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Foreign direct investment location choosing
Datacenter investments in Finland and Ireland

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Description

The objective of the study was to gain knowledge on how big multinational enterprises choose locations for their datacenter investments. And to find especially how Finland can improve in attracting datacenter investments. Datacenter investments are valuable for the host countries as they create lot of job opportunities, and bring money and knowledge to the host country. In Finland, there is a lack of research concerning datacenters and in particular, the reasons that influence the choice of location.

The research method used for this study was benchmarking. Finland was compared to a most successful country in the EU in attracting datacenter investments, Ireland. The approach for this research was qualitative. Primary data was collected by conducting two semi-structured interviews with two experts working in investment agencies, both for Finland and Ireland. The secondary data was gathered through news articles and databases.

The results of the study implicated that foreign direct datacenter investments are not dependent on singular factors, but the combination of multiple factors, and the strategy of the company making the decision. The study showed that the most important factors were data communication infrastructure and datacenter hubs. Recommendations based on the study for Finland were to improve these two factors. Main limitation of the study was that big datacenter investor companies are secretive about their operations.

Keywords (subjects) Foreign direct investment, datacenter, Finland, Ireland

Miscellanous

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Tiivistelmä

Tutkimuksen tarkoitus oli oppia, miten isot kansainväliset yritykset valitsevat sijainnin uusille palvelinkeskusinvestoinneilleen ja kuinka erityisesti Suomi voisi tulevaisuudessa houkutella enemmän palvelinkeskusinvestointeja. Palvelinkeskusinvestoinnit ovat arvokkaita kohdemaille, koska ne luovat paljon työpaikkoja tuoden rahaa ja tietotaitoa. Suomessa ei ole aikaisemmin tehty tutkimuksia palvelinkeskuksista eikä erityisesti syistä, jotka vaikuttavat niiden sijainnin valintaan.

Tutkimusmenetelmänä käytettiin esikuva-analyysia. Siinä vertailtiin Suomea Euroopan menestyneimpään palvelinkeskusinvestointeja vetoavaan maahan, Irlantiin. Tutkimuksen näkökulma oli laadullinen ja primäärisenä tietona käytettiin kahta haastattelua. Tutkimuksessa haastateltiin kahta asiantuntijaa, jotka työskentelevät Suomessa ja Irlannissa sellaisissa virastoissa, joiden tehtävänä on houkutella ulkomaisia sijoituksia. Sekundäärinen data kerättiin akateemisista julkaisuista, uutisartikkeleista ja tietokannoista.

Tutkimuksen tulokset viittaisivat siihen, että ulkomaalaisten investoijien päätökset eivät ole riippuvaisia yksittäisistä tekijöistä vaan useiden tekijöiden muodostamasta kokonaisuudesta ja näiden yritysten strategiasta. Tutkimus osoitti, että tärkeimmät tekijät, jotka vaikuttavat sijoituspäätöksiin, ovat tietoliikenneinfrastruktuurin laatu ja alueella sijaitsevien muiden palvelinkeskusyritysten luoma keskittymä. Tutkimuksen tekijöiden suositukset kohdistuvat Suomeen ja siihen, kuinka maan pitäisi parantaa kyseisiä tekijöitä. Tärkeimpänä rajoitteena tutkimukselle oli suurien palvelinkeskusyritysten tapa suojella tietojaan liittyen palvelinkeskustoimintaan.

Avainsanat (asiasanat)
Ulkomaaninvestoinnit, palvelinkeskus, Suomi, Irlanti

Muut tiedot

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1 Introduction

1.1 Background

Finland has been in economic downturn since the year 2009 and there has been no significant rise in the industrial sector. However, at the same time as the downturn hit, Finland got its first datacenter foreign direct investment from Google, which has been later followed by other big IT-companies, such as Yandex and Microsoft. Datacenters are big storage facilities where IT-companies keep their servers and digital information stored. All of these three datacenter investments combined have brought roughly 1.65 billion euros worth of investments to Finland (Nissilä, Eho & Kokkonen 2015, 1) (Rajala 2015.)

The future of Finland concerning datacenters is looking positive, as Boston Consulting Group expects that 60 new large datacenters need to be built in Western Europe by year 2020. (Nissilä et al. 2015.) Finland stands as a good prospect for attracting new datacenters due to its climate, infrastructure, stable power-grid and high competitiveness in IT-sector. In 2014 Network Readiness Index, Finland was placed first (Bilbao-Osorio, Dutta & Lanvin 2015, 23). However, the country is struggling to benefit from these positive possibilities.
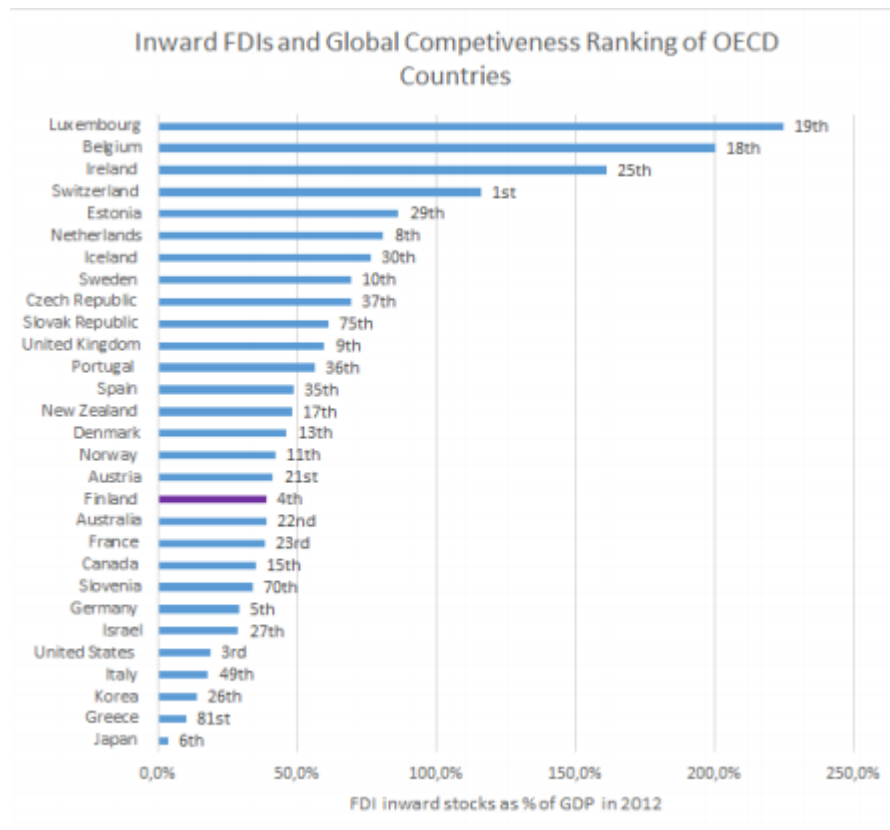
Figure 1. Inward FDIs and Global Competitiveness Ranking of OECD Countries (Nissilä, Eho & Kokkonen 2015, 3)

As can be seen from the graphic above, Finland is falling behind other OECD countries and it is also trailing all the other Scandinavian countries in the foreign direct investment stock percentage as of gross domestic product, in the year 2012. Finland's number of inward foreign direct investments has been slightly changing up and down on a yearly basis during the last ten years (Statistics Finland 2015).

To find aspects where Finland needs improvement, this research will use Ireland as a benchmark for highlighting the differences between these two countries. The reason why Ireland was chosen as the benchmark is because of the country's ability to attract FDIs, and its position in the "Inward FDIs and Global Competitiveness Ranking of OECD Countries" (3rd), as their inward FDI stocks percentage is 160 percent of their gross domestic product.

Finland has three major datacenter players located in the country; Google, Microsoft and Yandex, Whereas, Ireland has multiple times more of these big companies' datacenters, including Amazon, Dell, Apple, Facebook, IBM, Google, Vodafone and Microsoft. (SiliconRepublic 2016).

Foreign direct investments (FDI) are investments by a multinational enterprise (MNE) into another country, in the form of establishing company operations or acquiring already established assets abroad. Primary objective of an FDI is generating economic growth but these investments have also big effects on the country that's being invested in trough created jobs and generated knowledge (Financial Times 2017).
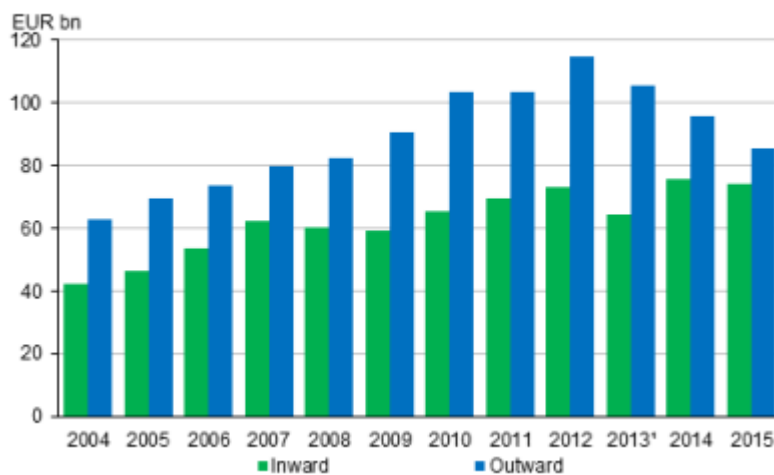
Figure 2. Stocks of FDI for Finland in 2004 to 2015 (Statistics Finland 2015)

The value of inward FDI stocks in Finland in year 2015 was 74.2 billion Euros (see figure above), following a slight drop of 1.6 billion from 2014. However, the overall amount of inward FDIs has been positive following the economic downturn in 2009. At that time (year 2009) the value of inward FDIs was slightly under 60 billion Euros, so the number has grown nearly 25 percent to year 2015 since the economic downturn (Statistics Finland 2015).

1.2 Motives for the research

The audience for whom this research will be useful are policy makers, and agencies such as Invest in Finland which was formed by the Finnish government with purpose of attracting FDIs. The agency has also experts in the datacenter industry. The results of this research will be useful for them to emphasize the important factors when it comes to attracting datacenters. The agency has already fifty investment-ready facilities for datacenters in Finland (Invest in Finland 2017.) Also the topic is rather new and current in the IT-field and there is no earlier literature written about location choosing in the context of datacenters.

Datacenters can have a huge impact on the host country's economy. For example, Nissilä et al. suggested that the Finnish datacenter hub can generate almost 50 000 years of employment and the total economic input of 11 billion euros. (2015, 1). These datacenter investments could help Finland to get out of the economic downturn faster.

1.3 Research objective and questions

The objective of this research is to find the key factors which are creating the gap between the amount and size of the foreign direct investment datacenters coming into Finland and Ireland. The factors consist of both qualitative and quantitative data, as the countries need to be measured and scored at the comparison. Ways of gathering data will be further detailed in the methodology chapter.

This research has one main research question:

- What are the key factors for why Ireland is attracting more datacenter investments than Finland?

The main question is answered by using Michael Porter's diamond model (1990) as a tool for recognizing and evaluating the factors which are forming the big picture of datacenter investment environment. The reason for this theoretical framework is the fact that for identifying the weaknesses of Finland's investment environment it is useful to compare it to Ireland, which is Europe's most successful country with attracting datacenters. The diamond model is most suitable for this because it analyzes the factors carefully. The research approach for the research is qualitative and the method is benchmarking. Benchmarking method is further explained in the "methodology" –chapter.

1.4 Structure

The second chapter of the research is the literature review. It explains the theoretical framework used for this research. All the factors covered in the research are based on the framework. Third chapter is the methodology chapter. It explains how we gathered and analyzed the data. In the fourth chapter we combine all the results and in the fifth chapter we discuss the differences between Finland and Ireland. In the final chapter we give our opinions on what Finland should improve to be more competitive in the future.

2 Literature review

2.1 Key concepts

This literature review covers two main concepts, internationalization and foreign direct investment. Internationalization is the practices of companies increased operations in the international markets. (Susman 2007, 281.) Internationalization is a big part of firm's competitiveness and in the modern market it often separates successful and not so successful companies. (Porter, 1990.)

Foreign direct investment (FDI) is an investment by a multinational enterprise (MNE) into another country, in the form of establishing company operations or acquiring already established assets abroad. Primary objective of an FDI is generating economic growth but these investments have also big effects on the country that's being invested in trough created jobs and generated knowledge. (Financial Times 2017.) Javorcik (2004) did a research on the topic of, does FDI's increase productivity in domestic firms and she found that there is a definite correlation with inward FDI's and success of local firms especially in developing economies. FDI's are clearly distinguished from portfolio investments, which are purely purchases of the ownership of the company as FDI's purposes are to control the company's decision making processes (625). Carr, Markusen and Maskus (2001) divided FDI's into horizontal and vertical. Horizontal FDI being MNE's which produce same products and services in different countries and vertical MNE's that produce different stages of goods or services in different geographical areas (693).

2.2 Motives for FDI

Most cited taxonomy of FDI motivations was proposed by Dunning (1993), where he divided the motives in to four categories:

1. Resource seeking: This is the category for MNE's that expand abroad to acquire resources that are not available in the home country of the entity, such resources are for example cheaper labour and natural resources.

2. Efficiency seeking: These are motives for MNE's that want to take advantage of another countries consumer habits, demand for products and also from their capabilities of supply. In efficiency seeking the firms aim is to make their production and sales as efficient as possible.

3. Market seeking: In this category MNE's motives are to penetrate new markets to increase sales and to create a bigger presence on markets, this often leads to building new production facilities to cater the new market.

4. Strategic asset seeking: In the last category of motives Dunning wrote about MNE's that invest abroad in aim to acquire and develop new technologies instead of benefit from existing assets.

Cantwell and Mudambi (2005) divided FDI motives in to two categories, which were resource exploitation and resource exploration. In resource exploitation MNE's motives to expand abroad are to exploit local circumstances such as cheap labour, bigger markets and natural resources.

In resource exploration MNE's look for new technologies and knowledge. Comparing this theory to Dunning's model it can be seen that the first 3 motives in Dunning's model are similar to resource exploitation and that fourth one fits in to the resource exploration category. These two categories are very similar with Dunning's model, but Dunning's is a bit broader (1109-1110).

2.3 Factors to influence the choice of FDI location

2-step model was proposed by Jain, Kumar & Kothari (2015) as a tool for scholars and also for managers, to help them make the best solution when choosing locations for FDI's. The two steps this model includes are firstly the company and industry specific location determinants, and secondly the country specific location determinants. It has to be noted that for all companies the model determinants are not of the same value and in some industry specific MNE's they have to value the importance of some determinants according to their line of business. For example, firms looking for new technology may find agglomeration more important than other determinants (1-22).
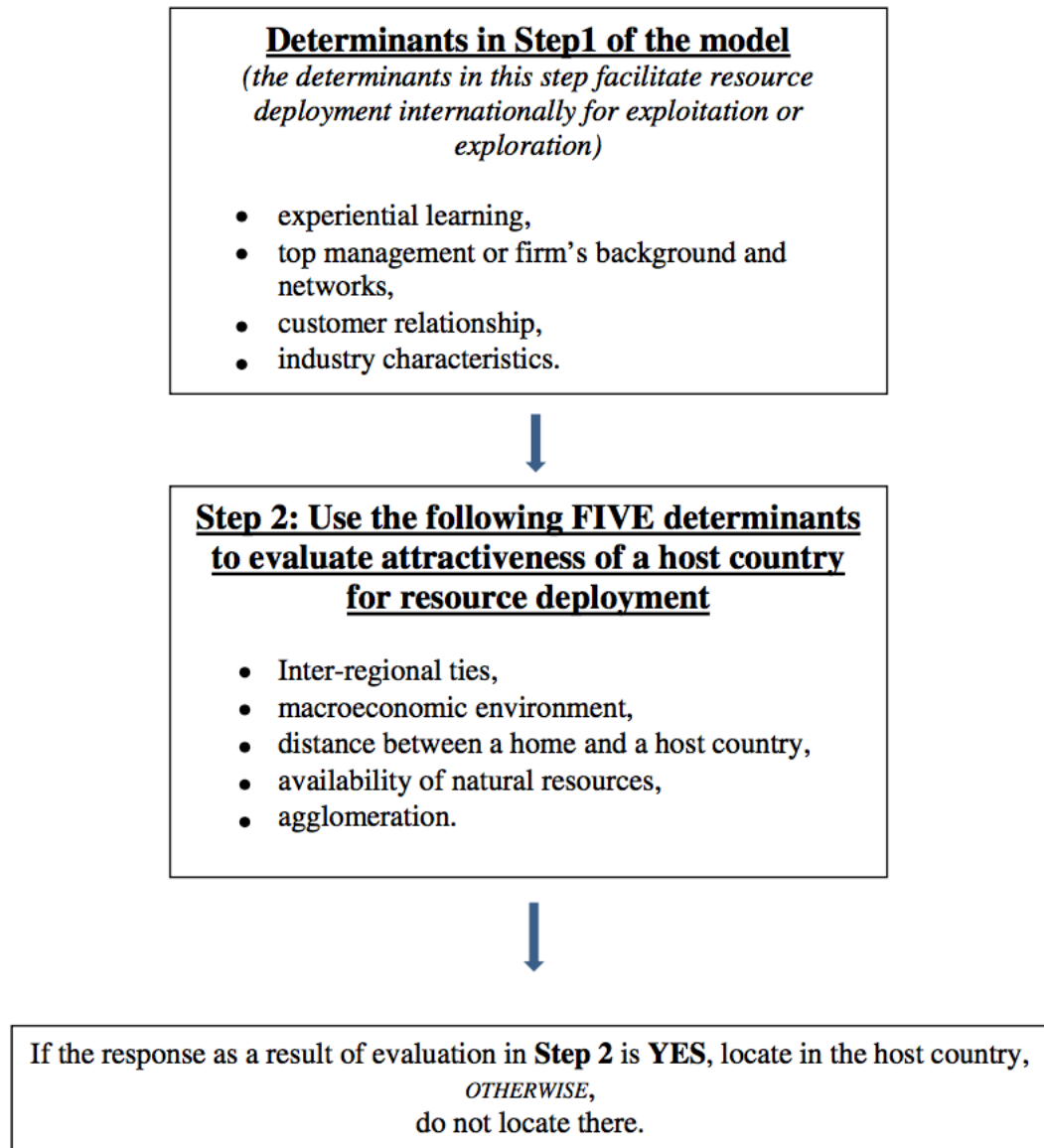
Figure 3. Two-step model (Jain et al. 2015, 6)

In step 1 MNE's evaluate their own firm by looking at the following factors:

- Experiential learning: Has the firm invested abroad before? Dowell and Killaly (2009) found that companies that have done earlier FDI's are more poised to doing it again, especially if they have earlier experience in investing to the host country. Dowell and Killaly also found that firms with earlier experience are better at avoiding unpredictable

environments than new comers and make more stable investments (13).

- Management or firm's background and networks: Tihanyi, Ellstrand, Daily & Dalton's (2000) research into international diversification from management created results that indicated that firms with younger managers, longer managerial careers in top management, managers with elite education and international experience have higher levels of international diversification. Ownership of the company has also a big effect on internalization depending on if the company is privately owned or state-owned (1172-1173). Filatotchev, Isanchenkova & Mickiewiecz (2005) identified that "restrictions on managerial independence may have negative effects on the companies' performance and internalization". Well connected managers can also improve internalization (22).

- Customer relationships: Especially firms that have client-vendor relationship often use customer following as a factor when making decisions, also these companies use their clients' expansions overseas as determinants (Li & Guisinger 1992, 690).

- Industry characteristics: This determinant is important for firms in various ways for example, competition in the home country positively relates to increases of FDI's and MNE's have resorted to following their competitors abroad as a defensive strategy to stay competitive (Li & Guisinger 1992, 685). Ghemawat and Thomas (2008) in their research into cement industry found that in geographical areas were, there is agglomeration of FDI's prices are also higher. These MNE's prefer to compete with global firms rather than local firms and at the same time keeping prices high (25).

After evaluating own attributes in phase 1, phase 2 will concentrate on the determinants evaluating attractiveness in host countries.

- Inter-regional ties: Political and historical ties of regions have important effects on FDI. Military conflicts have negative effects on bilateral investments while defence pacts and other military alliances increase investments, horizontal FDI's are often not as heavily influenced by security relations as vertical FDI's (Li & Vashchilko 2010, 777.)

- Macroeconomic environment: Local factors of the host country which attract inward investments, financial development openness to trade, infrastructure, level of education, development of market, communication and transformation facilities and quality of human capital (Alguacil, Cuadros & Orts 2010, 7.)

- Distance between a home and a host country: This determinant can be divided in to six sub-categories that explain the different types of distances between home and a host country. (Jain et al. 2015, 11).

  o Psychic distance: These distances are differences in political systems, religion, language and business practises. Literature has yielded uncertain results at best, Ellis (2008), found that psychic distance has a moderate effect but it's not a direct effect. (365-366).

  o Cultural Distance: How far are the two countries culturally? Perceptions and experiences have also an effect in work life and managers prefer locating in a country that is culturally close to their own (Chapman, Gajewska-De Mattos, Clegg, Jennings & Buckley, 230).

  o Geographic distance: Distance between home and a host country, smaller companies rather invest in a host country physically close and bigger companies are more ready to invest in a country that is further away (Erramilli, Srivastava & Kim

1999, 41); (Nachum, Zaheer & Gross 2008, 23-24). Ghemawat (2001) added that also difference in climates and lack of proper transportation between the countries lengthens the geographical distance (1.)

- o Economic distance: This distance includes distinction in consumer incomes, control of corruption, technological and economic development and capabilities. Long economic distance influences FDI's negatively (Cuervo & Genc 2008, 965); (Ghemawat 2001,1,6).

- o Administrative distance: Distances of legal and financial institutions, political hostilities or lack of associations. (Ghemawat 2001) presented administrative distances in his CAGE distance model but otherwise it's rarely looked at in location choosing literature (1).
- o Institutional distance: Host countries that have efficient governance so political and legal climates have been more effective in drawing inward FDI's. (Globerman & Shapiro 2003, 5).

- Availability of natural resources: This is the biggest determinant for resource seeking FDI's and the countries with most natural resources that can be accessed are most likely chosen by MNE's that seek resources (Asiedu 2006, 74).

- Agglomeration: Agglomerations and clusters draw companies because of their supply and demand benefits. Firms with a low level of product differentiation can benefit from operating at the same geographical location by using same resources and knowledge (Nachum & Wymbs 2005, 429).

If all of these determinants match the needs of the company, this model suggest that this is a good location for the company to invest

2.4 Theoretical framework: Michael Porter's Diamond Model

Michael Porter introduced Diamond Model as a tool for defining regional competitiveness in his book The Competitive Advantage of Nations (1990). The framework investigates four determinants which all as a combined whole creates a setting for national business environment. These four factor determinants are:

    I.   Factor conditions
   II.   Demand conditions
 III.   Related and supporting industries, and
 IV.   Firm strategy, structure and rivalry. (Porter 1990, 78).

Porter states in his book that the factors are vital part for business, industry or geographical area in order to become internationally successful and competitive. If a change happens in any of the four categories, it will affect the rest of them as well. (Riasi 2015, 18).

The diamond model theoretical framework for analysing decisions for choosing the location of foreign direct investment, will serve as a grading-tool for comparing particular countries at their chances of attracting FDIs.
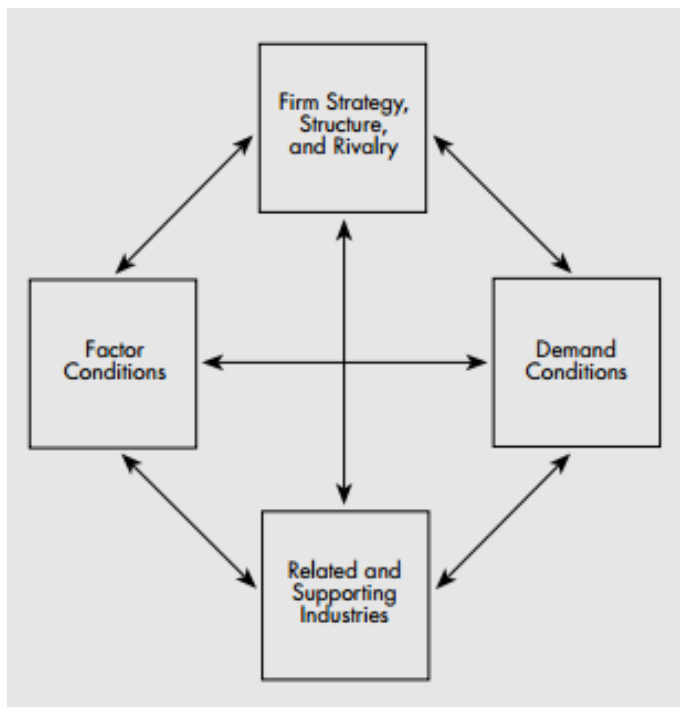
Figure 4. Diamond model (Porter 1990, 78.)

2.4.1 Factor conditions

Factor conditions are production factors which are tightly linked to a certain industry. All the resources that a business needs in production state of development are included in the factor conditions determinant. They can be divided into two factors (Konsolas 1999, 17):

1. Basic factors
2. Advanced factors.

The basic factors consist of all the resources that are essential part of any location: raw materials – wood, water, soil and plants; climate – weather conditions, temperature and amount of daylight; human resources – including regular labour and semi-skilled labour; capital resources – availability level of capital for businesses; and location – geographical area and size. The basic factors do not require sophisticated planning and are fairly easily accessible, yet they don't possess attributes for knowledge-based advantage. (Moon, Rugman & Verbeke 1998, 141).

Advanced factors are the factors which distinguish companies between their levels of competitiveness. They are instrumental in setting the efficiency level for production segment in different industries. These factors are harder to access through foreign investments, which makes them an advantage for a company in domestic markets, if the domestic advanced factors are on desired level. The factors include technological infrastructure – communication systems and data network; knowledge-based resources – high-skilled labour, educational- and research-based institutes; and infrastructure quality – quality and reliability of state organized services, such as health care. (Porter 1990, 79).

2.4.2 Demand conditions

Demand conditions cover the factors of home demand of a certain country or geographical area. Porter (1990) states that companies succeed in business when the home demand defines the need-base for their products or services in early stage of company's life-cycle. The size of the demand in not necessarily the main point for success, but the "quality" of demand which the home customers are reflecting, and its accessibility and clarity are important aspects. The competitive advantage on home customers over foreign competitors is reached when the visibility of the domestic company is higher than for the foreign companies. (82).

The elements of demand conditions can be divided into three groups:

- Sophistication level of buyers,
- Size and structure of demand, and
- Growth and internationalization.

The sophistication of buyers means that the buyers are capable of evaluating products and services in a way of knowing their value. The buyers are critical about prices and product quality, and can combine these attributes when making purchase-decisions. Sophisticated buyers are also the most demanding ones. The habits of sophisticated buyer force the company to

shape their strategies on how to innovate, advance and add value to their products and services. (Porter 1990, 82).

Size and structure of the domestic demand define the levels of scale and segments of the demand. The overall size of the demand is a minor component for competitive advantage, more important factor is the size of sophisticated buyers, and how they are scattered into advanced segments. (Konsolas, 1999, 18).

Rate of growth over multiple demand segments affects the company's competitiveness also on the international markets. Advanced segments and number of sophisticated buyers help domestic companies to analyze future trends about their product values, and how the values are considered in the foreign markets. (Konsolas 1999, 18).

2.4.3 Firm strategy, structure and rivalry

The third component in Porter's diamond model consists of three major aspects affecting companies' competitiveness: strategy, structure and rivalry. Konsolas (1999) states in his research that strategy and structure should be efficiently suiting a certain industry in order to gain competitive advantage. The factors affecting these two segments are, for instance managerial leadership, organisational structure, objectives set within the company and orientation towards global competitiveness. The style of managing companies is in the roots of domestic education; in what kind of conditions and settings are the current managers educated. (19). Porter (1990) highlights the importance of motivational factor within the structure and strategy. The motivation level of employees is a key resource for boosting the efficiency of business and competitiveness. Factor conditions reflect to the strategy and structure section through educational choices in the past by current managers and employees. (84).

Konsolas (1999) suggests in his research that also small and emerging companies should be considered as a factor for this part of the diamond model. They create more competition within industries as they intensify rivalry. The more there is domestic rivalry, the more the companies are forced to add value through innovating to their services and products in order to remain at their targeted position. (19-20). Domestic rivalry goes beyond company versus company approach, as it often intensifies to personal level; the companies are competing for domestic resources, such as human resources and government investments. (Porter 1990, 85.)

2.4.4 Related and supporting industries

The last of the four sectors in the diamond model is related and supporting industries. They include all the companies, enterprises and industries which are connected in the business processes or affecting each other by supplementing value chain segments. (Moon et al. 1998, 143.) The supporting industries consist mainly of suppliers, which can be both, domestic and foreign suppliers. The study by Moon et al. (1998) shows also that the factor conditions, especially advanced factors, have a linkage with supporting industries, as they categorize the present-day infrastructure to be a supporting industry. (143).

Companies create more competitive advantage when the suppliers are located nearby. Close location provide possibilities for more efficient and faster ways of using communication channels, transportation, information management and trading of valuable assets. (Porter, 1990, 83). Level of innovation is more likely to witness growth when the company and its suppliers are located close to each other, and the company is able to participate in the development process for instance by acting as a practical test customer for new innovations from the suppliers. In addition, domestically located suppliers are great advantage for a company if they are competitive in international markets. Through the international networks, the suppliers have a chance of receiving valuable information from other competing industries

which then the supplied company can use for its competitiveness fostering. (ibid., 83).

The related industries include all the other parties of the value chain apart from suppliers. The can also be either national or international actors. They offer the same type of beneficial aspects for companies as the supporting industries do, regarding competitive advantage. (ibid., 83)

3 Methodology

3.1 Research approach

This research has one main research question.

- What are the key factors for why Ireland is attracting more datacenter investments than Finland?

The research approach is qualitative. This includes one interview and one questionnaire with two people who are involved in agencies attracting foreign direct investments, especially for datacenters. One person is from Finland, and one from Ireland. The articles and reports which were read by the authors are also part of the qualitative data. The qualitative research approach allows the data gathering process to be more flexible and open-ended by using interviews and articles. For interviewing the person in Finland's agency, the most suitable method from qualitative approach is semi-structured interview which allows to gather detailed information with personal insight for particular topic. (Saunders, Lewis & Thornhill 1997, 320.)

Research method for this research is the benchmarking method. Using the benchmarking method, it is easy to identify differences in country processes in achieving competitive advantage. The benchmarking is especially suitable for determining how one country is doing its practices better than others.

(Teplanova 2012). In this research the benchmarking method is implemented by comparing Finland and Ireland.

3.2 Research context

3.2.1 Datacenter

Datacenters are facilities for enterprises where their computing services like servers and databases are maintained. In Facebook's example their datacenters are used to hold the user information. They process daily 350 million photographs, 4.5 billion "likes" and 10 billion messages per day, so a lot of storage space is needed. (Harding 2015.) Datacenter consumes a huge amount of energy and produces a lot of heat, so companies running these facilities are constantly trying to develop ways to cool their datacenters and save as much energy as possible. Big firms are tackling cooling issues by for example locating their facilities in colder climates like Google in Finland and Facebook in Sweden. Microsoft has also a project were they are setting up a datacenter underwater in hopes of having an easy cooling solution. (Vincent, 2016.) Security of datacenters is important as there is a lot of user data held in the facilities: leaking or manipulation of this information could have severe effects on the company. Bigger datacenters are also always protected by back-up systems for cases of power outages or other extreme conditions.

3.2.2 Finland

Finland is located in Northern Europe, between Sweden and Russia (see picture below). It was declared independent from Soviet Union in 1917. With its population of 5.5 million it is rather small country population-wise. (Worldometers, 2017.) Finland is a highly developed welfare state with gross domestic products of 42 000 US dollars per capita. (OECD, 2017.) The country has been a member of the European Union (EU) since 1995 and uses Euro as a currency. (European Union, 2017.) The biggest trade partners for Finland are Germany and Sweden. Between the two countries, Finland do

most of both export and import trading. (The Observatory of Economic
Complexity 2017.)

Figure 5. Location map of Finland (Freeworldmaps 2017)

3.2.3 Ireland

Ireland is an island country located west from the mainland Europe, on the
west side of United Kingdom, only Irish Sea in between (see picture below).
The country was declared independent from the United Kingdom in 1921.
(History 2017.) The population of Ireland is 4.7 million (Worldometers, 2017.)
and its gross domestic product is 69 000 US dollars per capita, making it the
second wealthiest country among the OECD countries. (OECD, 2017) Ireland
uses Euro as its currency and it has been part of the EU since 1973.
(European Union, 2017.) The country has significant trading partnerships with
the United States and the Great Britain, US being the number one for

exporting and the Great Britain for importing. (The Observatory of Economic Complexity 2017).

Figure 6. Location map of Ireland (Freeworldmaps 2017)
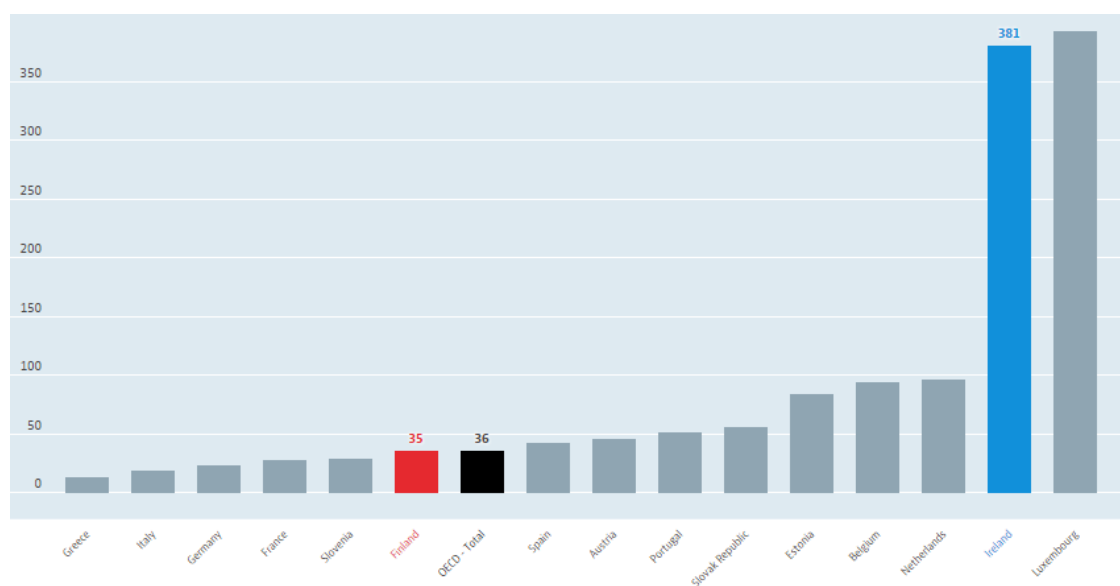

Figure 7. Inward FDI stocks in 2015 in percentage of GDP (OECD 2017)

The graph above shows the amount of inward FDI stock as of percentage of country's GDP, in 2015 among European Union member countries. As it can be seen, Ireland is totally in its own category with the percentage being 381, whereas Finland's figure, 35%, is slightly under OECD average.

3.3 Data collection

Primary data for this research was collected by doing one semi-structured interview with Alpo Akujärvi, Head of Industry, Data Centers from Invest in Finland. The interview was done in Invest in Finland's main office in Helsinki. We chose Akujärvi to be our interviewee because of the fact that he is the head of the datacenter section in the Invest in Finland agency, which is responsible for attracting foreign direct datacenter investments to Finland. The interview was conducted in Finnish, as the interviewee was Finnish. We chose the semi-structured interview, because of the topic of the research has many aspects to it, so there might have been something important missing if the interview had been done fully structured. Saunders, Lewis and Thornhill (1997) suggest that having additional questions coming up during the interview, helps to cover the research questions more deeply. (320.) They also state that managers tend to support doing in-person interviews rather than online interviews, to ensure the reliability and trustworthiness towards the researchers. (324.) We recorded and transcribed the interview with Akujärvi, as Saunders et al. suggest that semi-structured interviews need to be recorded so that the detailed data covered in them would not get lost. (320-321.) The questions for the semi-structured interview are available in English in the "Appendices" –chapter.

Another primary source was a questionnaire with the president and founder of Host in Ireland, Garry Connolly, whose team won European DC Location initiative of the year in 2016, and was nominated for the same award in 2017. Face-to-face interview was not possible to conduct, so we decided to use a

questionnaire instead. The questions for this questionnaire are also available in the "Appendices" –chapter.

Secondary data consists of news articles, research papers, and data bases. Based on the different factors of the diamond model, we searched for the information individually factor by factor by using the internet. All the sources for the secondary data can be found in the "Appendices" –chapter.

The interview and the questionnaire were chosen as primary source because of the fact that there is not a lot of public information available about datacenters. We chose to contact people from Finland and Ireland to gain valuable insights into these countries. And by using interview and questionnaire we were able to focus our questions on the country-specific factors.

For literature review we used scholarly publications and research papers to get as reliable data as we could. Secondary data was mostly used for the results chapter to gain more knowledge about the datacenter activities in Ireland and Finland.

3.4 Data analysis

For this research we used Excel to organize data by using codes for different factors. This allowed us to filter the factors easily and compare the factors between Finland and Ireland. The variables used in the data analysis were factor conditions; demand conditions; firm structure, strategy and rivalry; and related and supporting industries. The variables which could be measured quantitatively were compared with numbers and statistics. In qualitative factors we searched for similar data from both countries that could then be compared. Figures below show how we divided the secondary data variables for both Finland and Ireland, by using Excel.

Table 1. Data variables

Code of the variable	Variable	Definition of the variable
FC 1	Electricity	Price of industrial electricity
FC 2	Temperature	Average temperature Helsinki
FC 3	Internet speed	Average internet speed in Mbits per second
FC 4	Road infrastructure	Amount of primary and secondary roads
FC 5	Renewable energy	Share of renewable energy in gross final energy consumption
FC 6	Number of airports	Number of airports in the country.
FC 7	Number of passengers	Helsinki-Vantaa airport passengers 2015
FC 8	Workforce	Labor force with tertiary education (% of total) 2014
FC 9	Level of Education	Higher Education System Strength Rankings 2016
FC 10	Immigrant education	% of immigrants with higher education 2011-2012
FC 11	English proficiency	English profiency ranking in the EF English Proficiency Index
FC 12	Skilled labour	World talent ranking 2016
FC 13	Hourly labour cost	Average cost of labour in 2015
FC 14	Cost of Living Index	Finland 23:th with a score of 73,06
DC	Internet penetration	Internet penetration statistics
RY	Cyber security	Chance of data risked in the country.
ST 1	Corporate Tax	Corporate tax rate 2016
ST 2	Political stability	Political stability
ST 3	Control of corruption	Control of corruption
ST 4	Amount of datacenter FDI:s	Amount of datacenter investments
ST 5	Program to attract IT professionals	Workforce initiative
CS	Invest in Finland	Investment agency
RSI 1	Fiber Optic cable	Fiber optic cabel connecting Finland and Germany
RSI 2	Fiber optic cable	Fiber optic cabel connecting Europe and Asia

The qualitative data analysis was done by first transcribing the interview and the questionnaire in to written form. After that we simplified the data by using data reduction method introduced by Saunders et al. (1997) which allowed us to focus on the exact factors based on the Porter's diamond model. We highlighted the parts of the transcribed text which were about the factors. (503.) After this, we compared the data from the interview and questionnaire with our already written results based on the secondary data to see if our results are valid, and to find new insights.

3.5 Verification of results

For literature review, sources we used were most cited scholarly publications, and for our interviewees we used people who work for government-related agencies.

Internal validity

Saunders et al. (1997) explained internal validity as following:

"*Internal validity in relation to questionnaires refers to the ability of your questionnaire to measure what you intend it to measure.*" (372)

Our semi-structured interview connected the theoretical framework with the research questions, and through that we received results which suit the framework. Therefore, our results from both quantitative and qualitative data links the theoretical framework to our findings.

External validity

The research was solely focused on datacenter context, except for the literature review section. This means that the results are limited to datacenter

industry, making them difficult to adapt to other industries. However, the diamond model is suitable for analysing any industries or countries in the world.

Reliability and objectivity

According to Saunders et al. (1997) the reliability of findings and results is meaning the same as consistency. (373.) In other words, other researchers should come up with similar results. Another thing to be considered with reliability is the triangulation of data. This means that data needs to be collected from multiple sources in order to avoid possible mistakes in one source. (Saunders et al. 1997, 602.)

Our research follow these reliability guidelines, as we have at least three different types of sources, which all have consistent results. One source is from primary data; the interview with Alpo Akujärvi from Invest in Finland. This interview is reliable as it is voice-recorded and transcribed. Second primary data is the questionnaire with Garry Connolly, which is transcribed. The two other sources are from secondary data; scholarly publications and news articles. We have findings based on both sources without any conflicts between the sources.

Based on our findings, other researchers should be able to receive same results. The secondary data collected for the research is available for everyone to explore. The primary data was collected by conducting an interview with the highest hierarchal datacenter expert in Finland, which makes it the most reliable source for datacenter-knowledge about Finland.

4 Results

The results chapter consists of four segments based on the Michael Porter's diamond model: factor conditions; demand conditions; firm strategy, structure and rivalry; and related and supporting industries concerning both Finland's and Ireland's attractiveness towards datacenter FDIs.

Datacenters are major investments for any multinational enterprises. Altogether datacenter foreign direct investments in Ireland sum up to roughly 4.5 billion Euros. (SiliconRepublic 2016.) In Finland, the amount is 1.65 billion Euros. (Nissilä, Eho & Kokkonen 2015.) (Rajala 2015.)

Invest in Finland's datacenter specialist, Alpo Akujärvi stated in the interview for the research that datacenter investments are not done based on just one factor no matter how appealing the factor might look like. The location is mostly chosen by combining different factors to create a bigger picture that supports the company's strategy.

4.1 Factor conditions

Energy

Datacenters consume great amounts of energy and the price of it makes a big difference in the cost of running the facility. Also lot of companies nowadays are strict about their energy policies; they want to use fully renewable energy in running the facilities. For example, Google has an intention to be run 100 percent on renewable energy in the year 2017. (Moodie 2016.) In our interview with Alpo Akujärvi (Head of Industry, Datacenters, Invest in Finland), he stated that still for most of the companies the price of the energy is more important than the source of it, especially at the investment decision making process. However, the companies are looking to use renewable energy as a source after settling down in a new location. Akujärvi also talked about

datacenter companies facing public resistance for their facilities consuming large amounts of energy. Use of renewable energy could decrease the amount of resistance the companies are facing.

The price of electricity relevant for datacenters is the Eurostat's (2017) data for "Electricity prices for industrial consumers". The statistics show price for industrial consumers in kilowatt-hours and it does not include taxes for the electricity.

At the first half of the year 2016, Finland's electricity price for industrial consumers was 0.0614 Euro (€) per kWh. The price was one of the lowest (5th) among all of the European Union (EU) countries which were listed in the comparison. Only four countries had a smaller price of electricity: Norway (1st), Denmark (2nd), Sweden (3rd) and Bosnia & Herzegovina (4th).

Electricity price for industrial consumers in Ireland at the first half of 2016 was relatively high among the EU countries. With the price of 0.1198 € per kWh, Ireland ranked fourth highest in the comparison. The three countries with higher price were Malta, the United Kingdom and Liechtenstein.

Multinational enterprises making the datacenter investments, take energy policies into consideration with care. For instance, Facebook's datacenter in Luleå, Sweden, is fully run by renewable hydroelectric energy. (Euronews.com 2015.) Share of renewable energy in gross final energy consumption within a country is an important indicator for investors as they look for areas for datacenters with possibility of having green energy. According to Connolly, investor companies are looking for green energy, but are especially highlighting the sustainability of it.

According to Eurostat, Finland's share of renewable energy in gross final energy consumption was 38.7 percent in 2014. (2017) The country ranks third among listed EU countries, only losing to Sweden and Latvia. Target share of renewable energy in gross final consumption for EU countries combined for

the year 2020 is 20 percent. Finland has topped this target, and also the country's individual target, which is 38%. (YLE 2014). For Ireland, the share of renewable energy was 8.7% in 2014. Their country-specific target for 2020 is 16%. (Eurostat 2017.)

Finland takes the better of Ireland in the price of industrial electricity and the renewability of it.

Hazards and climate

The geographical location of Finland is minimizing the risks of natural hazards in the country. There are no active volcanoes nearby, and the closest ones in Iceland are separated by the Atlantic Ocean (Volcano Discovery 2017.) Chances for notable earthquakes in Finland are basically zero as the closest tectonic plate seam is roughly 2000 kilometers away. The most commonly occurring natural hazard which affects especially Northern-, Southern- and Western Finland is flooding. Flooding occurs annually especially during spring and sometimes during summer. The spring flooding is due to snow melting and summer floods are occurring if there are heavy rains (Climatechangepost.com 2017.) The flooding causes damage to roads, buildings and other infrastructure. It also limits the construction possibilities in the areas which might be affected by flooding. Between the years 1995 and 2015, Finnish government has had to pay compensation payments of over 19 million euros in total caused of all types of flooding (Finland's Environmental Administration 2016.)

Earthquakes and volcanoes are not threatening nor probable natural hazards in Ireland (Ireland Office of Emergency Planning 2012, 7.) The country's closest active volcanoes are located in Iceland. Flooding is the most common natural hazard which causes incidents and damage for infrastructure and in some cases for people as well. In 2011, there were two casualties in Dublin caused by flooding due to heavy rain (Ireland Office of Emergency Planning 2012, 7.)

Both Ireland and Finland are located in stable geographical areas, and the chances for natural disasters are moderately low in both countries. In Connolly's opinion, stable locations are not that important because of the fact that both Ireland and Finland have similar locational features.

Temperature is a key factor for datacenter's location choosing. Datacenters produce lot of heat while operating, so colder locations make cooling solutions easier and cheaper, as the facilities can use the outside air to cool down the systems. For instance, Facebook built its first datacenter outside of the United States to Luleå, Sweden, with one of the reasons being the cold air at the location. (Euronews.com 2015.)

Finland is located on the right side of Sweden, and the two countries share relatively similar temperature conditions. The average temperatures for coldest and hottest months for Helsinki, Finland, in 2016 were -9 degrees Celsius (January) and 19 degrees Celsius (July). The average temperature for the whole year was 7.4 degrees Celsius. The same statistics for Ireland's (in Dublin) coldest and hottest months were 6 degrees Celsius (February) and 17 degrees Celsius (July). The annual average was 11.2 degrees Celsius. (World Weather Online 2017).

In this case, Finland's annual average temperature is lower than Ireland's, making it better location from the cooling point of view. However, Akujärvi suggested that in the future this factor will not be as relevant because of the development in the field of cooling systems. And Garry Connolly (president and founder of Host in Ireland) stated that climate and especially temperatures are not factors to differentiate two countries, but from investor's social responsibility companies like greener facilities.

Internet speed

Ireland is connected to both mainland Europe and USA by optic fibre cables that provide Ireland with a highly reliable network and low latency, Finland

also has an optic fibre cable connecting Finland to Germany. (Newenham 2015.) (Willits 2016.)

Datacenters require certain internet speed to function efficiently. Oliver Smith from the Telegraph created a world map for average internet speeds for each countries. The map is based on data from Akamai, which is one of the biggest worldwide web traffic and information handler. (Telegraph 2016). The speed is displayed as Mbits per second and it is calculated through different factors. These factors are "Average connection speed, average peak connection speed, high broadband connectivity, broadband connectivity, 4K readiness and mobile." (Belson 2015.)

Both Finland and Ireland are in the top 10 of the worldwide internet speed listing. Ireland is second on the list with average speed of 17.4 Mbits/s, only losing to South Korea. Finland is number 10 on the list with average speed of 13.7 Mbits/s.

Alpo Akujärvi stated the following:

"*Data communication infrastructure is one of the most important factors for companies choosing location for their datacenters.*"

Host in Ireland's Garry Connolly also stated that fiber cable connections are critical piece of infrastructure especially for on-island located countries, and their datacenter data export.

When looking at the average internet speeds in Ireland and Finland, Ireland has the second fastest internet connections in the world while Finland makes it to the top ten as well, the difference is still quite substantial. This is mostly due to the big optic fibre cables connecting Ireland to the North America and mainland Europe, which keeps the latency of the connection low and reliable. Finland has only one current fibre cable connection to Germany (C-Lion 1), but in February 2017 Cinia (Finnish Network Company) made deal with one of

the biggest networking companies in Russia, TTK, to connect Europe and Asia by using the Cinia C-Lion 1 submarine cable. This deal allows Finland to be connected to Russia and Asia via optic fibre cable. (Cinia 2017).

Mobility infrastructure

Airports

Airports are important part of mobility infrastructure for datacenters, as they offer fast connections for human resources and small cargo between cities and countries. The flight destinations from each airport are vital part of choosing a location for a datacenter. (Neudorfer 2013.) Finland has 32 airports in the country (Airport Authority 2017) which is relatively high amount. Biggest of them is the Helsinki-Vantaa International Airport through which 16.4 million passengers moved during the year 2015. (Finavia 2016.) Ireland has 20 airports located in the country (Airport Authority 2017), significantly biggest being Dublin International Airport. In 2015, 25 million passengers flew through this airport, and it has over 180 destination connections through 34 operating airlines. (Dublin Airport 2017.)

Ports

In Finland, the biggest port is located in a little over 100 kilometers east from the capital city, Helsinki. The port is called Port of HaminaKotka and their total throughput in gross tonnes in 2016 was 13.4 million. (Port of HaminaKotka Statistics 2017.) In Ireland, the biggest port is located in the capital city and it is called Dublin Port. The port had throughput of 34.9 million in gross tonnes in 2016. (Dublin Port Company 2017.)

Roads

European road system includes two big road categories which allow quick connections between cities and possibility to transport freight on them. They

are primary roads and secondary roads. The numbering of these roads are marked with one or two digits.

In Finland, the total number in kilometers for primary and secondary roads combined is 13328. The number includes motorways as part of the primary road category. The longest individual primary road goes vertically through the whole country from Helsinki to Utsjoki and it is 1294 kilometers long. (Grönroos 2010). In Ireland, the primary and secondary roads cover 5 306 kilometers of the national road system. There are many motorways connecting the biggest cities, such as M1 from Dublin to Dundalk and M4/M6 from Dublin to Galway. (Transport Infrastructure Ireland 2017).

Both Finland and Ireland are highly developed countries with their infrastructure, but in the case of datacenters in these two countries the physical infrastructure is not as relevant for datacenter operations as the datacommunications infrastructure.

Human and knowledge resources

Datacenters are high tech facilities and running them requires professional workforce. IMD World Talent Report ranked Finland to having 6th most skilled labour force in the world with Ireland placing 18th. This report also brings forward a lot of interesting factors concerning this research, as in the criteria of appealing foreign investors Finland placed 23rd and Ireland 6th. Finland's biggest hindrances being high personal income tax rate and the amount of foreign high-skilled people, so it can be seen that Finland's own workforce is highly skilled but faces a lot of problems attracting foreign highly skilled workers. (IMD 2017).

Finland's problems with attracting highly skilled foreign workers can also be seen from a research done by OECD back in 2011-2012 where it was found that 47% of Finland's immigrants had a foreign higher education, as in Ireland the percentage was 71%, which is a big difference. (OECD 2015) As this

research was done for year 2012's data we can't completely rely on it as the humanitarian crisis of Middle East in recent years with over 4.5 million people fleeing Syria alone in this crisis has definitely changed this figure. (Rodgers, Gritten, Offer & Asare 2016) In 2015, Finnish Minister of Foreign Trade, Lenita Toivakka, stated in her conversations with the leader of Google's Hamina datacenter, Joe Kava, that Google would still be interested in investing even more money in Hamina, but they have problems finding suitable and qualified workforce for their needs. (Palojärvi 2015.)

Biggest difference between the workforce in Ireland and in Finland is the language spoken as most of the biggest companies in the world come from English speaking countries. In this factor Ireland has a big advantage compared to Finland with it having English as a mother tongue, Finnish people have good proficiency in speaking English and Finland placed 5th in the world in the EF English Proficiency Index. (EF 2017.) Even though Ireland has the advantage of being English speaking country, Akujärvi stated in the interview that Finland has not faced any problems concerning English proficiency and Finnish people are known for having strong English skills.

Universities and schools can with cooperation with datacenter companies provide students project work that provides valuable experience for both parties and in the future even possibility of employment. For example, Google in Finland is working on a project with the local university XAMK (formerly known as KYAMK), where students work on real-life projects with the company. This can be really beneficial for the students and for Google (Puhakka 2016). Universities also provide highly educated workers and Finland is often praised for its schooling system and in the Higher Education System Strength Rankings of 2016 Finland was ranked 16[th,] but Ireland isn't far behind as it placed on the same ranking 25th. (Top Universities 2016.) However, Garry Connolly from Host in Ireland stated that closeness with universities and availability of local IT-experts is not very important factor for multinational enterprises as their operations are spread out around the world,

including large metropolitan areas with the most successful technology agglomerations.

Costs of human resources

Finland and Ireland both are highly developed countries with a high standard of living. This can be seen from the Numbeo Cost of Living Index where Ireland is ranked as 16th most expensive country in the world and Finland 23rd. (Numbeo 2017). This has an effect on companies investing in these countries as labour costs can get quite expensive, Eurostat calculated that in Finland the average hourly labour cost is 33,0€ and in Ireland it is 30,0€. This is the total sum after insurances, taxes etc. (Eurostat 2017).

Overall, both Finland and Ireland are countries with high standard of living with high tax rates.

4.2 Demand conditions

Demand conditions are rather insignificant in the context of datacenters. Multinational enterprises are focusing their data handling to continental areas, rather than focusing on one country's data flow. For instance, Google's datacenter in Hamina, Finland, handles data from all around the Europe, not only Finland's data.

However, one factor to be considered as demand condition is the internet penetration, meaning what percentage of the population have an access to internet. In Finland the percentage is 92.5% and in Ireland 81%. (Internet Live Stats 2016.)

4.3 Firm strategy, structure and rivalry

Corporate tax

Corporate taxation is a big factor for companies when they choose locations for their new investments as it determines how much of their profits will be taxed.

Ireland has a really low corporate tax rate of 12.5% which has given them a big advantage in luring big multinational enterprises (MNE), like Google, Apple etc. Finland's corporate tax rate is moderately low 20% and when comparing to neighbouring countries Sweden, Denmark and Norway, Finland has the lowest tax rate. (KPMG 2017).

Most of datacenters are cost-centers, meaning that they are only there to store data. They don't have other operations and they don't generate any profit. So, instead of being profit-centers, corporate tax does not affect them as much as they effect on these companies' other operations.

Both Finnish and Irish governments have no special incentives for datacenter investments and activities. (Akujärvi; Connolly)

Capital resources

The companies making their decision to invest in a datacenter, whether it is building it from start to finish or acquiring an already existing facility, are the ones to bringing in the capital for the investment, this can be seen from the fact that Google alone invested in 2015 10 billion dollars on cloud services with most of the expenditure going to datacenters (Shields 2016). These expenditures include supporting actors such as construction and security. (Binnie 2014.)

Investment agencies

Both Finland and Ireland have an agency formed to attract FDI's, these two agencies, Invest in Finland and IDA Ireland have similar structure were they provide important information and experts who are there to help possible investors. In addition Ireland has an initiative called Host in Ireland specialized in promoting the country in global markets. Both agencies are easy to contact through their website using several languages. Invest in Finland have a webpage in English, Russian and in Chinese and IDA Ireland's language selection is even broader by having in addition also German, Spanish, French, Indian and other languages. (Invest in Finland 2017; IDA Ireland 2017)

In June 2016, Irish government launched a 1.9 million euro initiative to attract up to 3 000 top tech professional annually to Ireland by using social media as a promotion tool to highlight business opportunities and high quality of life in Ireland. Irish Minister of Jobs Mary Mitchell O´Connor said that if Ireland wants to keep attracting foreign investments they will need a bigger amount of higher educated workforce to meet the needs of the growing ICT field. (Enterprise Ireland 2016).

Rivalry

In this case rivalry is not significant factor as datacenters are not competing with each other. However, hub of datacenters provides an area with highly educated and professional workforce, and attracts new investors to the area.

In Finland, the datacenter hub is still quite small with three big datacenter players, Yandex, Microsoft and Google. Ireland has over ten big multinational enterprise datacenters in the country, and nine out of ten biggest software companies in the world have operational facilities in Ireland. Akujärvi stated that depending on the strategies of these datacenter companies, they choose whether they focus their operations to hubs or not. He also said that Ireland

has a reputation for being the European datacenter hub, so for most multinational enterprises it is clear that they need to be located there.

Control of corruption

The World Bank defines the control of corruption with following sentence:

"Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests." *(2017)*

The control of corruption index measures around 40 different factors, such as "Public Trust in Politicians", to come up with a figure for each country. The level of corruption is determined on the scale from -2.5 to 2.5 with -2.5 being the worst possible.

Finland ranked second at the list of control of corruption in the whole world in 2015. (The World Bank 2015.) The score was 2.28 and for the first placed country (New Zealand) the score was 2.29. For Ireland, the country placed at 18th position with the score of 1.64. Overall, the average figure for the whole world was -0.04.

Political Stability

The World Bank has created a political stability index for countries, in which it measures all the factors contributing to the level of political stability. The index takes into consideration also political-based violence, such as terrorism. (World Bank 2017). The scoring for countries is done by the same way as for control of corruption index. The highest score is 2.5 and the lowest is -2.5.

In the measurement index for political stability in 2014, Finland received 1.26 points and ranked 9th in the world. Ireland's position was 23rd with the score of 1.05. The average for whole world in 2014 was -0.04.

Both countries have stable political systems and risk of conflicts and other political disasters is quite low. Also the prevention of corruption is well developed in both countries.

Cyber Security

Datacenters are used to maintain and store data, in Facebooks example that's all the user data they have which means that the information held in datacenters needs to be properly protected.

Cyber-attacks are really costly for big companies, BusinessInsider has calculated that global average cost of a cyber-attack resulting in a breach in 2015 cost 3.79 million per breach. (Camhi 2016.)

Artmotion ranked countries based on where data is most secure by using factors such as risk of corruption, level of infrastructure and political risk. In this ranking Finland placed 11th with a data risk score of 7.6%, Ireland couldn't make it to top 15 with a score of 13.2%. (Artmotion 2017.)

European Union's Court of Law has created a law to protect all citizen's personal information. It states that no personal information of EU citizens cannot be transferred to countries where data protection practices are not sufficient. As Finland and Ireland are both members of the EU, the law offers same benefits for both countries. (Confederation of Finnish Industries 2015).

Cyber security is really important for companies storing user-information or other important data. These companies invest a lot of money to insure their data is secured. So, from the data risk score above it can be seen that Finland is slightly more secure place to store data than Ireland.

Companies' investment decisions

From companies' perspective the datacenter investments are mostly based on the combination of physical resources and human resources. For big investors the energy sources and location are major factors from physical resources. For instance, Google's decision to invest in Dublin, Ireland, was because of the area with developing possibilities, and the source of renewable energy. (Google 2017.) Facebook stated that one of the main reasons for their decision to choose Ireland for their datacenter was the availability of windpower, and the possibility to run the facility fully with renewable energy in the future. (Furlong 2016.)

From human resources, the most important factor is the knowledge resource. Google highlighted the importance of having workforce and local expertise concerning different phases of construction, when they revealed their decision to invest in Hamina, Finland. (Google 2017.)

4.4 Related and supporting industries

Related and supporting industries in the context of datacenters include for instance construction, cleaning and security suppliers. Host in Ireland's Garry Connolly stated that the availability of these services, especially construction and maintenance, are key factors for establishing and maintaining datacenter operations.

According to Datacentres Ireland, who organize datacenter conferences for operators in Ireland, the list of parties connected to the related and supporting industries of datacenters include for example the following industries: power solutions providers (Aggreko Ireland and E+I Engineering), air conditioning

providers (EDPAC International Limited), physical security and fire security
(Cross-Guard and Chubb), logistics providers (ATC Logistics), strategy and
management consulting companies (CBRE Data Centre Solutions), and
services of engineering (Kirby Group). (Datacentres Ireland 2017). These are
all companies which cooperate with datacenters.

Similar organization for Finland is Finnish Data Center Forum, which is
connecting member companies in their network for datacenter operators. In
other words, they are offering their services to datacenters as well. For
example, the following industries and the companies representing them are
found from the members: construction services (Hilti), plumbing and sealing
services (Roxtec), engineering providers (Äyräväinen), energy solutions
provider (Granlund), power solutions (Celltech), datacommunication security
providers (Coromatic), fiber cable solutions (Hexatronic), and facility
maintenance (ISS). (FDCF 2017).

5 Discussion

5.1 Objective and summary

The objective of this research was to gain knowledge on based on what
factors do multinational companies choose locations for their datacenter
investments. Our research question was "*What are the key factors for why
Ireland is attracting more datacenter investments than Finland?*" We
answered this question by benchmarking a really successful country (Ireland)
to Finland. Our main finding was that there is no single factor that is solely
behind the investment decision. It is the combination of multiple factors and
the strategy of the company.

The result of this study shows that the most important factors are data
communication infrastructure and the datacenter hub. The total package of
factors is similarly good in both countries, but in these two most important
factors, Ireland is better.

5.2 Managerial implications

The findings of the study encourages Invest in Finland to market the fibre cable connection to Asia, which will be important because of the rising markets of Asia. The connection will probably raise the internet speed in Finland. So perhaps, Invest in Finland should promote Finland as a destination for Asian companies. The agency should also promote Finland's political stability as it is one of the best in the world; and also the price of electricity and the renewability of it.

Another important practical implication is that the government of Finland should cooperate with other countries to establish new fibre cable connections to get Finland to at least top 5 in the world for internet speed ranking. And to also add to the existing capacity for data transferring. This would make Finland look more attractive for companies that need to transfer a lot of data.

The Finnish government should also start initiatives through which Finland would be able to attract professional and highly educated workers similarly like Ireland is doing. This was also agreed by our Finnish datacenter expert (Akujärvi). These initiatives would be beneficial both for companies' already in Finland to get them investing more, and for new companies looking for locations for their operations. Through all these implications Finnish datacenter hub would expand and Finland could become the Northern European datacenter agglomeration.

5.3 Comparison with earlier literature

Similarly to the findings in the present study, earlier literature from Dunning (1993) proposed that companies choose locations for their investments based on their needs. In the case of datacenter investments, they can be placed into "*Efficiency seeking*" –category. The efficiency seeking companies invest abroad to locations where they can make their facilities as efficient as possible. For example, Facebook chose Luleå for their datacenter location

because of the cold climate and the access to completely renewable energy. (Euronews 2015.)

The two-step model by Jain, Kumar & Kothari (2015) suggested that in the step 1, companies evaluate themselves on the need and capabilities to invest abroad. Once they make the decision to invest, they use the step 2, where they use five different determinants to evaluate the new host country based on the resources they are looking for. The first section, "Inter-regional ties" helps the investor to evaluate the political stability and the host country's political ties with the investor country. Section two, "Macroeconomic environment" helps the investor to cover financial development, infrastructure and the quality of human resources in the host country. The third section is "Distance between a home and a host country". This covers how far the two countries are culturally, geographically and economically. The fourth section is "Availability of natural resources", but in the case of datacenter this is not as important section as the others. The final section is "Agglomeration" which is the same as a hub, which is really important for companies looking for locations for their datacenters.

Our findings are in line with earlier literature, especially with the two-step model.

5.4 Limitations of the research

Main limitation of the research was that big datacenter investor companies are secretive about a lot of their information concerning datacenter operations. Limitations in collecting primary data was that we were not able to conduct a face-to-face interview with the Irish datacenter expert. Instead, we received answers to our questions in written form. The lack of the face-to-face interview with our Irish expert limited the data we could get, as it was not possible to present follow-up questions.

The reliability of our data was ensured by using various sources of the same information to make sure that they all have the same results. Our results were in line with the opinions of the interviewed experts, making them more reliable.

5.5 Recommendations for future research

It would be important to study datacenter hubs and activities from other viewpoints in addition to the focus of the present study. For example, as we interviewed experts from the countries' point of view; further research could be done from the companies' point of view by interviewing their representatives. This would create insights into these companies' strategies as we found that mostly these strategies are more important for the investment decisions than the offerings from the host country itself. Combined with our research, it could bring valuable results. Further research in this field would be of great help for Finnish government in attracting more datacenter investments in the future.

Further research could also be done in the field of Asian datacenter companies, as the new Cinia fibre cable is the first connecting Europe to Asia. This could be beneficial to Finland if the Asian companies would build datacenters in Europe.

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Appendices

APPENDIX 1: Interview questions for Alpo Akujärvi

Factor conditions:

- How valuable are geographical features and climate for datacenters? For example considering temperature and hazards.

- How important is the closeness of research institutes and universities, and possible cooperation of them for datacenters?

- How important factor is the source of energy for datacenter investors? Do many of them require green energy?

- How important is the surrounding infrastructure, for instance availability of airports?

- Have investors had any doubts about the English proficiency among the Finnish workforce?

Firm strategy, structure and rivalry:

- What are the main incentives Irish/Finnish government are offering for MNE's making the datacenter investments?

- Are there any policies by government related to attracting datacenter FDI's?

- Has the higher (compared to Ireland) tax rate been a hindrance for Finland when companies have chosen their investment locations?

- What are the main benefits of investing in Ireland?

- Ireland has an initiative where they try to attract 3000 IT-professionals annually to move to Ireland through social media; does Finland have any similar programs?

- In 2011-2012 OECD's statistics showed that the portion of immigrants with a higher degree coming to Finland was 47%,

whereas Ireland's percentage was 71%. In your work, have you noticed this difference?

Related and supporting industries:

- How important is the availability of supporting and related industries such as construction and maintenance in the specific area of datacenters?
- Have foreign companies had problems with finding professional construction operators?
- How important are optic fiber cable connections for datacenters?
- Is Finland and Russia connected via optic fiber cable?

Demand conditions:

- Do big datacenter companies rather invest in bigger urban areas or smaller rural areas?

Additional questions:

- How is the future of Finland looking in the context of acquiring new datacenter investments?
- How important are datacenter hubs?
- Facebook chose Luleå as their datacenter location mainly based on the cold climate; has there been any interest in investing in to the northern areas of Finland?

APPENDIX 2: Questionnaire for Garry Connolly

Factor conditions:

- How valuable are geographical features and climate for datacenters? For example considering temperature and hazards.
- How important is the closeness of research institutes and universities, and possible cooperation of them for datacenters?
- How can datacenters benefit from local IT-experts and recently graduated IT-specialists?
- How important factor is the source of energy for datacenter investors? Do many of them require green energy?
- How important is the surrounding infrastructure, for instance availability of airports?

Firm strategy, structure and rivalry:

- What are the main incentives Irish/Finnish government are offering for MNE's making the datacenter investments?
- Are there any policies by government related to attracting datacenter FDI's?

Related and supporting industries:

- How important is the availability of supporting and related industries such as construction and maintenance in the specific area of datacenters?
- How important are optic fiber cable connections for datacenters?

Demand conditions:

- Do datacenter companies rather invest in highly populated areas instead of rural areas?

APPENDIX 3: Sources for secondary data (Finland)

Variable	Source
Invest in Finland	http://www.investinfinland.fi/home
Internet penetration	http://www.internetlivestats.com/internet-users-by-country/
Electricity	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_pc_205&lang=en
Temperature	https://www.worldweatheronline.com/helsinki-weather-averages/southern-finland/fi.aspx
Internet speed	http://www.telegraph.co.uk/travel/maps-and-graphics/Mapped-The-world-according-to-Internet-connection-speeds/
Road infrastructure	http://www.mattigronroos.fi/Tiet/eng/
Renewable energy	http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_31&plugin=1
Number of airports	http://airport-authority.com/browse-FI
Number of passengers	https://dxww91gv4d0rs.cloudfront.net/file/dl/i/g2DkIw/oaQCEIvHBsfZylj6F_g_og/Matkustajatlentoasemittainsuo-fi1215.pdf
Workforce	http://data.worldbank.org/indicator/SL.TLF.TERT.ZS?end=2014&start=1980&view=map
Level of Education	https://www.topuniversities.com/system-strength-rankings/2016
Immigrant education	http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/indicators-of-immigrant-integration-2015-settling-in_9789264234024-en#page152
English proficiency	http://www.ef.fi/epi/regions/europe/finland/
Skilled labour	http://www.imd.org/uupload/IMD.WebSite/Wcc/NewTalentReport/Talent_2016_web.pdf
Hourly labour cost	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lc_lci_lev&lang=en
Cost of Living Index	https://www.numbeo.com/cost-of-living/rankings_by_country.jsp
Fiber Optic cable	http://www.datacenterdynamics.com/content-tracks/core-edge/cinia-completes-submarine-cable-between-germany-and-finland/95525.fullarticle
Cyber security	https://www.artmotion.eu/risk-map/
Cyber security	https://www.artmotion.eu/risk-map/
Corporate Tax	https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html
Political stability (2014)	http://databank.worldbank.org/data/reports.aspx?source=worldwide-governance-indicators and http://www.theglobaleconomy.com/rankings/wb_political_stability/
Control of corruption	http://www.theglobaleconomy.com/rankings/wb_corruption/
Amount of datacenter FDI:s	http://www.oxfordresearch.fi/media/241351/finland_s_giant_data_center_opportunity_final_version.pdf

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APPENDIX 4: Sources for secondary data (Ireland)

Variable	Source
IDA Ireland	http://www.idaireland.com/invest-in-ireland/
Internet penetration	http://www.internetlivestats.com/internet-users-by-country/
Electricity	http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do
Temperature	https://www.worldweatheronline.com/dublin-weather-averages/dublin/ie.aspx
Internet speed	http://www.telegraph.co.uk/travel/maps-and-graphics/Mapped-The-world-according-to-Internet-connection-speeds/
Road infrastructure	http://www.nra.ie/roads-tolling/our-road-network/
Renewable energy	http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_31&plugin=1
Number of airports	http://airport-authority.com/browse-IE
Number of passengers	https://www.dublinairport.com/about-us/did-you-know/facts-and-figures
Workforce	http://data.worldbank.org/indicator/SL.TLF.TERT.ZS?end=2014&start=1980&view=map
Level of education	https://www.topuniversities.com/system-strength-rankings/2016
Immigrant education	http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/indicators-of-immigrant-integration-2015-settling-in_9789264234024-en#page152
Skilled labour	http://www.imd.org/uupload/IMD.WebSite/Wcc/NewTalentReport/Talent_2016_web.pdf
Hourly labour cost	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lc_lci_lev&lang=en
Cost of Living Index	https://www.numbeo.com/cost-of-living/rankings_by_country.jsp
Fiber optic cable	http://www.irishexaminer.com/ireland/300m-cable-connects-new-york-with-mayo-348337.html
Fiber optic cable	http://www.activetelecoms.com/news/infrastructure/first-subsea-fiber-optic-cable-system-planned-between-ireland-and-france
Cyber security	https://www.artmotion.eu/risk-map/
Corporate tax	https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html
Program to attract IT professionals	https://www.enterprise-ireland.com/en/News/PressReleases/2016-Press-Releases/National-initiative-to-help-attract-up-to-3-000-top-tech-professionals-per-annum-to-Ireland.html
Political stability (2014)	http://databank.worldbank.org/data/reports.aspx?source=worldwide-governance-indicators and http://www.theglobaleconomy.com/rankings/wb_political_stability/
Control of corruption	http://www.theglobaleconomy.com/rankings/wb_corruption/
Amount of datacenter FDI:s	https://www.siliconrepublic.com/enterprise/data-centre-network-ireland