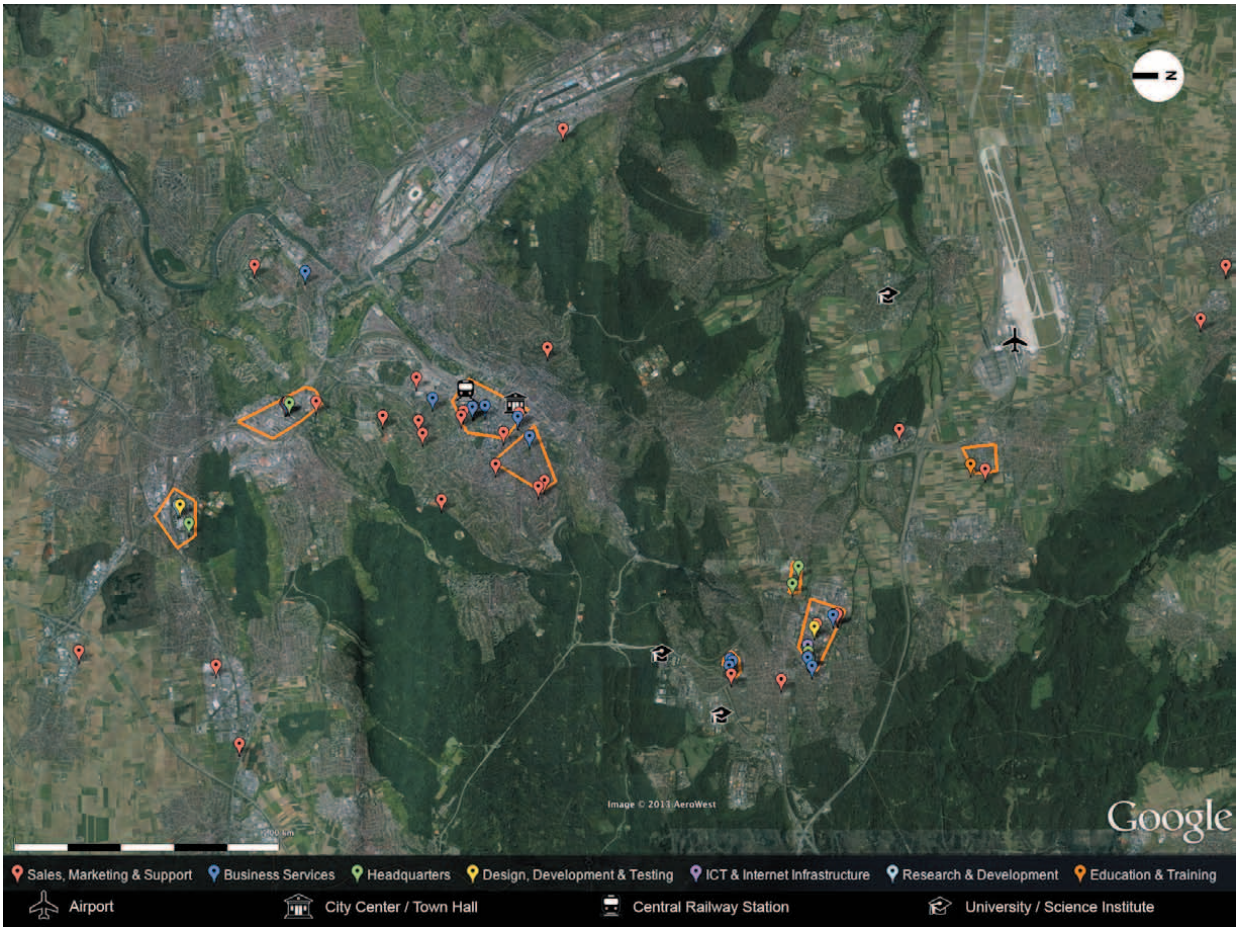
Functional characteristic of FDI locations	
Commercial	3,6%
Green	0,0%
Industry	10,9%
Mixed	27,3%
Office	18,2%
Techno	38,2%
Complex	0,0%

Proximity of FDI locations (average values)	
Relative distance to Airport	1,08
Relative distance to University	3,80
Relative distance to Center	0,98
Categorical distance to MainRoad	2,43
Average number of firms in cluster	5,78
FDI concentration ratio	0,23

Presence of Business Districts (0–4 highest)	
Presence City Center District	2
Presence Prestige Quarter	1
Presence Epicenter	1
Presense Complex	3
Presence Highway Office Park	1
Presence Research Park	0
Presence Airport District	0

Urban characteristics of FDI locations	
Urbanity	2,78
Number of floors	4,91
Amenities (presence)	40,7%
Waterfront (presence)	0,0%
Public Space (1-4 best)	2,63
Green Areal (1-4 highest)	2,41
Water Areal (1-4 highest)	1,00
Street Parking	42,6%
Parking Lots	14,8%
built Parking	42,6%

General city characteristics	
GDP per capita ($)	41.199
Accessibility by air (mln pass)	9,72
Accessibility by road (EU27 = 100)	
Unemployment rate	6,9%
Higher education rate	31,8%
Word Rank of top university	301
Temperature in january (ºC)	0,5
Green space proportion of the region	53,1%
Business District Differentiation	5



ANNEX 5: RESULTS MULTIPLE REGRESSION ANALYSIS

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility (model fit: Adj R sq = ,085)		
rdist_Cntr_ln	-,175	,001
rdist_Airport_ln	-,209	,012
rdist_UNI_ln	,141	,031
cdist_MainRoad	-,104	,060
Functional characteristic (model fit: Adj R sq = ,037)		
funct_Industr	-,410	,001
funct_Commerc	-,008	,884
funct_Mixed	,077	,204
funct_Office	-,033	,567
funct_Techn	,062	,260
funct_Complex	-,101	,069
Urban characteristic (model fit: Adj R sq = ,146)		
Urbanity	,319	,000
Amenities	,429	,002
Nfloors	,004	,946
Waterfront	-,023	,659
Spatial Quality (model fit: Adj R sq = ,048)		
B-Parking	,340	,008
PublicSpace	,134	,040
Green_Ar	-,083	,204
Water_Ar	,087	,126
L-Parking	,046	,470

Dependent Variable: FDI_ln

table I: All results of SPSS Multiple Linear Regression Analysis on District Characterics and location of All KI FDI

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility (model fit: Adj R sq = ,101)		
rdist_UNI_ln	,371	,000
rdist_Cntr_ln	-,260	,002
cdist_MainRoad	-,242	,010
Functional characteristic (model fit: Adj R sq = ,015)		
funct_Complex	-,835	,017
Urban characteristic (model fit: Adj R sq = ,065)		
Urbanity	,535	,000
Spatial Quality (model fit: Adj R sq = ,013)		
Water_Ar	,182	,021

Dependent Variable: Act1_SMS_ln

table II: Significant results of SPSS Multiple Linear Regression Analysis on District Characterics and location of FDI in Sales Marketing & Support.

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility (model fit: Adj R sq = ,109)		
rdist_Cntr_ln	-,309	,000
rdist_Airport_ln	-,345	,007
rdist_UNI_ln	,262	,011
Functional characteristic (model fit: Adj R sq = ,080)		
funct_Mixed	,369	,044
funct_Complex	-1,031	,003
funct_Industr	-,575	,005
Urban characteristic (model fit: Adj R sq = ,206)		
Urbanity	,658	,000
Amenities	,678	,001
Spatial Quality (model fit: Adj R sq = ,094)		
B-Parking	,647	,002
L-Parking	-,500	,005

Dependent Variable: Act2_BS_ln

table III: Significant results of SPSS Multiple Linear Regression Analysis on District Characterics and location of FDI in Business Services.

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility (model fit: Adj R sq = ,023)		
rdist_Airport_ln	-,310	,004
Functional characteristic		
-		
Urban characteristic (model fit: Adj R sq = ,010)		
Amenities	,323	,037
Spatial Quality		
-		

Dependent Variable: Act3_HQ_ln

table IV: Significant results of SPSS Multiple Linear Regression Analysis on District Characterics and location of FDI in Headquarters

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility		
-		
Functional characteristic		
-		
Urban characteristic		
-		
Spatial Quality (model fit: Adj R sq = ,020)		
L-Parking	,318	,007

Dependent Variable: Act4_DDT_ln

table V: Significant results of SPSS Multiple Linear Regression Analysis on District Characterics and location of FDI in Design Development & Testing

Characteristic	B-value (Unstand. Coefficient)	p-value
Proximity / accessibility (model fit: Adj R sq = ,011)		
cdist_MainRoad	-,108	,031
Functional characteristic (model fit: Adj R sq = ,043)		
funct_Complex	,628	,001
funct_Techn	,725	,031
Urban characteristic		
-		
Spatial Quality (model fit: Adj R sq = ,022)		
L-Parking	,243	,004

Dependent Variable: Act6_RnD_ln

table VI: Significant results of SPSS Multiple Linear Regression Analysis on District Characterics and location of FDI in Research & Development.