Impact of external linkages on the innovativeness of multinational companies operating in Finland

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Research Objectives and Methods Innovativeness is an important competitive advantage for many companies in Finland. The purpose of this thesis is to find out how external linkages of multinational companies operating in Finland impact the perceived innovativeness in these companies. Previous research done on external linkages is still quite fragmented as the whole field is quite new in academic literature. This topic is contemporary in terms of most recent theories in international business and investigating the whole area of research has obvious managerial implications. Analysis is based on quantitative data gathered from the largest companies in Finland. The statistical methods used in this thesis are factor analyses and multiple linear regression modeling.   **Summary of the Findings** The main finding of this thesis is that the business partner role seems to have some significance over the benefits of receiving resources from external linkages which is an important signal for further research. Otherwise, not enough evidence of making a conclusive decision whether external linkages of multinational companies contribute to innovativeness in these companies was found. The main limitation to this was the small sample size which limited the number of statistically significant variables in the analysis.
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Tutkielman tavoitteet ja tutkimusmenetelmät

Innovatiivisuus on tärkeä kilpailuetu monille yrityksille Suomessa. Tämän tutkielman tarkoitus on tutkia, kuinka Suomessa toimivien monikansallisten yritysten ulkoiset liikesuhteet vaikuttavat näiden yritysten innovatiivisuuteen. Aikaisempi akateeminen tutkimus tällä alueella on yhä melko vähäistä, koska tämä tutkimusalue kokonaisuudessaan on vielä melko nuori. Tämä aihe on ajankohtainen viimeisimpien kansainvälisen liiketoiminnan teorioiden näkökulmasta ja tutkimuksella on selkeä hyöty käytännön liike-elämää ajatellen. Tutkimus perustuu numeeriseen aineistoon, joka on kerätty Suomen suurimmista yrityksistä. Käytetyt tilastotieteelliset menetelmät ovat faktorianalyysi sekä lineaarinen regressio.

Keskeiset tutkimustulokset

Tutkielman tärkein löydös on se, että liikekumppanin roolilla on nähtävästi merkitystä siihen, millaista hyötyä monikansallinen yritys saa liikekumppanilta saamastaan informaatiosta. Tämä on oleellinen signaali tärkeästä tulevaisuuden tutkimusalueesta. Muutoin analyysin perusteella ei voi vetää yleistä johtopäätöstä siitä, että ulkoisilla liikesuhteilla olisi suora vaikutus yritysten innovatiivisuuteen. Oleellinen analysointia rajoittava tekijä tässä tutkimuksessa on pieni otanta, joka merkittävästi rajoittaa tilastoillisesti merkitsevien muuttujien määrää tässä tutkimuksessa.

Avainsanat: ulkoiset liikesuhteet, innovatiivisuus, monikansalliset yritykset

Kieli: englanti

Arvosana:

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1   INTRODUCTION

1.1   Background

Multinational corporations have become the drivers of international business as they are often forced to expand outside their domestic markets in order to grow and remain competitive. In small open economies (SMOPECs), like Finland, certain industries are very high-tech and very specialized requiring vast amounts of knowledge and intellectual capital. Knowledge and information on the other hand can be acquired internally from other units of the multinational corporation or externally from its business partners. Hence, companies do not operate merely on their own; they possess business relationships for instance between suppliers, buyers, alliance or joint venture partners and other units of the company. These individual external connections or linkages form networks, which are unique to each company forming competitive advantage.

The most contemporary theory of multinational management is the idea that multinational companies create value through their networks. In the international business literature, Bartlett & Ghoshal's (1990) seminal paper first introduced the idea that external networks could be a crucial aspect for multinational companies' competitiveness. By definition, a business relationship or a linkage between two companies involves exchange of products, money or information (Forsgren et al, 2005; 16). In this thesis, the focus is on the knowledge transfer in the external linkages of companies and how this impacts the innovativeness in these companies. It is argued that companies sharing knowledge in their business relationships are able to create more value and be more innovative.

Classical literature finds that research and development (R&D) is the main source of innovation for multinational companies (e.g. Rogers, 1983; 13, Dunning, 1995; 45).

However, the most recent theory in multinational management argues that companies acquire competitive advantage from both internal and external networks the company is linked to (Forsgren et al, 2005). This paper seeks to find evidence towards the assumption the innovation resources can also be drawn from external sources, not merely from internal R&D. In other words, networking with other companies is argued to enhance the innovative capacity within multinational companies.

This thesis is in the field of international business with close focus to multinational management as it examines the impacts of multinational companies' external linkages. Due to the nature of measuring innovativeness, which relates to R&D activities in companies, the background for this study is also in the field of technology. A closer examining of the formation and mechanics of these linkages would lead towards sociological studies, but this is out of the scope of this work. The structure of this thesis is the following; first the research problem is defined followed by definitions of key terms used in this study. The second chapter discusses and analyzes the existing academic literature in this field including the theoretical framework for this research. In the third chapter, the research methods used in this thesis are presented and the results of the performed analyses are described in the fourth chapter. Fifth chapter contains the analysis and discussion about the empirical results and the last chapter contains summary of the main findings and suggestions for further research.

1.2   Research Problem and Research Gap

The idea of international companies creating competitive advantage through their networks is a contemporary view in multinational management. In multinational companies, there has been much research done on the internal linkages within the company and their impacts on the overall performance of the company, but only quite recently have researchers started to put focus also on the external networks of multinational companies. In addition, Hage (1999) finds it surprising that even though

there is academic literature existing on joint ventures and inter-organizational networks, there is very little research done on how these linkages affect innovative capacity.

The main driver behind innovation is knowledge and it is transferred between organizations through linkages which altogether form networks. The main idea of this thesis is to find evidence whether this transferred knowledge is actually contributing towards innovativeness in multinational companies. The goal is to find evidence, whether strong external linkages are beneficial for multinational corporations in terms of innovativeness as their competitive advantage. According to network-based view of multinational management, companies acquire competitive advantage through linkages, which altogether form unique network structures which are valuable for companies (e.g. Forsgren et al, 2005). The assumption is that sharing knowledge resources within external linkages of multinational companies go beyond what is necessary to maintain normal business relationships. By getting access and applying the information received from external business relationships companies should increase their innovative capacity.

The context of a small, open economy (SMOPEC) such as Finland brings specific characteristics to this research problem, as the existence of foreign multinationals is highly important for the development and success of the local business environment. In Finland for example, there are half a dozen highly developed industrial clusters, which are located within specific geographical areas (Palmberg & Pajarinen, 2006). These clusters have proven to be highly innovative and it is reasonable to assume that this is not merely the result of companies having in-house R&D, but also being connected and sharing information with other companies in the same industry.

1.3   Definitions

The existing literature in this field is still quite fractured, presumably because of the contemporary and abstract nature of the research in this field. Therefore, it is necessary to define the main terms used in this work in order to avoid confusion and misinterpretations. In the following, these terms are stated in alphabetical order.

Business relationship

A business relationship is based on a mutual agreement based on trust, commitment, dependence and knowledge and it may consist of exchanges of products money and information (Forsgren et al, 2005; 16-17). Due to the context of this thesis, the discussion of exchanges in business relationships focuses on the transfer of information and knowledge.

Innovation

By definition an innovation is an idea, practice or object which is perceived as new in terms of knowledge, persuasion or a decision to adopt (Rogers 1983; 11). Innovations may be developed by individuals or organizations (ibid) and in this thesis innovation refers to organizational innovation. In Rogers (1983) conceptual study on diffusion of innovations, all new ideas analyzed were technological innovations. The information required to make an innovation possible is usually derived from either R&D activities when the new technology is developed or sometimes from practice (Rogers 1983; 13).

Innovative capacity or Innovativeness

Many contemporary scholars use the term innovative capacity (see for example Hage & Hollingsworth, 2000) to describe the level of innovativeness within an organization. Rogers (1983; 22) uses the term innovativeness and defines it as the level to which an individual or a unit is relatively earlier adopting new ideas than other members of a system. In this thesis, the same definition is used with the expansion that the units in

general refer to companies or MNC subsidiaries and networks to which the company is linked to. Also innovative capacity or innovativeness refers to organizational innovativeness, unless mentioned otherwise.

Multinational Corporation (MNC)

A multinational corporation (MNC) by definition is a company, which engages in foreign direct investment (FDI) and has value-adding activities in more than one country (Dunning & Lundan, 2008; 3).

Network Embeddedness

Embeddedness is an implicit yet integral idea of a social structure. It refers to how different levels of contacts and relationships are linked (or embedded) together forming a network structure. These network structures themselves are connected to larger institutional contexts. (Choi & Kim, 2008). The term embeddedness was first introduced in academic literature in Polanyi's book "The Great Transformation" (Choi & Kim, 2008) which was first published in 1944. Polanyi (2001; 60) introduced the idea that instead of economy being embedded in social relations, they are actually embedded in the economic system. For the purposes of this thesis, embeddedness also consists of both direct and indirect linkages to other businesses (Choi & Kim, 2008).

Relational Capital

Relational capital builds on the goodwill and trust between a firm and its customers, suppliers, partners, government agencies and its other relevant external entities. These linkages are unique and contribute in the creation of competitive advantage to the company. (Chen et al. 2004; 320). Similarly, Palmberg & Pajarinen (2006b; 89) use the term *alliance capitalism* which is the term used by Dunning in his extended Ownership-Location-Internalisation (OLI) paradigm of firm internationalization (Dunning, 1995). Alliance capitalism has emerged from the increasing trend of strategic alliances between internationalized companies and it refers closely to O

(ownership) –advantages. If it is not beneficial to internalize O-advantages, internationalization may still be a viable option through an alliance with a foreign partner. (Palmberg & Pajarinen, 2006b; 90-91).

Chen et al (2004) divide resources contributing to relational capital into three categories; basic resources, strategic resources and knowledge resources. Basic resources include for instance labor and natural resources which occur naturally in a certain economy; they are typically homogenous and available to all. Strategic resources such as skilled workforce or supporting industries do not exist naturally in a society, as they develop over time if the surroundings are favorable. Knowledge resources are the most advanced and difficult to obtain as they have to be learned. On the other hand, these resources tend to be firm-specific and therefore difficult to imitate.

1.4   Research Questions

In order to examine the research problem, it has been divided into four research questions. These questions are investigated through quantitative analysis and they are transformed into proper null and alternative hypothesis later on in the method of research section of this thesis.

The main research question links directly to the research problem and it is stated as:
Do local linkages of multinational companies have a positive impact on their innovativeness?

The assumption that local embeddedness enhances the innovativeness in multinational companies is based on the idea that companies share valuable information or knowledge resources in their external linkages. Correspondingly it is necessary to see whether the direction of information flows between a MNC unit and its local business

partners have an impact on the innovativeness experienced by the MNC unit. The second research question focuses on this and it is stated as:

Does the direction of information flow in external linkages have significance over the impact on innovativeness?

Innovation and innovative capacity have been commonly linked to R&D in classical literature (e.g. Love & Mansury, 2007; 485). However, many new products and processes have developed in close business relationships and it is argued that new knowledge and innovation are not merely a product of individual companies' R&D activities, but also a result of inter-firm communication within business networks (Forsgren et al, 2005). This argument makes in relevant to investigate, whether merely looking at R&D activities in companies is a sufficient way to evaluate their innovativeness. This argument is explored through the third research question:

Does the level of R&D investment correlate positively with the innovativeness in multinational companies?

Networks include business relationships with suppliers, buyers and other business partners. The fourth research question is:

Does business partner role have an impact on whether sharing resources has an impact on innovativeness as a competitive advantage to a MNC?

2 REVIEW OF LITERATURE

The main hypothesis of this thesis is based on the argument presented by e.g. de Propris (2002; 350) that firms tend to be more innovative if they cooperate with other companies than if they do not. Local embeddedness does not exist in companies by chance; it requires attention and commitment before it can be an asset for the company. To support this idea, Florin (1997; 20) finds that a major challenge for managers of MNCs nowadays is building relational exchanges across organizations and nations as those companies able to learn how to develop these relationships are more likely to benefit from efficiency and innovation.

Forsgren et al (2005) find that being able to access and share knowledge is one of the key elements of business networks and a prerequisite for innovation. In conjunction, Rogers (1983; 293) finds evidence that networks can facilitate important connections to information resources and consequently contribute to innovation in companies. Because the purpose of this paper is to study the connection between external linkages of Finnish MNCs and their innovativeness, it necessary to explore the existing literature on both network theory (or alternatively network-based view (NBV) of multinational management) and knowledge transfer between MNCs and their business partners. Examining transfer of knowledge of Finnish MNCs and MNC subsidiaries located in Finland links closely to research questions one and two.

The review of existing relevant literature is divided as follows; first the contemporary academic research on external networks in multinational management is introduced. Second, innovation is explored and focus is especially on how research and development (R&D) related activities are related to innovative capacity of a company. Third, Finland as a small open economy (SMOPEC) is briefly introduced to the point which it is relevant for the purposes of this thesis. The analysis of the literature is concluded with a theoretical framework for this thesis.

2.1   Perspectives of MNC Management

The most contemporary perspective and stream of academic research in multinational management is based on the idea that the performance of MNCs builds on their ability to manage and organize the networks MNC are connected to (Forsgren et al, 2005). An important work contributing to the framework of network-based view (NBV) of multinational management is *Managing the Embedded Multinational* by Forsgren et al (2005), which highlights the role of external linkages contributing to the creation of competitive advantages of the MNC.

The idea of conceptualizing an MNC as a network of inter-organizational exchange relationships was introduced in a seminal study by Bartlett & Ghoshal (1990) and the work of Forgren et al (2005) partially references their work. The main idea is that a multinational company is embedded in an external network and its success depends on the quality of linkages within this network (Bartlett & Ghoshal, 1990).

Network theory has its roots in a preceding internationalization theory, the Uppsala model. The founding idea behind it is that companies base their internationalization decisions on the experience and knowledge they have and therefore they are more likely to take the initial steps abroad in a country with close geographical proximity and somewhat similar business environment. This way knowledge is critical for the success of the internationalization process and by embedding itself in the local network, a MNC subsidiary acquires access to country specific knowledge (Johanson & Vahlne, 2003).

Traditional resource-based view (RBV) finds that competitive advantage in companies is created by unique and inimitable resources possessed or controlled by the MNC (Sharma & Erramilli, 2004). What it doesn't explain is how companies gain access to or create these resources which are its competitive advantage. Inter-company

relationships have an impact on the overall strategy decisions in MNCs' and therefore strategic networks should be incorporated in the study of strategic behavior of firms in order to the research to be more comprehensive. Strategic resources are one contributor to the gains a MNC subsidiary creates, another one is the unique network it is embedded in. (Gulati et al, 2000). This argumentation supports the idea of using the network-based view in the framework of this study, as the purpose is to investigate how external networks impact innovativeness, which is a very powerful competitive advantage to MNCs. Regarding the nature of innovativeness and innovation, which is discussed further in the following chapter, in this context it is also important to link knowledge transfer into the discussion.

Knowledge based view (KBV) sees a firm as a repository of knowledge within which information is codified and activities are coordinated. As different units within the firm cooperate with each other, knowledge is easier to transfer within the MNC than across organizations and this contributes to the ownership advantage of a firm. (Kogut & Zander, 2003). At this point it is paramount to understand that the two perspectives, NBV and KBV are not substitutes for each other. On the contrary, they complement each other as they are both theories explaining how multinationals become unique and create value. Both qualities are required as far as innovation is concerned; without knowledge, there is no information to be transferred and on the other hand, without networks it would be impossible to take an advantage of the knowledge that exists.

Supporting this argumentation, Saliola & Zanfei (2009; 378) conclude in their findings that local embeddedness is positively correlated with the intensity of knowledge transfer between MNCs and local companies suggesting that being more present within the host country has a positive effect on the development of local networks. One of the main incentives for building local relational capital is to gain access to the local resources of innovation (e.g. Dunning & Lundan, 2009; Kale et al, 2000). In other

words, relational capital induces inter-firm learning which is an important source of innovation (Kale et al, 2000).

According to Chen et al (2004; 320) relational capital becomes a competitive advantage, if a firm manages to use the relevant resources in an effective and a unique way. The networked MNC consists of both internal networks, which link the different units of the corporation, and external networks, which are unique to each subsidiary as they are embedded to their individual local context (e.g. Bartlett & Ghoshal, 1990). In other words, in order for relational capital becoming a competitive advantage to a MNC, the corporation needs to be able to transfer the knowledge created through external linkages of its different subsidiaries within the whole organization. Almeida & Phene, 2004 argue that networks with high levels of advanced knowledge offer greater possibilities for innovation, but they also identify a great challenge transferring this knowledge both externally and internally.

2.2   External Networks and Linkages

Networks in multinational corporations can be broadly divided into two categories; internal and external networks. This classification is referred also as a double network (Zanfei, 2000) or dual network (Almeida & Phene, 2004). Internal network in the context of multinational management refers to the relationships and linkages between the different units within the MNC. They can be also referred to as intra-company networks. External networks (or inter-company networks) on the contrary are connections which the MNC has established to its business partners and other external entities relevant to its business. Each MNC subsidiary has its own unique set of these local linkages and in order for them being a strategic asset for the MNC, the knowledge drawn from local networks has to be efficiently transferred through the internal networks. The foundation for this argumentation is discussed in the following paragraph.

Because of the dual network structure, the potential competitive ability derived from external networks has two different levels. Firstly, the MNC subsidiary can develop its own competitiveness within the local markets it is embedded in and secondly, this local competence can be transferred through the MNC's internal networks upgrading the know-how in the MNC as a whole (Andersson et al, 2002). One way to look at this is that the role of external networks is to support and strengthen intra-firm relationships of the MNC. Contrast to this, external networks can also be a strategic resource for the MNC (Forsrgen et al, 2005) and the specific know-how created by a subsidiary's external networks makes it beneficial for the MNC as a whole to transfer the knowledge through the whole organization. (Dunning, 2002).

Zanfei (2000) identifies two streams of academic literature, which focus on either internal or external networks of MNCs. Both of these streams are found relevant in developing an interpretation for the organization of innovative activities within an MNC. On the other hand, academic literature discussing strategic networks from the viewpoint of both internal and external linkages within multinational corporations can be found. For example, an empirical study by Almeida & Phene (2004; 858) conclude as their main finding that MNC subsidiaries gain more innovative capacity from their external linkages within the host country than from the internal linkages to the other units of the MNC, even though the number of internal linkages may be higher than the number of external linkages the subsidiary possesses.

The discussion of this thesis focuses on the external linkages and networks of companies and therefore the analysis of internal networks is out of the scope of this study. However, it is important to realize how the dual network of MNCs is structured and the possible implications it may have when looking more closely into the organization of MNCs activities.

2.2.1 Strategic Networks

Multinational corporations (MNCs) are the main drivers of globalization, and their existence has an impact on the way local companies organize their operations depending on the level of embeddedness to the local environment (Saliola & Zanfei; 378). Foreign MNC subsidiaries are linked to the local business environment and these linkages create a unique network which ultimately becomes a strategic resource for the whole company (Andersson et al, 2002).

Part of companies' growth derives from developing their existing business relationships. Also companies cherish these strategic relations and are ready to establish new relations which support their existing strategic business relationships. (Forsgren et al. 2005; 67). To conclude, a strategic network of a company consists of these linkages. According to Gulati et al. (2000) strategic networks are composed of inter-organizational relationships and have the potential to allow firms to access information, resources, markets and technologies. Similarly, networks play an important role in discovering new opportunities, testing new ideas and supporting organizational development within companies (Aldrich & Zimmer 1986 in Lee et al, 2001).

The network structure to which an individual firm belongs to may be also more or less internationalized; in other words, it may include internationalized companies but also firms operating only in a national setting. (Forsgren et al. 2005; 27). This relates directly to the foundation why companies internationalize in the first place – to gain access to local resources and markets which otherwise would remain unreachable. The main research question of this thesis relies heavily on this finding as it is argued here that building and nurturing these local linkages ultimately transfers into innovation and competitive advantage.

2.2.2 Business Partner Role

A traditional reason for collaboration between business partners is the fact that external networks perform a vital role in accessing complementary resources as companies very often cover only a part of their value chain in-house (Burt, 1992; Pfeffer & Salancik, 1978 in Lee et al, 2001). This argument applies well to business relationships to suppliers and buyers. Choi & Kim (2008) discuss further the expansion of buyer-supplier relationship as they point out that having formal contracts between these two parties automatically links them to each others' existing business relationships. In other words, these parties may be forced to interact with each other in order to be able to maintain their routine operations.

A more contemporary view on this matter is that external networks provide important channels for sharing and getting access to information and resources (Echols & Tsai, 2005). This development widens the field of inter-firm communication from classical buyer-supplier relationships to also cover other business partners. As the previous discussion shows, different views exist on the relevance of different business partner roles. Therefore, it is also important in this thesis to more closely analyze, whether the business partner role is relevant when discussing possible impacts on innovativeness. This discussion is more closely analyzed through the fourth research question.

2.2.3 External Embeddedness

The term embeddedness has become a commonly used term among scholars and it describes the level of adaptation to a certain network and it emphasizes the importance of relationships among different business actors for an MNC (Andersson et al, 2002). Echols & Tsai (2005) define network embeddedness as whether or not a company's network structure is redundant by the company being connected to other firms.

Andersson et al (2002 & 2004) find some variation on how embeddedness is defined in different contexts, but they find the following common aspects:

- Network embeddedness is a strategic resource for MNCs'
- Embeddedness can be understood as a continuous variable which develops over time
- It can be divided into relational and structural embeddedness. Relational embeddedness refers to direct external relationships a subsidiary has which serve as sources of learning whereas structural embeddedness focuses on the network structure where the subsidiary is entrenched and focuses on the advantages the network offers in contrast to individual relationships.

On the basis of the definition above, in this thesis the term embeddedness refers to relational network embeddedness.

Local embeddedness is the result of external linkages a company possesses which form a unique network structure which creates value for the company. Andersson et al. (2004) have investigated how international MNC subsidiaries' local embeddedness effect on their strategic role within the MNC. They find that numerous studies have been made on the internal networks and resource transfer, but only a few exceptions have studied the external business relationships. However, in their empirical study they find that MNC subsidiaries' external relationships have significance in the overall performance of the MNC and therefore they argue that inter-organizational networks should be included while studying differentiated MNCs. Therefore it is important to further investigate the impacts of external networks on the overall performance of MNCs which also justifies the relevance of this research.

Almeida & Phene (2004) have investigated the influence of external information on technical innovation within subsidiaries of multinational corporations within the semiconductor industry in their study. These subsidiaries are simultaneously embedded in both the internal MNC network and to the external local business environment

referring to the previously mentioned dual network structure of the MNC. Their research finds that technological richness within the MNC, a high level of local adaptation of the subsidiary and high level of development within the host country all correlate positively with the increased levels of innovation within the subsidiary. Their empirical findings also point out that linkages to host country knowledge provide the best inputs for innovation. Similarly, technical embeddedness is found to have direct positive correlation with subsidiary's expected market performance in terms of increased sales volume, market share and profitability (Andersson et al, 2002). Local linkages also facilitate value creation especially in the form of product innovations (Tsai & Ghoshal, 1998) and long-lasting external networks reduce costs through knowledge sharing and mutual understanding (Chen et al, 2004). Based on these findings, it can be said that MNC subsidiaries embedded in the local business environment create greater competitive advantages comparing to a situation where the same activities were conducted merely in the home country.

Local presence is found to be efficient in building long-lasting relationships based on trust (Dyer & Chu, 2000). However, there are costs associated with building these relationships referred to as linkage costs and therefore unique and significant benefits derived from these linkages need to exist (Chen et al, 2004). Another possible hazard in building external linkages is them becoming a burden to a MNC. One such case is referred to as overembeddedness, where the level and intensity of external relationships becomes so high that emotions may override economic imperatives (Uzzi, 1996). Echols & Tsai (2005) have investigated how network embeddedness impacts the performance of product and process niche companies, in other words companies which have niches product or process differentiation as their competitive advantage. They find that this influence can be either positive or negative based on the network conditions.

2.3   Innovation and Innovative Capacity

There are quite a few different ways innovation is categorized in academic literature. A common theme between researchers is to separate product and process innovation. In addition, some literature separates organizational innovation from these two main categories. Damanpour (1996; 694) for example defines organizational innovation as a means of changing an organization either as a response to changes in the external environment or defensive action to influence the environment and finds that most important predictors of organizational innovation are structural complexity and organizational size. Other types of categorization or break-downs also exist. For example, De Propris (2002; 340) breaks innovation into four categories: product, process, incremental and radical innovations. For purposes of this thesis, the main categorization, i.e. defining between product and process information is used as the research problem does not include deeper analysis of innovation types. However expanding the definition of innovation beyond product innovation makes it relevant to seek the sources of innovativeness in companies, as R&D activities in general produce specifically product innovations (Rogers, 1983).

Lee & Kang (2007) distinguish between product improvement and product innovation. Their definition for product innovation is developing new products significantly different from existing ones as product improvement is defined as a significant technical enhancement in an existing product. Considering that R&D covers both these areas, using the amount of R&D as a measure of innovation does not make a distinction between innovation and improvement.

Product and process innovations can be investigated through the concept of innovation networks. This framework consists of six functional dimensions (Table 1), which all describe different research activities, all relevant to innovation. (Hage & Hollingsworth, 2000)

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Table 2.1. Functional dimensions of an idea innovation network.

Functional Dimension	Definition
Basic research	Acquiring new knowledge without any particular application or use in view.
Applied research	Acquiring new knowledge directed towards a specific practical aim or objective.
Product development or product innovation	Systematic work based on research and experience aimed towards developing new products.
Production research or process innovation	Research aimed to design new production products or processes.
Quality control research	Research aimed to improve the quality of products or processes.
Commercialization research	Research aimed to understand customer demands or to improve distribution channels.

Source: Hage & Hollingsworth, 2000; 980

Communications and connectedness among the different functions are determined by the various modes of coordination. Inter-organizational relations as a mode of coordination have become increasingly invasive especially in industries involved in complex knowledge base. (Hage & Hollingsworth, 2000). This model helps in understanding the different ways R&D exists in organizations. Nevertheless, it is important to investigate whether these activities alone are the factors contributing towards innovativeness in MNCs.

2.3.1   Research and Development (R&D) in MNCs

R&D related activities of multinational companies can be targeted to either adapt existing products or processes into international context or to generate new knowledge and competencies for the MNC (Dunning & Lundan, 2009). This links to Lee & Kang's (2007) previously discussed distinction between improvement and innovation. R&D is directly aimed towards creating new products, services or processes within companies and these activities can therefore be understood as a direct source of innovation. This

traditional way of looking at innovation merely as a result of R&D has been recently challenged by many corporate leaders as they have realized that innovation should occur throughout the organization (Balsano et al, 2008). This idea is supported by Lawson & Samson (2001; 382) as they find that leading innovators encourage innovativeness anywhere in the organization, not only in its R&D department. As a result it can be argued that R&D as a measure of innovativeness in companies is questionable.

Accordingly, the use of R&D as a measure of innovativeness divides opinions among scholars. Palmberg (2002) for instance uses R&D intensity as a measure for the level of innovation in companies. However, he recognizes that even though R&D intensity in most cases is a valid measure of innovativeness within an industry, it also neglects some other sources of innovation, which are relevant to the actual commercialization of a technological opportunity (Palmberg, 2002; 194). Accordingly, Lee & Kang (2007) point out that not all innovative activities lead to the actual realizations of innovations. Therefore expenditures on R&D as a measure of innovation do not properly take into consideration the actual number and intensity of innovations. This is in conjunction with de Propris (2002), who states that small firms tend to be more innovative than larger firms even though their investment on R&D often is very small.

Freel (2000) has investigated product innovation barriers in small manufacturing firms. In conjunction with the main argument of this thesis, he concludes that innovative small enterprises were much more likely to have linkages to organizations involved in innovative activities which imply that one source of innovativeness lies within these external linkages of companies. Correspondingly, Love & Mansury (2007; 485) have found that companies with well-established R&D functions are more capable of applying information received from external linkages.

Freel's (2000) study does not take into consideration linkages to contractual business partners such as suppliers and buyers. Palmberg (2000) on the other hand finds that in science-oriented industries' R&D related activities and relations are the main source of innovations. In supplier-oriented industries where R&D intensity is found to be lower, innovative capacity is more likely to be linked to developments in process technology, in other words process innovation (Palmberg, 2000). De Propris (2002; 344) has found evidence that cooperation on innovation within production networks have a positive impact on innovation. In other words, firms which have cooperation on innovation with their client firms are likely to be linked to them through the supply chain.

All in all, recent academic literature has challenged R&D's role as an incubator of innovation and as a measure of innovativeness in organizations. These findings are later on further discussed in the discussion of empirical findings section regarding research question three but already at this point it can be noted that evidence is very little supporting towards R&D investment correlating positively with innovativeness in MNCs.

The following two paragraphs discuss more detailed the impact of R&D location in MNCs. It is important to remember that even though R&D is not a perfect measure of innovativeness, it still contributes towards it. Following the argumentation of this thesis, in-house R&D can be further on developed by tapping into the knowledge resources of the local business environment.

MNC subsidiaries in different locations have different responsibilities and levels of autonomy. One of the most powerful reasons for an MNC to decide to decentralize its R&D activities is getting access to the knowledge and talent of another country's innovation system (Dunning & Lundan, 2009). Regarding the location of MNC's R&D activities, Kuemmerle (1997) distinct between home-base exploitation and home-base augmentation whether or not a subsidiary is using merely the R&D resources provided

by the MNC or also drawing location advantages from the host country. Palmberg & Pajarinen (2006; 55) find evidence to support the idea of home-based augmentation being more beneficial to innovation in the case of Finnish multinationals.

The presence of MNC subsidiaries is also beneficial for local companies within the host country, especially in the case of home-based augmentation. Benefits of external networks to local entities are often referred to in literature as FDI spillovers. The definition of the term is that the presence of a foreign subsidiary results as benefits in terms of productivity, capability or efficiency for local firms (Blomström & Kokko, 1998). A significant contribution to investigating FDI spillovers is a paper by Scott-Kennel (2007). The purpose is to address the limitations in the existing literature on FDI spillovers, to differentiate the foreign affiliates according to their linkage formation and finally to analyze the relationship between linkage formation and affiliate characteristics.

The following section discusses knowledge transfer within external linkages and its impact on innovation. As it was found in this chapter, R&D contributes towards innovation in organizations, but not all innovation can be traced as a result of R&D. By transferring knowledge through external linkages it is argued that companies do not necessary lose the results of their in-house R&D, but allows them to access the knowledge resources from other companies as well.

2.3.2 Knowledge Transfer and Innovation

Innovation is a learning process and is therefore dependable of knowledge creation and accumulation (Dicken 2007; 98). In this research, the resource which is investigated is knowledge as it can be seen as the fundamental ingredient in innovative activities. For example, Grant (1996) in Almeida & Phene (2004), states that innovation arises from recombining existing knowledge from different sources. Dunning & Lundan (2009; 27)

conclude that cross-border knowledge creation of an MNC can be the result of internal, acquired or contractual R&D activities or development work carried out in informal external networks. Accordingly, one of the main trends in the development of R&D is related to it becoming more internationalized. By this development, company linkages have become more important and R&D activities increasingly take place in external collaboration between companies. (Howell, 2008)

Kogut & Zander (1992) distinguish knowledge between information and know-how. In their classification, information includes facts and other types of explicit knowledge, which can be easily transferred into know-how, which can be understood as applying information in practice and which is often tacit and requires learning. In terms of innovation, it could therefore be argued that know-how is the type of knowledge which primarily relates to building competitive advantage through innovative activities within companies.

MNC subsidiaries have two different contexts in terms of resource transfer. Firstly, the subsidiary is a part of a larger inter-organizational network, the MNC, where intra-firm knowledge transfer exists (Bartlett & Ghoshal 1990). Secondly, the subsidiary is up to some degree integrated into the local business environment of the host country. Within this context, inter-firm knowledge transfers may exist (Porter 1990). In conclusion, the network structures in which knowledge transfers and innovation exist are bilateral as they consist of internal and external networks, and follow the previously discussed dual network structure of MNCs.

External knowledge transfer can be linked to the phenomenon of the emergence of industrial clusters. The following chapter discusses the existing cluster formations in Finland and the foundation behind them. The previous discussion on knowledge transfer in MNCs is an important factor behind clusters, as MNCs are usually strongly

present and involved in clusters and gain competitive advantage through them (Porter, 1998).

2.4   Industrial clusters in Finland

Finland is a small open economy (SMOPEC) with a limited number of high-tech firms with a strong global presence (Palmberg & Pajarinen, 2006; 33). Doing business abroad is a relatively new practice for Finnish companies. During the existence of Soviet Union, large industrial companies had significant trade and business relations with Russia but very few existed to companies within other countries. Before the collapse of the Soviet Union, foreign direct investment (FDI) was practically non-existent in Finland. The internationalization has been following the pattern suggested by the Uppsala model. According to it, in the early stages of internationalization, companies tend to start doing business in countries that are somewhat similar in terms of demographics, legal environment, culture and that are geographically near. For instance, many Finnish companies have started their internationalization by expanding operations to Sweden or other Northern European countries. The growth of Finnish economy has been exceptionally rapid since the 1990s. This growth originates mostly from export-based, high technology industries such as ICT. This past performance indicates that also in the future, Finnish economy growth will be highly dependent on innovation. (Romanainen, 2001; 379).

Evidence suggests that many Finnish MNCs have started internationalization very cautiously but expended their operations abroad very rapidly after the initial steps. Nevertheless, the internationalization levels of Finnish multinationals are in general lower than in SMOPEC countries. (Palmberg & Pajarinen, 2006; 46) It is reasonable to assume that partly this derives from the brief history of internationalization in Finland discussed in the previous paragraph.

Rugman & Verbeke (2003) view Buckley & Casson's (1976) *The Future of the Multinational Enterprise* as the main conceptual study of the transaction cost view of the MNC. According to this view, internationalization occurs in a company only if the financial gains exceed the costs. A key issue which MNCs face is the decision whether allocating resources between external markets is a liability or a competitive advantage (Rugman & Verbeke, 2003; 131). The latter refers closely to the development of clusters. The authors find that in order for a cluster being more effective than a MNC and external markets being separate depends on the trust and commitments between cluster participants and its efficiency in transferring knowledge inside the cluster (Rugman & Verbeke, 2003). The more complex industrial networks turn into, the more important efficient information and communications channels between external linkages of companies become (Luukkainen, 2001;277).

Luukkainen (2001) has researched industrial clusters in Finland. His study identifies five cluster structures in Finland based on significant trade linkages; foodstuffs, ICT, metals, construction and forestry. In other words, within these five sectors networking between entities was found to make significant contributions to the productivity and innovation. As a matter of fact, 75% of value added was found of being produced within the five clusters identified for the study. Networking within industry clusters was found to have a positive impact on GDP via two ways; economies of scale through outsourcing and catalyzing technological progress through technology diffusion among the industry (Luukkainen, 2001; 275).

Palmberg & Pajarinen (2006; 36) find empirical evidence that MNCs based in small economies tend to increasingly localize their R&D activities into regions with specific technological knowledge available in that field. These findings provide a background to cluster development and partly explain why clusters exist in the first place. The emergence of clusters therefore links closely to the previous discussion on the localization of R&D of MNCs. It was found that the main reason for decentralizing

R&D was the ability to gain access to the local knowledge resources otherwise unreachable (Dunning & Lundan, 2009).

Palmberg & Pajarinen (2006) investigate how the internationalization of R&D activities of Finnish multinationals translates into innovative output. In their study, innovation is measured by the number of patents as the authors argue that patents are an indirect output measure of innovation and they have also been used extensively in previous similar studies. The evidence shows that increasing the internationalization of R&D has resulted in increases in patent numbers. What is interesting though is that the increases in innovation have been fairly modest comparing to other SMOPECs. Partly this is found to originate from the relatively short period of time Finnish firms have been internationalizing. Palmberg & Pajarinen (2006).

To summarize, Finland as a SMOPEC is dependent on innovation in terms of staying competitive and its most advanced industries are focused on certain industries. Within these industries, obvious and visible cluster formations can be found and companies within clusters are in close interaction with each other. This phenomenon supports the main research question, because of these clusters tend to create innovations and it seems that external linkages have a strong presence in this.

2.5   Theoretical Framework

Companies are becoming increasingly internationalized and contemporary academic literature in International Business discusses the linkages and networks companies possess and view them as an important competitive advantage for companies (e.g. Forsgren et al, 2005; Andersson et al, 2002; Zanfei, 2000; Porter, 1998; Bartlett & Ghoshal, 1990). A network is a unique set of individual linkages or relationships and the information and knowledge transferred through these networks creates value for their possessor and the counterparties. (Forsgren et al, 2005).

Innovation is another common term in today's academic discussion as it can be seen as a crucial factor maintaining and creating competitiveness in advanced nations (Porter & Stern, 2001). Especially in small, developed economies, like in Finland, innovation creates competitive advantage as a way of differentiation. In other words, being able to come up with new ideas and providing cutting edge technologies in small market niches is vital for the competitiveness of Finland in world markets (Romanainen, 2001).

Based on the research done in academic literature from the field of this study, it is possible to build a model framework describing the theoretical background relevant to this study and how the different research questions are related to it. The central item in this study is a MNC operating in Finland, either a domestic MNC headquarters or a foreign MNC subsidiary. As it was found for instance by Forsgren et al (2005); Almeida & Phene (2004) and Zanfei (2000), MNCs have a dual network structure, which means that the company is linked to both internal and external parties. In the context of this study, an internal network consists of sharing knowledge created through the idea innovation network (Hage & Hollingsworth, 2000), in other words, the different types of R&D activities of the MNC. On the other side, external networks are influenced by the SMOPEC environment, which supports innovative activities in general and acts as an innovation catalyst for companies located within its area. The external linkages are in individual business relationships, for which the theoretical model has been contributed to by Forsgren et al (2005; 17). These linkages form the external networks, which under right circumstances become a competitive advantage to the MNC and impact the strategic role of the MNC unit located in Finland (Forsgren et al, 2005). These relationships are presented in Figure 2.1, below.

Figure 2.1. Theoretical Framework.
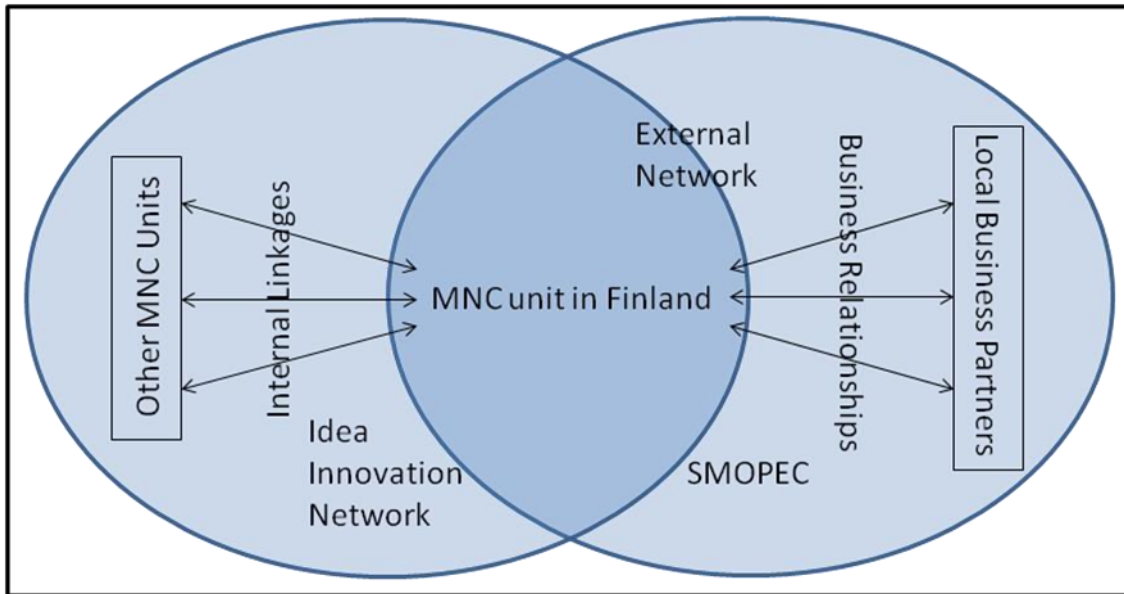
The dual network needs to perform well as a whole, which means that the overall performance of the MNC depends on the quality of both the internal and external linkages of the MNC (Bartlett & Ghoshal, 1990). In terms of innovation, it is vital to be able to transfer knowledge through these networks as the main reason for companies building local embeddedness is because there is a way to get access to the local innovation resources (Dunning & Lundan, 2009).

The main research question of this study focuses on the effect which happens on the borderline between the MNC's innovation network and external entities. The focus is on the innovativeness of companies which occurs within the MNC unit in Finland. This unit has both internal and external linkages which both involve knowledge transfer either between other MNC units or local business partners, respectively. MNC also has its own idea innovation network, which consists of all the innovation seeking activities within the MNC (Hage & Hollingsworth, 2001). By assumption, the MNC gains new knowledge from external linkages, but also allows other companies to use the proceeding which it has created internally.

This study does not focus on the impacts of internal linkages of MNCs, but previous studies have indicated that knowledge transfer within organizations is important for the overall success of the MNC (e.g. Bartlett & Ghoshal, 1990). Subsidiaries are located in different countries, because it allows them to access the resources possessed by the host country. Without effective means of spreading these resources throughout the organization, the advantages cannot be fully being exploited. This is why it is important to realize the impacts of internal linkages on the overall success of the MNC.

Investigation regarding the impact of external linkages on the innovativeness of MNC is more closely approached through looking at the external linkages. These linkages include two-way flows of information and also the counterparty roles may differ. These two focusing aspects are further investigated through research questions two and four. R&D seeks to find new innovation in companies and therefore it is relevant to consider it as one of the aspects defining innovativeness in MNCs. The limitations and evidence against R&D as a measure for innovativeness was previously discussed in paragraph 2.3.1 and as it was then noted, research question three focuses on this aspect.

3 METHOD OF RESEARCH

The purpose of this thesis is to investigate whether external linkages of multinational companies operating in Finland have an impact on the innovativeness of these companies. The empirical data in this study is a part of a larger academic research project conducted by Dr. Joanna Scott-Kennel, Dr. Axele Giroud and Dr. Fabienne Fortanier. This study examines the overall impacts of MNC subsidiaries' local linkages. The general framework of this project has been previously explained in the theoretical framework.

3.1 Data and Data Gathering

The empirical data used in this study is gathered during fall 2008 using a web-based survey sent to the 500 largest companies in Finland measured by their operating revenue. This selection method does not take into consideration whether the company is internationalized or not so this has to be taken into consideration in the analysis. E-mail containing a link to the on-line survey and a brief letter explaining the study was sent to the recipients in the beginning of October 2008. The full questionnaire in English can be found in Appendix 1. The survey consisted of 28 different questions and an estimated time for completing the survey was between 20 and 30 minutes. The recipients were offered a choice of answering the questionnaire in Finnish or English. The English version was translated into Finnish by the author and another student of the Helsinki School of Economics and the draft was revised by the International Business faculty at the Helsinki School of Economics. Practically all survey participants who completed the survey chose to answer in Finnish.

The survey was sent to each company CEO's personal e-mail address which were gathered mainly from the Internet or by contacting the company directly via telephone. The CEO was the primary candidate, because answering the survey questions

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realistically required a good knowledge of the company's operations both in Finland and abroad. Of course, there was a possibility that the survey was given to someone else in the company to be answered and this was practically impossible to control. The instructions would tell the recipient about the option of forwarding the survey to someone else from the management team of the company, if the CEO was unable to complete the survey himself.

After sending out the first batch of survey links, the answer rate was quite low, well below 10%. By assumption, the comprehensiveness and relatively long time required to answer the survey were the main reasons why the number of answers was quite low after the first e-mails were sent out. In order to get more answers, follow-up calls were made to companies asking whether the company wished to have further information about the survey and if someone else from the company would be willing to fill out the survey, if the CEO was unable to fill out the survey. After the follow-up calls, the response rate climbed slightly over 10%.

Another method of acquiring more responses was sending out a paper version of the survey during November 2008 to about 150 companies. One reason for this method was that the follow-up calls indicated that a fraction of companies hadn't even received the survey link, as the email had been deleted as spam. Paper version of the questionnaire had the same questions in the same order as the electronic version, so they are comparable with each other and the answers received via mail were afterwards manually added to the survey data.

As a final result, a total of 76 companies completed the survey. Out of these, 53 could be classified as MNCs, the rest had operations only domestically. As mentioned, the survey sample consisted of the largest Finnish companies measured by their operating revenue. This selection method includes both domestic and international companies. For the purposes of this study, companies with no reported employees outside of

Finland were excluded from the data used in this research. In other words, the data used consists of foreign MNC subsidiaries operating in Finland and MNCs based in Finland. By definition, MNC is a company engaged in FDI and with value adding activities in other countries (Dunning & Lundan, 2008). For the purposes of this study, the reported number of employees abroad is used to determine whether a Finnish company has activities abroad. A foreign MNC subsidiary can be identified from the data, if the company has reports being headquartered outside Finland. After making the adjustments, the sample data for this study narrowed down to N=53.

The summary of company data used in this thesis is presented in Table 3.1. The presence of few large MNCs in the data skews heavily the averages e.g. in employee numbers, so therefore the median is a better measure for evaluating the sample data with absolute values. As it can be seen in Table 1, the majority of companies in the sample are headquartered in Finland. This is also the case with the ownership; most of the companies are domestically owned.

Table 3.1. Summary of company data.

Sample companies (N=53)					
HQ Location		Number of employees			Foreign parent company
			Average	Median	
Finland	39	Finland	1965	750	Yes	16
Europe	9	Europe	8784	1500	No	37
USA	5	Other	11736	110	
		Total	22484	3850	

Most questions in the study used a Likert scale from one to seven (1-7) and some questions also had an eighth option on NA – not applicable. To avoid these non-replies skewing the data, the questions containing the NA option were modified so that this answer choice was placed in the middle of the range. This is done under the assumption that the answers are somewhat normally distributed.

The questionnaire asked companies to assess their involvement in both receiving and contributing resources from their business partners. These resources were separated between technical, organization and marketing know-how and human resources training. Another specification to the type of external linkage was done by having separate questions regarding suppliers, buyers and other business partners both in Finland and worldwide. Overall, there were 32 questions measuring the depth of external embeddedness plus eight questions, which measured information flows within the MNC. These variables regarding internal linkages were left out of this analysis as this paper focuses on the impacts of external linkages. All these questions used a 1-8 Likert scale, and the data was modified so that the not applicable answers were placed in the middle of the range (value=4).

3.2   Analysis Methods

Analyzing the data in this thesis uses two different statistical methods, which are introduced in the following chapters. The survey consisted of a total of eight questions regarding external linkages to different business partner types, each with four sub-questions. Considering the size of the sample and the form of the main research question, it was necessary to find a way of combining this data into fewer dimensions. This was done by using a statistical method called factor analysis. After the reformation of variables, the main analysis method, multiple linear regression was used to analyze the hypotheses. Due to the exploratory nature of this study, the regression modeling consists of four different models aimed at finding the most suitable and reliable regression equation.

3.2.1   Factor analysis

Factor analysis is a statistical method for finding similarities within a set of multiple variables and combining similar variables into fewer dimensions called factors. The main indicators within this analysis method are factor loadings, which describe the correlation between original variables and the factors. Other key figures are communalities (h2), which describe the amount of variance of a variable shared with all variables within the model. Eigenvalue represents how much variance each factor accounts for and commonly factor is accepted if Eigenvalue>1, meaning that the factor describes better than one original variable. (Hair et al, 1998; 88-90). The applied rotation method used in the analysis is orthogonal varimax, which is the commonly used method which aims both to simplify the factor matrix and provide a clearer separation of the factors (Hair et al, 1998; 109-110).

Two separate factor analyses were done for both receiving and contributing resources from different business partner types. The direction of information flow was also separated in the questionnaire as similar questions were used for both directions. Also later on, the significance of the direction of information flow is hypothesized in this chapter based on research question number two.

After the individual variables were allocated into different factors based on the highest factor loading, the data was modified so that the factors represent the pool of answers given to those questions within the factor. This maneuver was done in terms of modifying the data more suitable for the regression analysis. In practical terms, this combination of variables has been done by taking a simple arithmetic average from the variables within each factor and weighting the average by the corresponding factor loadings. This way, the variables with more significance within the factor have more influence than the ones with smaller factor loadings. By this procedure it was also

possible up to some degree avoid the statistical insignificance of the factor analyses results caused by the small sample size.

3.2.2 Multivariate Linear Regression

The main hypothesis of this study is investigated by applying a multiple linear regression to the sample data. This method was chosen because it allows examining the possible influence of several independent variables on a single dependent variable at the same time. Remembering the abstract nature of innovation it is reasonable to assume that it is not possible to find only one variable that has an impact on innovativeness, but it is more of a myriad of several different variables.

The standard form of a multivariate linear regression equation is:

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \cdots + \hat{\beta}_i X_i + \varepsilon_i$$

Where Y is the dependent variable, Xs are the different independent variables and betas act as their coefficients. B_0 is the constant (or intercept). The last term ε is the residual, which represent the difference between the observed Y and the regression model (Studenmund, 2006; 14). The dependent variable chosen for this model is the significance of innovativeness as a competitive advantage to the company. The dependent variable was measured by one to seven Likert scale and it can therefore be understood as a continuous variable, which is necessary for all the variables within the regression model.

Using this analysis method is quite sophisticated and it has several prerequisites in order to have valid and reliable results. These conditions are the following (Studenmund, 2006):

- Dependencies have to be linear
- Variables have to be continuous and normally distributed
- Independent variables cannot be dependent of each other (multicollinearity)

- Homoskedasticity; no systematic variation between error terms.

- Error terms do not correlate with each other (serial correlation)

- In addition, it has to be noticed that outlier values within the data may cause significant error to the proposed model. Coefficients being linear and normally distributed are assumptions and not specifically tested in this study. In the following, the rest of the preconditions for regression analysis are individually discussed.

One of the main conditions for performing a regression analysis is that the independent variables must not be correlated with each other. If they are, multicollinearity exists causing the separate independent variable effects on the whole model being biased. In this regression analysis, the existence of multicollinearity was detected by a simple correlation matrix (see Appendix). The models include a few independent variables with [>0,50] correlation, but considering these only as a small fracture of the total number non-correlated variables, it can be concluded that multicollinearity does not cause significant error to the regression models.

Homoskedasticity is one preference of a reliable regression model. It means that the variance of residuals remains constant over the range of an individual variable (Hair et al, 1998; 144). The easiest way to confirm homoskedasticity is to plot the residuals and see how they scatter and this is the method used in this thesis.

Serial correlation or autocorrelation means that the observations of the error term are correlated (Studenmund 2006; 394) causing hypothesis testing being unreliable. It can be detected by using a Durbin-Watson d-test, which gives a value of 1,7 for this regression. Considering the high number of independent variables used in this analysis, it is possible to reject the hypothesis of the existence of serial correlation for this regression based on the d-test value being close to 2 (for further explanation of the Durbin-Watson d-test, see Studenmund 2006; 325-329).

The final model of the regression in this study uses stepwise estimation in order to maximizing the prediction and at the same time minimizing the number of variables within the model. Stepwise estimation is a one type of sequential search method, which includes adding more variables into the model one by one and leaving or discarding them depending whether they increase or decrease the partial F-value of the whole model.

The empirical analysis for the main hypothesis consists of four different regression models. These models have been built so that each following model outruns the previous model. The analyses have been done so that the first model is built having all the variables discussed above and then the following two models are based on removing insignificant variables from the previous models using argumentation based on either theoretical background or evidence based on the empirical data and results from this study. The fourth model is done by using stepwise estimation method in order of finding the best prediction for the model using the minimum number of variables. The further discussion about these decisions is included in the analysis and discussion about the results, as the basis of these decisions closely relates to the actual findings of the empirical analysis.

3.3   Analysis Variables and Research Hypotheses

The dependent variable Y used in the analysis is the level of the importance of innovation as a competitive advantage to the company. This variable is obtained from answers to question number 27 in the questionnaire (see Appendix 1). This is a subjective view of the company, but as said, innovativeness does not have a perfect measure. In differing between innovativeness and actual number of innovations, the question relates more closely to the first variable as the firms assessment of innovation

as a competitive advantage does not take a stand on the quantity of innovations, merely the level of importance of innovation for the company.

Independent variables include the intensity of linkages which is divided into different counterparties and whether or not resources are received or contributed. These variables are obtained from questionnaire questions 19 to 22 and they were measured by using a 1-8 Likert scale including an NA – not applicable option placed in the middle of the range. The combination of similar results regarding different types of information is done through the factor analysis and the new factors obtained from the analysis are more closely presented in the following chapter. The data contained in these variables is used to analyze both the main hypothesis H1 and hypotheses H2 and H4. Other independent variables are the level on R&D investment (question 25.1 in the questionnaire) and autonomy of MNC unit over its R&D performed in Finland (question 5). These variables are used to analyze H3. In addition, two independent variables are used to measure the size of the company and these include the number of employees and revenue. Both of these variables were measured by using absolute figures. At this point it is also good to keep in mind that the number of employees both globally and domestically was also used previously in the selection of companies. The variables discussed in this paragraph are listed in Appendix 2.

As the research questions are examined by using quantitative analysis methods, it is necessary to reform them into the proper null and alternative hypotheses. For the first research question, the hypotheses are as follows:

H_{0q1}: *Local linkages do not have or they have a negative impact on the innovative capacity of MNCs.*

H_{Aq1}: *Local linkages have a positive impact on the innovative capacity of MNCs.*

In mathematical terms, the null and alternative hypotheses can be expressed as:

H_{0q1}: $\beta \leq 0$

H_{Aq1}: $\beta > 0$

The beta (β) represents the standardized coefficient of independent variable in a regression equation. H_0 is the null hypotheses, which can be either rejected or not rejected depending on the empirical findings.

In the analysis of research question two, the direction of information flows is divided between receiving and contributing resources to different business partner types. The hypotheses for this research question are:

H_{0q2a}: Receiving resources from local business partners does not have an impact on the innovativeness of MNCs.

H_{Aq2a}: Receiving resources from local business partners has an impact on the innovativeness of MNCs.

H_{0q2b}: Contributing resources to local business partners does not have an impact on the innovativeness of MNCs.

H_{Aq2b}: Contributing resources to local business partners has an impact on the innovativeness of MNCs.

For research problem three, the hypotheses are:

H_{0q3}: The level of R&D investment does not impact whether or not innovation is a competitive advantage to the company.

H_{Aq3}: Innovation is a more important source of competitive advantage to companies with higher levels investment in R&D.

Evidence for rejecting the null hypothesis is searched from the results of the regression models built mainly for the investigation of the main research question.

For the fourth research question, analysis is based on the results drawn from the factor analysis and by also further analyzing the results of the regression models. The purpose is to find whether or not it is possible to combine variables measuring approximately the same thing into groups. The hypothesis is that it is possible to find enough similarities in the data to support the idea that the counterparty role is irrelevant in

terms of sharing and receiving knowledge on technical know-how, R&D and innovation. Based on this, the following null and alternative hypotheses are presented:

H_{0q4}: *Business partner role (supplier, buyer or other business partner) in a business relationship has significance in terms of innovativeness being a competitive advantage to the MNC unit.*

H_{Aq4}: *Business partner role (supplier, buyer or other business partner) in a business relationship does not have significance in terms of innovativeness being a competitive advantage to the MNC unit.*

3.4   Limitations

A small overall sample size is a limitation to this study. Usually, it is suggested that studies with voluntary participation should count 40-50% oversampling in order cover for lost surveys and recipients involuntary to participate in the study (Bartlett et al, 2001; 46). In this case, where the final response rate was only ~15% it can be concluded that the number of answers was a disappointment and it sets certain limitations to the analysis. An ideal situation would have allowed looking into the innovativeness of exclusively foreign MNC subsidiaries operating in Finland, but due to the very small number of these companies completing the survey (N=16), in order to have more reliability to the empirical results, the sample chosen for this study consists of foreign MNC subsidiaries and MNC's headquartered in Finland. In the text, these are commonly referred to as MNC units. The decision of whether a company is a MNC or not was based on reported employees outside of Finland. This is based on the idea that a company is involved in FDI, when it is employing personnel in another country.

The relatively low sample size of this study was caused by most companies refusing to participate in the survey as it can be seen from the response rate. By assumption reasons for this are firstly the comprehensiveness of the study, in other words, it taking a long time to complete (about 30 minutes) and secondly the fact that someone from the

top management was required to answer the survey. The low response rate and small sample may cause nonresponse bias, in other words, the sample not being unrepresentative of the whole population (Studenmund, 2006; 550). In practical terms, this means that making generalizations based on analysis based on this data is difficult, unless it can be supported with other existing literature and research. The projected sample size for this study was expected to be larger than the actual number of answers qualified for the sample used. According to Bartlett et al (2001; 48), when using multiple regression analysis as an analysis method, the number of observations to independent variables ratio should not fall below five. In other words, having a sample size of 53, the maximum number of independent variables within the model is five or there is a risk of overfitting the regression. Also the number of observation sets certain limitations to performing a factor analysis, as usually it provides reliable results only when sample size exceeds 100. With a small sample, the factor loadings are required to have higher values in order to be statistically significant (Bartlett et al; 49).

The use of company's perception of the importance of innovativeness for the MNC is not a perfect measure of innovativeness itself. However, innovation and innovativeness are quite abstract by nature and therefore difficult to measure. One way to measure it is to use some measurable statistics, e.g. patent data, which has been the case in many previous studies, including Palmberg & Pajarinen (2006). Another way of doing this is by asking the company itself to assess the importance of innovation as its competitive advantage. The issue with this measure is that even though the company may view innovativeness as an important competitive advantage for the company, it does not necessarily mean that the company has a high level of innovation. However, it is reasonable to assume that if innovation is a competitive advantage to a MNC, the company is also innovative, or otherwise there may be serious problems with the profitability of the company. Based on this reasoning, using this measure is suitable for the purposes of this stud

4   EMPIRICAL ANALYSES RESULTS

This chapter presents the results for both the factor analyses and regression models. Factor analyses are used to categorize and combine data for the regression models and therefore these results are presented before the regression results. The regression and other data analysis were performed using SAS Enterprise Guide 4.1 software. Preliminary modifications of the data such as the selection of companies and editing the not applicable answers to the middle of the range were done using Microsoft Excel. The complete results of the data runs can be found from Appendices 3 and 4.

4.1   Categorization of data gathered on external linkages

Due to the large number of variables measuring external embeddedness, a factor analysis was first performed in order to group similar variables into fewer categories. This maneuver was primarily done in order to decrease the number of independent variables for the proceeding regression analysis, but to also test whether different business partner or knowledge types have significant similarities or differences in them. Separate analyses was performed for received resources and contributed resources, as the direction of the knowledge resources is hypothesized to be significant in determining how they benefit the company.

Table 4.1 presents the results for the first factor analysis focusing on received resources from external linkages. The full SAS printouts can be seen in Appendix 3. A total of four factors were given by the model, based on their Eigenvalue being >1. These four factors explain 67% of the variance of all the 16 variables chosen for the analysis. In other words, it was possible to divide the initial set of variables into four larger groups.

In the table, the numbers given under the four factors are the rotational factor loadings representing the correlation between the individual variable with the factor. Variables

were assigned to their groups based on their highest factor loadings; the factor with which a single variable had the highest correlation to was selected. The column next to factor loadings tells the communality (h2) of the variables, i.e. how much of the variance of the individual variable can be explained by all of the factors.

Table 4.1. Factor analysis results on received resources.

Benefits from resources received from suppliers in Finland	Factor 1	h2
Technical know-how, R&D, innovation	0,58	0,44
Organisation and management know-how	0,87	0,79
Marketing know-how, market information	0,78	0,67
Training, development of human resources	0,69	0,53
Benefits from resources received from buyers in Finland	Factor 2	
Technical know-how, R&D, innovation	0,68	0,62
Organisation and management know-how	0,77	0,73
Marketing know-how, market information	0,58	0,55
Training, development of human resources	0,84	0,73
Benefits from resources received from other business partners in Finland	Factor 3	
Technical know-how, R&D, innovation	0,81	0,72
Organisation and management know-how	0,70	0,71
Marketing know-how, market information	0,72	0,64
Training, development of human resources	0,71	0,63
Benefits from resources received from other business partners worldwide	Factor 4	
Technical know-how, R&D, innovation	0,73	0,66
Organisation and management know-how	0,90	0,82
Marketing know-how, market information	0,73	0,63
Training, development of human resources	0,81	0,80

For the contributed resources, a similar analysis found four categories based on their Eigenvalue being >1, and in this case these categories explain 71% of the overall variance of the individual variables. Summary of the results for this factor analysis can be found in Table 4.2 and the full SAS printouts in Appendix 3. In this case, the categories are not as neatly tied to the business partner type as with received resources. First of all, resources contributed to suppliers in Finland form one factor, excluding technical know-how contributed, which falls to the same category with contributed

resources to buyers. Also in terms of other business partners both worldwide an in Finland, the categories divided pending on whether the shared information was technical or marketing know-how versus organizational or training knowledge.

Table 4.2. Factor analysis results on contributed resources.

Resources contributed to suppliers in Finland	Factor 1	h2
Organisation & management know-how	0,75	0,67
Marketing know-how, market information	0,83	0,76
Training, development of human resources	0,64	0,62
Resources contributed to buyers in Finland	Factor 2	
Technical know-how, R&D and innovation to suppliers in Finland	0,67	0,62
Technical know-how, R&D and innovation	0,82	0,82
Marketing know-how, market information	0,45	0,58
Training, development of human resources	0,66	0,84
Technical and marketing know-how contributed to business partners	Factor 3	
Technical know-how, R&D and innovation to partners in Finland	0,65	0,63
Marketing know-how, market information to partners in Finland	0,55	0,60
Technical know-how, R&D and innovation to partners worldwide	0,81	0,73
Marketing know-how, market information to partners worldwide	0,82	0,74
Management know-how and training contributed to business partners	Factor 4	
Organisation & management know-how to buyers in Finland	0,58	0,69
Organisation & management know-how to partners in Finland	0,73	0,70
Training, development of human resources to partners in Finland	0,76	0,73
Organisation & management know-how to partners worldwide	0,78	0,75
Training, development of human resources to partners worldwide	0,86	0,85

As it was mentioned in limitations, the small sample size needs to be addressed when analyzing the results, as it may impact the statistical significance of the results. Bartlett et al (2001; 49) suggest that the factor loadings for a sample of 50 observations, individual factor loadings need to be at least 0,70 in order to be considered statistically significant at 95% confidence interval.

Regarding the received resources, it is promising to see that only two individual variables from the total of 16 variables had lower factor loadings, which contributes towards overall validity of this analysis. For the results of the factor analysis on contributed resources, the results are not as good. Even though most of the factor loadings of individual variables are at relatively high levels (>0,70), there are a total of seven individual variables which fall behind this level.

All in all, the primary goal for both factor analyses, i.e. categorizing data more suitable for the regression analysis was accomplished. The results for the multiple linear regression models are discussed in the next section. Further discussion of the factor analyses results and also their impact on the research hypotheses of this research are continued in the following chapter.

4.2   Results of the Multivariate Linear Regression Models

The primary analysis method of this study is multiple linear regression. Due to exploratory nature of this study, it was not possible to make a conclusive selection of analysis variables based on previous theory and therefore as a result, four different regression models were used to analyze the research hypotheses.

The results of the three first performed multiple regression models are shown in Table 4.3 and the full results of the SAS runs can be found in Appendix 4. The analysis was started by building first a model which included all the independent variables chosen for the analyses and which are expected to have an impact on innovativeness as a competitive advantage. The overall fit of the first model is quite poor, as the overall F-value is statistically insignificant and also there are no statistically significant variables in the model using the standard 95% confidence interval.

For regression model two, the contributed resources variables were left out from the model as no evidence towards rejecting H_{0q2b} was found due to all four factors regarding contributed resources being statistically insignificant. Another fact supporting the exclusion of these variables was the inconsistency within the factor analysis regarding the contributed resources. In the second model, the overall fit is better, as the F-value is already quite close to the desired 0,05 p-value, which would mean being inside an overall 95% confidence interval of the model.

For the third model, also the R&D spending was dropped from the independent variables included in the regression. As it has been discussed, there is evidence that R&D spending does not necessarily correlate with the amount of innovativeness within companies, so using it as an independent variable in this thesis is questionable. Also R&D spending was found the least statistically significant variable within the second regression model. The results for the third regression model show, that the R^2 and adjusted R^2 which are the measures of the regression equation quality are high, suggesting that the regression equation is well-built. On the other hand, contradictory to this is the F-value for the model (F-value = 2,22), which is just outside the desired 95% confidence interval.

The third model consist a total of seven variables plus the constant. Two independent variables are within a 95% confidence interval and the number increases to three with 90% confidence. The remaining variables with no statistical significance naturally impact the overall validity of the model and explain why the previously discussed F-value is not as high as desired.

Table 4.3. Multivariate linear regression results, models 1-3.

Dependent variable:
Innovativeness as
competitive advantage

Variable	Model 1			Model 2			Model 3		
	Coefficient	*t-statistic*	*p*	*Coefficient*	*t-statistic*	*p*	*Coefficient*	*t-statistic*	*p*
Intercept	0,00*	3,69	0,00	0,00*	3,93	0,00	0,00*	4,06	0,00
Autonomy in R&D activities	0,37**	1,97	0,06	0,41*	2,42	0,02	0,42*	2,56	0,02
Revenue	-0,22	-1,47	0,15	-0,23***	-1,68	0,10	-0,22	-1,66	0,11
R&D spending (% of Sales)	-0,11	-0,75	0,46	-0,06	-0,41	0,68			
Number of employees	0,24	1,30	0,20	0,24	1,43	0,16	0,24	1,47	0,15
Factor 1 received resources	-0,27	-1,49	0,14	-0,32*	-2,14	0,04	-0,31*	-2,14	0,04
Factor 2 received resources	0,37**	1,82	0,08	0,27	1,64	0,11	0,28***	1,72	0,08
Factor 3 received resources	-0,23	-1,28	0,21	-0,24	-1,43	0,16	-0,25	-1,50	0,14
Factor 4 received resources	0,12	0,65	0,52	0,20	1,24	0,22	0,19	1,32	0,22
Factor 1 contributed resources	-0,25	-1,12	0,27						
Factor 2 contributed resources	0,12	0,64	0,53						
Factor 3 contributed resources	0,08	0,44	0,67						
Factor 4 contributed resources	-0,01	-0,06	0,96						
Observations	51			51			51		
R^2	0,2968			0,2698			0,2654		
Adjusted R^2	0,0748			0,1307			0,1458		
Durbin-Watson D	1,98			1,92			1,87		
DF Regression	12			8			7		
DF Residual	38			42			43		
DF Total	50			50			50		
F-value	1,34		0,2391	1,94		0,0791**	2,22		0,0511**

*p<0,05; **p<0,10.

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The first three regression models for examining and testing the research hypotheses were further on developed by using stepwise estimation method for selecting the variables for the fourth model with a goal of maximizing the prediction with a minimum number of variables. This method includes adding variables to the model only if they increase the partial F-value of the regression (Hair et al, 1998). By applying the stepwise estimation, only three variables were qualified to stay in the model. The proposed number of variables fit into the general rule of having a number of observations to number of independent variables –ratio below 5:1. The variables left in the fourth regression model were autonomy over R&D activities within the MNC unit in Finland, resources received from buyers in Finland and resources received from suppliers in Finland. The F-value for this model is 3,11 and its statistical significance is within a 95% confidence interval with a p-value of 0,0350. The results for this regression model are shown in Table 4.4, below.

Table 4.4. Results of Multiple Regression Model 4.

Dependent variable: Innovativeness as competitive advantage	Model 4		
Variable	Coefficient	t-statistic	p
Intercept	0,00*	6,09	0,00
Autonomy in R&D activities	0,22**	1,66	0,10
Received resources suppliers	-0,35*	-2,44	0,02
Received resources buyers	0,27**	1,88	0,07
Observations	51		
R^2	0,1658		
Adjusted R^2	0,1126		
Durbin-Watson D	1,88		
DF Regression	3		
DF Residual	47		
DF Total	50		
F-value	3,11*		0,0350

*p<0,05; **p<0,10.

Autonomy over R&D activities was found to have a positive correlation with innovativeness as a competitive advantage for the MNC. Nevertheless, the significance

level for this variable stayed below the desired 95% confidence interval, with t-statistic value 1,66 and significance-p of 0,10. However, this result goes in conjunction with the literature, as it suggests that decentralizing R&D activities, i.e. having local autonomy over R&D activities has a positive impact on innovativeness. On the other hand, both resources received from both suppliers and buyers in Finland were found to have significance levels within a 90% confidence interval with t-values -2,44 and 1,88 respectively. The results suggest that resources received from suppliers in Finland have a negative impact on innovativeness, as on the other hand resources received from Finnish buyers have a positive correlation on innovativeness of Finnish MNC units.

Regarding the validity and reliability of the built regression models, it is necessary to look into the general prerequisites of regression modeling. Multicollinearity in these analyses was detected by a simple correlation matrix. Not a significant amount of variables have correlations over 0,50 so multicollinearity does not cause bias to the analyses. Serial correlation was detected by using the Durbin-Watson D-test, which value was close to D=2 in all four models, indicating no serious problems caused by this phenomenon. The final possible obstacle, heteroskedasticity, was investigated by looking at the plotted residual values (shown in Appendix 4) for each model. The graphs show that residual values are more or less evenly distributed throughout the range of the variables, and therefore it can be concluded that homoskedasticity exists in all four models, as it should.

5 DISCUSSION AND ANALYSIS OF RESULTS

This chapter focuses on analyzing the results from the empirical analysis presented in the previous chapter. Main focus is on finding out, whether or not it is possible to reject the null hypothesis regarding each of the research questions and analyzing these decisions mirroring previous research. Findings are also linked to previous literature and the theoretical framework and possible contradictions to these results are further on discussed.

5.1 Impact of Local Linkages on Innovativeness

The main research question was investigated by using multiple linear regression method. The relatively low F-values especially in the first three regression models may suggest that there is an omitted variable missing from the model. This is not that surprising considering that there are a number of factors that might have an impact on the significance of an individual firms' competitive advantages. For instance, the sample consisted of companies including both MNCs headquartered in Finland as well as foreign MNC subsidiaries located in Finland from a variety of industries, the analysis does not take into considerations the possible differences caused by these variables. The fourth regression model is the most valid one, as it has the highest F-value 3,11 which is also within the expected 95% confidence interval which is sufficient for the purposes of this analysis. Due to the most reliable results gained from the fourth regression model, it is primarily used in the analysis.

Based on the results it could be found that received resources from suppliers had a negative impact over the innovativeness as a competitive advantage for MNC units in Finland and received resources on the other hand had a positive impact. This finding is contradictory to the main research hypothesis H_{0q1}, because being able to reject it

would have required all variables measuring external linkages having a positive impact towards innovation as a competitive advantage for MNC units.

As it was discussed in the limitations segment if the methodology, there are certain obstacles, which need to be addressed considering the results. The main problems regarding this analysis are related to the small sample size. There are a large number of statistically insignificant variables in the models and it is assumed that this phenomenon at least partly relates to the relatively low level of observations within the sample. A larger sample would make it easier to see where the answers scatter and detect the outliers. In other words, in order to confirm these results a further more comprehensive study is needed.

As a conclusion regarding the main research hypothesis H1, not enough evidence towards rejecting null hypothesis H_{0q1} was found, as received resources from suppliers had negative and received resources from buyers a positive coefficient, which were the only statistically significant variables regarding external linkages. This result has an important implication considering this research and it relates closely to H4. These results show that there was a significant difference on the impact on innovativeness between resources from suppliers and buyers and therefore this evidence points towards the fact that business partner type is significant in terms of knowledge transferred. Further discussion on business partner type is continued in section 5.4. Overall, it seems that making a universal conclusion that external linkages increase the innovativeness in MNC units is quite difficult to do as there are many other variables which have simultaneous impacts. Therefore making further definitions to this hypothesis is necessary.

5.2 Direction of information flows

In the initial setting for this research, the direction of information flows was separated between receiving and contributing resources between different business partner types. Also based on the results, it is possible to find differences between them. For this study, two separate factor analyses were performed for both received and contributed resources. Overall the results regarding received resources were more consistent and reliable than the results considering contributed results. Overall the results from the factor analyses were promising in a sense that with a sample this small, one possibility could have been that none of the results were statistically significant. With these results, it was possible to reduce the number of independent variables for the regression analysis, which was the primary goal of the analyses.

The results for received resources from suppliers and buyers suggest towards being able to reject null hypothesis H_{0q2a} as both of these variables showed significance over the perceived innovativeness of Finnish MNC units. However, these two variables had polarized impacts on innovativeness as received resources from buyers had a positive correlation and received resources from suppliers had a negative correlation. This finding indicates that it is important to put focus also on the impact of business partner type which is investigated in this research through hypothesis four.

On the other hand, the results for contributed resources were not as straight forward, as it was not possible to categorize all information types based on the business partner type. Another consideration is that within the factor analysis, there were more variables, which need to be considered statistically insignificant making the results less reliable. Because of the small sample size and its limitations it is reasonable to assume that at least part of the issues regarding contributed resources are caused by the sample size.

Due to these inconsistencies, contributed resources were dropped out from the regression model at an early stage, due to these variables being insignificant within the regression model. These variables were found to have the least significance in the first regression model and also the results from the factor analysis regarding these resources were somewhat inconsistent. Therefore it is not possible to reject null hypothesis H_{0q2b}. Regarding the contributed resources, it would be interesting to see how much impact reciprocation has on contributing resources. The argumentation here is that the reason for contributing resources in the first place is the expectation of getting something in return, as this not being the case the company would be giving out its assets for free without any expected gains. In other words, giving out resources by itself does not benefit the company, but being able to receive similar resources in return on the other hand does.

5.3   Impact of R&D on innovativeness

Regarding research question three, no statistically significant evidence towards rejecting the null hypothesis was found in any of the regression models built. Therefore it is not possible to reject H_{0q3} and the same conclusion could be drawn in the analysis of literature. As it was discussed previously in the literature review, the impact of R&D spending as a measure of innovativeness has been challenged by many scholars (e.g. Balsano et al, 2008; Lee & Kang, 2007; de Propris, 2002) and these results do not provide any evidence against this view either.

However, related to R&D, the fourth regression results show that autonomy over R&D activities within the MNC unit seems to be contributing towards innovativeness in it. This result is only within a 90% confidence level, so some precaution needs to be taken into consideration when making conclusions based on this result. Autonomy over R&D activities relates closely to the internal organization of the MNC. However, it also needs to be remembered that this study also included MNCs headquartered in Finland,

which quite understandably have higher levels on autonomy. In other words, based on these results it is not possible to make any final conclusions over the impact of R&D activities. These results point more to the direction that further study focusing on MNC subsidiaries located in Finland should be investigated in terms of their autonomy over R&D.

5.4   Business partner type significance

An interesting finding regarding received resources is that based on the factor analysis results, it is possible to categorize the variables based on the business partner type, regardless of the information type which is receiced. This result follows the previous research done in this area in a sense that not that much research has been done from the viewpoint of knowledge resource types, but authors have separated different business partner types in earlier studies in this field (e.g. Choi & Kim, 2008; Echols & Tsai, 2005; Freel, 2000). Because it seems to be possible to categorize knowledge resources which are received based on the business partner type which provides this information, it is reasonable to say that business partner type is relevant when discussing the impacts of received information. In other words, it is not possible to reject null hypothesis H_{0q4}.

The previous discussions about the results from the factor analysis are also supported by the evidence from all the four regression models as there is a statistically significant difference between received information from suppliers and buyers. This means that business partner type seems to have an impact on whether or not the relationship and knowledge transfer is beneficial from the innovativeness of the MNC unit. Therefore also these results point to the direction that it is not possible to reject null hypothesis H_{0q4} regarding business partner type significance. As it was mentioned earlier, more results regarding the information resources received and contributed by different business partner types would be useful. Especially, it would have been interesting to get significant results especially for resources shared between other business partners as

these include e.g. joint venture and strategic alliance partners. Supplier-buyer relationship is closely tied to value chain of the company and these linkages are often formally generated through contractual agreements (Choi & Kim, 2008). In other words, it would have been interesting to find evidence also from more informal and voluntary linkages, not to mention that these partners could be considered as peers for the MNC. Also by having evidence on other business partner linkages it would be possible to find evidence for or against the previously discussed phenomenon alliance capitalism (Dunning, 1995).

One possible explanation to the experienced difference between received resources between suppliers and buyers can be found on the type of collaboration between these two business partner types. Suppliers can be understood as providing raw materials and semiconductors which in the buyer company transforms into more advanced products and services, i.e. adds value through its own value chain. In other words, it can be argued that suppliers do not necessary have that much to offer regarding their buyers, as their position in the overall value chain is in the initial stages of the value adding process. Buyers on the other hand may have higher demands for their suppliers which can at least partly explain why resources contributed by them seem to have a positive impact towards innovation. In their position, it may be necessary for them to provide information and knowledge to their suppliers in order of getting the kind of resources back which they need for their own production processes.

6   SUMMARY AND RECOMMENDATIONS FOR FURTHER RESEARCH

Multinational corporations in Finland are linked to their local business partners through their networks of external linkages. The existence of these connections is obvious e.g. through the emergence of industrial clusters in Finland (Palmberg, 2006) and this argument is also supported by the empirical evidence used in this study. The empirical analysis provided interesting and also some surprising results and these are summarized in the following.

The main hypothesis regarding the overall impact of local linkages on MNC innovativeness, was explored through regression analysis and based on the results it was not possible to reject the presented null hypothesis H_{0q1} because the analysis showed differing results to received resources from suppliers and buyers. However, the polarized impacts of received resources from suppliers and buyers provide interesting viewpoints especially for H4 regarding the business partner role. Similarly, results obtained from the factor analysis pointed towards making similar conclusion on the significance of business partner role.

The most interesting finding of this research was the difference between the impact of received knowledge resources from suppliers and buyers. It was originally hypothesized that business partner role would have been insignificant over the impact on innovativeness. However these results suggest that linkages to suppliers have a negative impact on the innovativeness of MNC as linkages to buyers have a positive impact. It has to be though remembered that even though these results were statistically significant, the correlation coefficients were quite small as there are other factors impacting companies' innovativeness as well.

R&D spending as a measure for innovativeness in companies has been challenged in recent academic literature. Neither in this study evidence was found towards positive

correlation between R&D spending and innovativeness. Continuing argumentation from this finding, the question remains, what are the factors impacting innovativeness in MNCs? As it was found in the literature, innovation is created from knowledge and therefore it is needed to be drawn from somewhere. Intellectual capital possessed by the people working for the organizations is by assumption the main source of knowledge, but also sharing it with others is paramount in creating new ideas.

H3 regarded the impact of R&D activities on innovativeness. As it was found from existing literature, these activities are targeted towards innovation in MNCs, but nowadays being linked to the local business environment also constitutes some portion of the alleged innovativeness in MCNs. This idea was supported by the data through autonomy in R&D activities, which was found to have a weak statistically significant positive impact on innovativeness of Finnish MNC units.

In this research, the direction of resource flow between the company and its business partners is separated between received and contributed resources. Based on these results, it can be argued that contributed resources outside the company actually shouldn't directly enhance innovativeness as the company does not gain any benefit for doing this. The benefit for sharing resources is indirect, by doing so the company can expect to get something in return, which relates more to receiving resources. Based on these findings and argumentation, it is not possible to reject H_{0q2b}, as no statistically significant evidence on contributed resources having an impact on the innovativeness of MNC units was found in the analysis. Based on the findings it was possible to reject H_{0q2a}, as significant results were found that receiving resources from business partners has an impact on MNC innovativeness. This was an expected result, as the whole argumentation of this thesis is based on the idea that external linkages have an impact on the innovativeness of Finnish MNC units.

The main limitations to this study relate to the small sample size caused by low response rate of the survey. The main limitation is that the data provides reliable evidence to only few aspects and factors of external networks and therefore future research in this field is important.

6.1   Managerial implications and suggestions for further research

Based on the findings, it is not possible to reject the null hypothesis H_{0q1} as received resources from buyers and suppliers have an opposite impact on innovativeness. However, these findings suggest that there are significant differences on the benefits of external linkages based on the business partner type. As only these two variables were found statistically significant in this research, an important area of future research would be to explore deeper into these suggested differences between received resources from different business partners. Interesting would be also to find out the impact of other types of business partners such as joint venture and alliance cohorts as these companies by assumption are well-comparable with each other in terms of core business.

On the other hand H_{0q2b} could not be rejected due to the inconclusiveness of the results. Also regarding the received resources, it was not possible to make conclusions on whether receiving resources from other business partners has an impact on innovativeness, which would have been quite interesting to find out, as these are the types of relations which are not necessarily obligated contractual relations as supplier-buyer relations often are.

The possible advantages for multinational corporations derived from the field of this study are quite obvious and significant. Especially in SMOPEC countries, innovativeness is crucial for the local business environment as differentiation through being on the cutting edge in certain industrial niches is often the way these areas retain

their competitiveness. Existing literature and also the results of this thesis support the idea that having linkages to business partners have positive impacts on the company's performance comparing to the situation where companies function on their own. The necessity to have contractual agreements in order to maintaining routine operations is one thing another is actually exchanging valuable information and knowledge in terms of creating something new. Naturally, each MNC has to make the decision, whether allowing other companies to have access to these resources is worthwhile, but it is something to consider.

Based on the results of this study and also previous studies in this field, it was concluded that R&D investment does not necessary correlate with high levels if innovation in MNCs. This is an important thing to realize, as large corporations may spend considerable amounts of capital in R&D related activities in their quest for new innovations. However, small local companies may be highly innovative with much lower levels of R&D spending only by focusing on a small niche within a certain industry and having tacit knowledge within that field. Collaboration between these companies and MNCs may provide valuable knowledge assets to both parties in conjunction with the main idea of the network-based view in multinational management.

The findings of this study provide many interesting areas for further research. First of all, the overall setting for this study was very general as companies included in the sample were large merely in terms of revenue. Considering the fact that the major industries in Finland are formatted in industrial clusters, a closer, and more precise study should be made on the linkages within a certain industry. In terms of innovativeness, for instance the ICT cluster would be very suitable for this study. Another issue would be to focus merely on the MNC subsidiaries operating in Finland, as these units are the result of FDI, which under Dunning's OLI theory need to have some locational advantages located in Finland or otherwise they wouldn't exist here.

Understanding the reasons why these MNCs have decided to have operations in Finland makes it possible to develop the local business environment towards more international context.

A deeper analysis could also be performed in terms of the direction of information flows and the differences between different business partner types. In this study the results for collaborated resources were inconclusive, so the argument that collaborated resources would not at least directly impact innovativeness is merely on a hypothesis level and needs more evidence to see whether it holds. An interesting research topic to analyze would be to find out how much impact does reciprocation have on collaborated resources in external linkages. In other words, how much sharing of resources is done merely seeking to get something better in return and how much is shared in terms of achieving cohesive advantages.

The most interesting finding of this analysis was difference between different business partner types in terms of impact towards innovativeness as a competitive advantage for a MNC. It was found, that resources received from suppliers had a negative impact on innovativeness whereas resources received from buyers had a positive impact. Especially important would be to find out whether other resources received from other business partners both in Finland and worldwide has a positive impact on innovativeness on MNC, as they can be seen as a peer group for the MNCs under study.

This area of research on the impact of external linkages on innovation is quite complex and has many attributes related to it. Based on the findings of this thesis, both the field of industry and business partner type are significant factors in terms of external linkages and innovation. A more in-depth analysis taking into consideration these two aspects and possibly focusing on foreign MNC subsidiaries is an important research area for the future.

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APPENDICES

APPENDIX 1.

Globe Connect Large Firms & Linkages in Small Economies

Contact: Joanna.Scott-Kennel@vuw.ac.nz

Welcome!

Thank you for choosing to answer the **GlobeConnect** questionnaire. It will ask you to provide details on your Finnish activities, relationships with local business partners, international connections and local business environment.

This research has been granted Ethical Approval by Victoria University of Wellington. Answers will remain absolutely confidential and only used for research purposes. No individual firm information will be presented in results or disseminated to other firms.

This project is undertaken by:

Dr. Joanna Scott-Kennel (Victoria University of Wellington, Finland)

Dr. Axele Giroud (Manchester Business School, United Kingdom) and

Dr. Fabienne Fortanier (Amsterdam Business School, the Netherlands)

Instructions

Unless otherwise indicated the questions in this survey relate to your firm's operations in Finland. It should be completed by a senior manager. It will take approximately 20 minutes to complete.

1. Where is your firm's global headquarters (HQ) located?
(This question and the next relate to your ENTIRE COMPANY worldwide, not just Finland (if applicable).

☐   In Finland

☐   In Europe

☐   Elsewhere, please specify:

2. How many employees does your global company have locally, regionally and globally?
(please indicate total number of employees)

In Finland

In Europe

Elsewhere

3. When was your company first established in Finland?

Year

➔ *If your firm has foreign (non-Finnish) ownership, please answer questions 4, otherwise go to question 5.*

4. Foreign ownership

4a. What is the percentage of foreign ownership of your firm in Finland?

Percentage of foreign ownership:

4b. How many years has your firm been owned by your current foreign parent company?

     Number of years:

4c - Does your firm have regional headquarter responsibilities?
(e.g. coordination of regional activities in manufacturing, service delivery, marketing or distribution)

Yes   ☐   **No**   ☐

5. How much <u>autonomy</u> does your firm have over strategic decisions in the following areas?

(please tick as appropriate)	No autonomy		Some autonomy			Full autonomy		Not applicable
	1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
R&D, product (service) design	☐	☐	☐	☐	☐	☐	☐	☐
Production and processes	☐	☐	☐	☐	☐	☐	☐	☐
Procurement, choice of suppliers	☐	☐	☐	☐	☐	☐	☐	☐
Marketing, distribution and sales	☐	☐	☐	☐	☐	☐	☐	☐

6. What percentage of your firm's total INPUTS is purchased by your firm from:
(Inputs include raw materials, intermediate & final goods and services)

Finland	Europe	Country of corporate HQ (if not Finland)	Rest of the world	Total Inputs
%	%	%	%	100%

7. What percentage of your firm's total OUTPUT is sold by your firm to:
(Output includes raw materials, intermediate & final goods and services)

Finland	Europe	Country of corporate HQ (if not Finland)	Rest of the world	Total Inputs
%	%	%	%	100%

8. What percentage of your firm's total inputs is purchased from other units of your firm in Finland or internationally? *(please give best estimate)*

% of total input purchased from   %
other units of your firm

9. What percentage of your firm's total output is sold to other units of your firm in Finland or internationally? *(please give best estimate)*

% of total output sold to other units   %
of your firm

10. Which of the following activities are performed by your firm in Finland?
(please tick if your firm is currently involved in any of these activities and how you expect your involvment to change in the 3-5 years)

	Currently involved in	In next 3 to 5 years		
		Decrease	Same	Increase
R&D, product (service) design	☐	☐	☐	☐
Product design and adaptation	☐	☐	☐	☐
Procurement	☐	☐	☐	☐
Manufacturing or service delivery	☐	☐	☐	☐
Human resource management	☐	☐	☐	☐
Accounting & finance	☐	☐	☐	☐
Information systems & IT	☐	☐	☐	☐
Marketing, sales, after-sales	☐	☐	☐	☐
(incl. helpdesk and call centres)				
Other, please specify:	☐	☐	☐	☐

11. In the <u>past 3 to 5 years</u>, has your firm (partially) outsourced any of these activities?

R&D	☐	Product design and adaptation	☐
Procurement	☐	Manufacturing or service delivery	☐
HRM	☐	Accounting and finance	☐
Information systems, IT	☐	Distribution & logistics	☐
Marketing, sales & after sales	☐	NO OUTSOURCING AT ALL	☐
Other, please specify:	☐		

12. For the 3 most important activities (above) what share has been outsourced?

			Primarily outsourced from:		
(please indicate the activity and approx. % outsourced in past 3 to 5 years)		Finland	Europe	China and India	Elsewhere
1	%	☐	☐	☐	☐
2	%	☐	☐	☐	☐
3	%	☐	☐	☐	☐

13. In the <u>next 3 to 5 years</u>, has your firm (partially) outsourced any of these activities?

R&D	☐	Product design and adaptation	☐
Procurement	☐	Manufacturing or service delivery	☐
HRM	☐	Accounting and finance	☐
Information systems, IT	☐	Distribution & logistics	☐
Marketing, sales & after sales	☐	NO OUTSOURCING AT ALL	☐
Other, please specify:	☐		

14. For the 3 most important activities (above) what share does your firm plan to outsource?

		Primarily outsourced from:			
(please indicate the activity and approx % to be outsourced in next 3 to 5 years)		Finland	Europe	China and India	Elsewhere
1	%	☐	☐	☐	☐
2	%	☐	☐	☐	☐
3	%	☐	☐	☐	☐

15.To what extent does your firm benefit from resources received from <u>suppliers</u> in Finland? *(please tick as appropriate)*

	Not at all		To some extent			Very much		NA
	1	2	3	4	5	6	7	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

16. To what extent does your firm benefit from resources received from <u>buyers</u> (incl. customers & agents) in Finland?

	Not at all		To some extent			Very much		NA
	1	2	3	4	5	6	7	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

17. To what extent does your firm benefit from resources received from <u>other business partners</u> (incl. alliances and joint-ventures) in Finland?

	Not at all		To some extent			Very much		NA
	1	2	3	4	5	6	7	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

18. To what extent do you benefit from resources received from <u>other units</u> of your firm located <u>outside</u> Finland?

	Not at all		To some extent			Very much		NA
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

Second, please indicate how your firm _contributes_ to the development of its business partners, through regular interaction in the business relationships.

19.To what extent does your firm contribute resources to <u>suppliers</u> in Finland?

(please tick as appropriate)

	Not at all		To some extent			Very much		NA
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

20. To what extent does your firm contribute resources to <u>buyers</u> (incl. customers & agents) in Finland? (please tick as appropriate)

	Not at all		To some extent			Very much		NA
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

21.To what extent does your firm contribute resources to <u>other business partners</u> (incl. alliances and joint-ventures) in Finland? (please tick as appropriate)

	Not at all		To some extent			Very much		NA
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐

	Not at all 1	2	3	4	5	6	7	NA
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

22.To what extent do your firm contribute to resources to <u>other units</u> of your firm located <u>outside</u> Finland? (please tick as appropriate)

	Not at all 1	2	To some extent 3	4	5	Very much 6	7	NA
Technical know-how, R&D and innovation	☐	☐	☐	☐	☐	☐	☐	☐
Organisation & management know-how	☐	☐	☐	☐	☐	☐	☐	☐
Marketing know-how, market information	☐	☐	☐	☐	☐	☐	☐	☐
Training, development of human resources	☐	☐	☐	☐	☐	☐	☐	☐

23. How favourable are the following aspects of Finland for your firm?

(please tick as appropriate)	Not at all favourable		Somewhat favourable			Very favourable		NA
Access to markets and resources	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Finland market	☐	☐	☐	☐	☐	☐	☐	☐
Proximity to Europe market	☐	☐	☐	☐	☐	☐	☐	☐
Availability of natural resources, raw materials	☐	☐	☐	☐	☐	☐	☐	☐
Access to capital	☐	☐	☐	☐	☐	☐	☐	☐
Availability of skilled labour	☐	☐	☐	☐	☐	☐	☐	☐
Local conditions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Knowledge infrastructure (e.g. universities)	☐	☐	☐	☐	☐	☐	☐	☐
Physical infrastructure (e.g. ports, roads, telecom…)	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle (quality of life)	☐	☐	☐	☐	☐	☐	☐	☐
Business relationships	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Finnish suppliers (including professional services)	☐	☐	☐	☐	☐	☐	☐	☐
Suppliers in rest of ASEAN (including professional services)	☐	☐	☐	☐	☐	☐	☐	☐
Presence of key competitors	☐	☐	☐	☐	☐	☐	☐	☐
Local rules and regulations	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Regulatory compliance costs	☐	☐	☐	☐	☐	☐	☐	☐
Government assistance/incentives/subsidies	☐	☐	☐	☐	☐	☐	☐	☐
Other, please specify:	☐	☐	☐	☐	☐	☐	☐	☐

24. How will these aspects in Finland change for your firm in the next 3 to 5 years?
(please tick as appropriate)

	Decline	Same	Increase
Finnish market	☐	☐	☐
Proximity to Europe market	☐	☐	☐
Availability of natural resources, raw materials	☐	☐	☐
Access to capital	☐	☐	☐
Availability of skilled labour	☐	☐	☐
Knowledge infrastructure (e.g. universities)	☐	☐	☐
Physical infrastructure (e.g. ports, roads, telecom…)	☐	☐	☐
Lifestyle (quality of life)	☐	☐	☐
Finnish suppliers (including professional services)	☐	☐	☐
Suppliers in rest of ASEAN (including professional services)	☐	☐	☐
Presence of key competitors	☐	☐	☐
Regulatory compliance costs	☐	☐	☐
Government assistance/incentives/subsidies	☐	☐	☐
Other, please specify:	☐	☐	☐

25. For the last financial year, what percentage of your total sales did your firm spend on:

1- R&D   **%**

2- Marketing and sales activities   **%**

26. Relative to your key competitors in Finland how would you assess your firm's performance in the following?

	Much worse			Similar		Much better	
(please tick as appropriate)	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Productivity and efficiency	☐	☐	☐	☐	☐	☐	☐
Profitability	☐	☐	☐	☐	☐	☐	☐
Sales growth	☐	☐	☐	☐	☐	☐	☐

27. To what extent are your firm's competitive advantages derived from the following factors?

	Not at all		To some extent			Very much		NA
(please tick as appropriate)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Price of product or services	☐	☐	☐	☐	☐	☐	☐	☐
Quality of product and service	☐	☐	☐	☐	☐	☐	☐	☐
Innovation and creativity	☐	☐	☐	☐	☐	☐	☐	☐
Marketing, sales, reputation and branding	☐	☐	☐	☐	☐	☐	☐	☐
Productivity and efficiency	☐	☐	☐	☐	☐	☐	☐	☐
Managerial or organisational routines	☐	☐	☐	☐	☐	☐	☐	☐

Procurement and supply □ □ □ □ □ □ □ □
Location near to infrastructure / critical resources □ □ □ □ □ □ □ □
Ability to predict and respond to market demand □ □ □ □ □ □ □ □
Other, please specify: □ □ □ □ □ □ □ □

28.To what extent do the following statements describe the strategy of your firm at the <u>corporate</u> level? (please tick as appropriate for global operations or foreign HQ if foreign-owned)

	Not at all		To some extent			Very much		NA
Our company ..	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
...achieves economies of scale by concentrating its activities at a limited number of locations	□	□	□	□	□	□	□	□
...defines its competitive position worldwide on a global basis	□	□	□	□	□	□	□	□
...has markets in different locations worldwide that are closely linked and interconnected	□	□	□	□	□	□	□	□
...treats markets that are too diverse to make competition on a global level possible	□	□	□	□	□	□	□	□
...has markets in each local worldwide separately	□	□	□	□	□	□	□	□
...tries to adapt products and practices to tastes and values in different locations worldwide	□	□	□	□	□	□	□	□

APPENDIX 2.

Definitions for variables used in the SAS analyses.

Variable	Definition
Intercept	Intercept
q0901	Autonomy in R&D
q200101	R&D performed in Finland Dummy
q6901	Technical know-how, R&D, innovation from suppliers in Finland
q6902	Organisation & management know-how from suppliers in Finland
q6903	Marketing know-how, market information from suppliers in Finland
q6904	Training and development of HR from suppliers in Finland
q7001	Technical know-how, R&D, innovation from buyers in Finland
q7002	Organisation & management know-how from buyers in Finland
q7003	Marketing know-how, market information from buyers in Finland
q7004	Training and development of HR from buyers in Finland
q7101	Technical know-how, R&D, innovation from other business partners in Finland
q7102	Organisation & management know-how from other business partners in Finland
q7103	Marketing know-how, market information from other business partners in Finland
q7104	Training and development of HR from other business partners in Finland
q7201	Technical know-how, R&D, innovation from other business partners worldwide
q7202	Organisation & management know-how from other business partners worldwide
q7203	Marketing know-how, market information from other business partners worldwide
q7204	Training and development of HR from other business partners worldwide
q7401	Technical know-how, R&D, innovation contributed to suppliers
q7402	Organisation & management know-how contributed to suppliers
q7403	Marketing know-how, market information contributed to suppliers
q7404	Training and development of HR contributed to suppliers
q7501	Technical know-how, R&D, innovation contributed to buyers
q7502	Organisation & management know-how contributed to buyers
q7503	Marketing know-how, market information contributed to buyers
q7504	Training and development of HR contributed to buyers
q7601	Technical know-how, R&D, innovation contributed to other business partners in Finland
q7602	Organisation & management know-how contributed to other business partners in Finland
q7603	Marketing know-how, market information contributed to other business partners in Finland
q7604	Training and development of HR contributed to other business partners in

	Finland
q7701	Technical know-how, R&D, innovation contributed to other business partners worldwide
q7702	Organisation & management know-how contributed to other business partners worldwide
q7703	Marketing know-how, market information contributed to other business partners worldwide
q7704	Training and development of HR contributed to other business partners worldwide
q810101	Percentage of Sales used in R&D

APPENDIX 3.

Results of the factor analysis on received resources.

	Eigenvalue	Difference	Proportion	Cumulative
Eigenvalues of the Correlation Matrix: Total = 16 Average = 1				
1	5.33647545	3.07997686	0.3335	0.3335
2	2.25649859	0.58238046	0.1410	0.4746
3	1.67411812	0.27201766	0.1046	0.5792
4	1.40210047	0.43502082	0.0876	**0.6668**
5	0.96707964	0.18516449	0.0604	0.7273
6	0.78191516	0.11582245	0.0489	0.7761
7	0.66609270	0.07024758	0.0416	0.8178
8	0.59584513	0.07770013	0.0372	0.8550
9	0.51814500	0.09202997	0.0324	0.8874
10	0.42611503	0.06545501	0.0266	0.9140
11	0.36066002	0.05542205	0.0225	0.9366
12	0.30523796	0.05335879	0.0191	0.9556
13	0.25187917	0.02255277	0.0157	0.9714
14	0.22932640	0.08363579	0.0143	0.9857
15	0.14569061	0.06287005	0.0091	0.9948
16	0.08282056		0.0052	1.0000

		Factor 1	Factor 2	Factor 3	Factor 4
		Rotated Factor Pattern			
q6901	q6901	0.15865	**0.57657**	0.27937	0.01010
q6902	q6902	0.03056	**0.86943**	0.15685	0.10289
q6903	q6903	-0.12555	**0.77760**	0.05230	0.22308
q6904	q6904	0.21042	**0.69387**	0.00973	0.07260
q7001	q7001	0.25112	-0.18793	0.24611	**0.67561**
q7002	q7002	0.14496	0.23811	0.22579	**0.77308**
q7003	q7003	0.01769	0.28736	0.36601	**0.58121**
q7004	q7004	0.08237	0.17107	0.02228	**0.83509**
q7101	q7101	0.17440	-0.08408	**0.81192**	0.14310
q7102	q7102	0.31229	0.26521	**0.70173**	0.22379
q7103	q7103	0.06548	0.11759	**0.71923**	0.31988
q7104	q7104	0.00452	0.36393	**0.70633**	0.06011
q7201	q7201	**0.73371**	-0.07000	0.32738	-0.10531
q7202	q7202	**0.90025**	0.04100	0.02217	0.07821
q7203	q7203	**0.72607**	0.09012	0.14670	0.26397
q7204	q7204	**0.81301**	0.26441	0.02450	0.26185

Final Communality Estimates: Total = 10.669193								
q6901	**q6902**	**q6903**	**q6904**	**q7001**	**q7002**	**q7003**	**q7004**	**q7101**
0.43574975	0.79203045	0.67292180	0.53110224	0.61539655	0.72634360	0.55465907	0.73392047	0.71717370

q7102	**q7103**	**q7104**	**q7201**	**q7202**	**q7203**	**q7204**
0.71037020	0.63772700	0.63499035	0.66150486	0.81874450	0.62649298	0.80006512

Results of the factor analysis on contributed resources.

	Eigenvalue	Difference	Proportion	Cumulative
Eigenvalues of the Correlation Matrix: Total = 16 Average = 1				
1	6.07786915	3.88889335	0.3799	0.3799
2	2.18897580	0.19192183	0.1368	0.5167
3	1.99705397	0.96002805	0.1248	0.6415
4	1.03702592	0.16000416	0.0648	**0.7063**
5	0.87702176	0.10466710	0.0548	0.7611
6	0.77235466	0.10247279	0.0483	0.8094
7	0.66988186	0.12639872	0.0419	0.8513
8	0.54348315	0.10100380	0.0340	0.8852
9	0.44247935	0.09608570	0.0277	0.9129
10	0.34639365	0.07652629	0.0216	0.9345
11	0.26986736	0.02809765	0.0169	0.9514
12	0.24176971	0.06193220	0.0151	0.9665
13	0.17983751	0.02245517	0.0112	0.9778
14	0.15738233	0.03688104	0.0098	0.9876
15	0.12050130	0.04239878	0.0075	0.9951
16	0.07810252		0.0049	1.0000

	Rotated Factor Pattern				
		Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
q7401	q7401	0.05630	0.34978	0.22019	**0.66789**
q7402	q7402	0.27482	**0.75353**	0.00283	0.15084
q7403	q7403	-0.07749	**0.82531**	0.25989	0.07360
q7404	q7404	0.28744	**0.63882**	-0.09297	0.34102
q7501	q7501	-0.09267	-0.00791	0.36640	**0.82251**
q7502	q7502	**0.58643**	0.57167	0.06578	0.13141
q7503	q7503	-0.10368	0.44086	0.41974	**0.44973**
q7504	q7504	0.52854	0.29736	-0.19067	**0.65818**
q7601	q7601	0.16912	0.33481	**0.65404**	0.25584
q7602	q7602	**0.72972**	0.35412	0.18163	-0.04217
q7603	q7603	0.31916	0.41584	**0.55406**	0.11802
q7604	q7604	**0.76159**	0.32220	0.08061	0.19384
q7701	q7701	0.19472	-0.10143	**0.81095**	0.14209
q7702	q7702	**0.77606**	-0.04975	0.34987	-0.13593
q7703	q7703	0.24691	0.05440	**0.81717**	0.08822
q7704	q7704	**0.85839**	-0.08338	0.31162	0.06431

Final Communality Estimates: Total = 11.300925								
q7401	**q7402**	**q7403**	**q7404**	**q7501**	**q7502**	**q7503**	**q7504**	**q7601**
0.62008240	0.66609870	0.76010952	0.61564491	0.81942249	0.69231108	0.58354871	0.83733621	0.63392390

q7602	**q7603**	**q7604**	**q7701**	**q7702**	**q7703**	**q7704**
0.69266578	0.59569820	0.72790966	0.72603963	0.74563221	0.73947713	0.84502432

APPENDIX 4.

Results of the regression model 1.

Number of Observations Read	55
Number of Observations Used	51
Number of Observations with Missing Values	4

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	20.16143	1.68012	1.37	0.2217
Error	38	46.54445	1.22485		
Corrected Total	50	66.70588			

Root MSE	1.10673	R-Square	0.3022
Dependent Mean	5.47059	Adj R-Sq	0.0819
Coeff Var	20.23057		

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	Intercept	1	4.06647	1.12291	3.62	0.0009	0
q0901	q0901	1	0.26653	0.14236	1.87	0.0689	0.35526
Revenue 2007	Revenue 2007	1	-8.74943E-8	5.982992E-8	-1.46	0.1519	-0.21972
q810101	q810101	1	-0.02046	0.02703	-0.76	0.4537	-0.11552
Employees	Employees	1	0.00000474	0.00000362	1.31	0.1979	0.24551
wFactor1 rec	wFactor1 rec	1	-0.18357	0.13378	-1.37	0.1780	-0.24654

84

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
wFactor2 rec	wFactor2 rec	1	0.30945	0.15941	1.94	0.0597	0.38148
wFactor3 rec	wFactor3 rec	1	-0.19244	0.15051	-1.28	0.2088	-0.22462
wFactor4 rec	wFactor4 rec	1	0.07742	0.14267	0.54	0.5905	0.10213
wFactor1 cont	wFactor1 cont	1	-0.21410	0.17363	-1.23	0.2251	-0.26806
wFactor2 cont	wFactor2 cont	1	0.11369	0.14420	0.79	0.4353	0.14347
wFactor3 cont	wFactor3 cont	1	0.07651	0.15037	0.51	0.6138	0.09633
wFactor4 cont	wFactor4 cont	1	-0.01551	0.17771	-0.09	0.9309	-0.01778

		Correlation of Estimates						
Variable	Label	Intercept	q0901	Revenue 2007	q810101	Employees	wFactor1 rec	wFactor2 rec
Intercept	Intercept	1	-0.7049	-0.0114	-0.2862	-0.4736	-0.3367	-0.1795
q0901	q0901	-0.7049	1	-0.0339	0.2185	0.6151	0.0853	0.0019
Revenue 2007	Revenue 2007	-0.0114	-0.0339	1	0.0839	0.0349	0.1944	0.2021
q810101	q810101	-0.2862	0.2185	0.0839	1	0.041	-0.0333	-0.027
Employees	Employees	-0.4736	0.6151	0.0349	0.041	1	0.2798	0.1379
wFactor1 rec	wFactor1 rec	-0.3367	0.0853	0.1944	-0.0333	0.2798	1	0.1431
wFactor2 rec	wFactor2 rec	-0.1795	0.0019	0.2021	-0.027	0.1379	0.1431	1
wFactor3 rec	wFactor3 rec	0.091	-0.2725	-0.0166	-0.1217	-0.2962	-0.244	-0.3035
wFactor4 rec	wFactor4 rec	-0.379	0.3269	-0.1958	0.2469	0.1827	-0.0095	-0.2059
wFactor1 cont	wFactor1 cont	0.0831	0.0375	-0.1069	0.2456	-0.1579	-0.3753	-0.4567
wFactor2 cont	wFactor2 cont	-0.0659	-0.2575	-0.1878	-0.0699	-0.1622	-0.0519	0.0963
wFactor3 cont	wFactor3 cont	-0.0756	-0.0774	0.1943	-0.2636	0.0681	0.2147	0.2296
wFactor4 cont	wFactor4 cont	0.2109	-0.0888	-0.1912	0.0536	-0.2466	-0.3519	-0.2933

		Correlation of Estimates					
Variable	Label	wFactor3 rec	wFactor4 rec	wFactor1 cont	wFactor2 cont	wFactor3 cont	wFactor4 cont
Intercept	Intercept	0.091	-0.379	0.0831	-0.0659	-0.0756	0.2109
q0901	q0901	-0.2725	0.3269	0.0375	-0.2575	-0.0774	-0.0888
Revenue 2007	Revenue 2007	-0.0166	-0.1958	-0.1069	-0.1878	0.1943	-0.1912
q810101	q810101	-0.1217	0.2469	0.2456	-0.0699	-0.2636	0.0536
Employees	Employees	-0.2962	0.1827	-0.1579	-0.1622	0.0681	-0.2466
wFactor1 rec	wFactor1 rec	-0.244	-0.0095	-0.3753	-0.0519	0.2147	-0.3519
wFactor2 rec	wFactor2 rec	-0.3035	-0.2059	-0.4567	0.0963	0.2296	-0.2933
wFactor3 rec	wFactor3 rec	1	-0.2525	-0.0309	0.0979	-0.0115	0.0707
wFactor4 rec	wFactor4 rec	-0.2525	1	0.2249	0.0037	-0.3278	-0.225
wFactor1 cont	wFactor1 cont	-0.0309	0.2249	1	-0.3629	-0.2209	0.0699
wFactor2 cont	wFactor2 cont	0.0979	0.0037	-0.3629	1	-0.2864	0.011
wFactor3 cont	wFactor3 cont	-0.0115	-0.3278	-0.2209	-0.2864	1	-0.3746
wFactor4 cont	wFactor4 cont	0.0707	-0.225	0.0699	0.011	-0.3746	1

Durbin-Watson D	1.975
Number of Observations	51
1st Order Autocorrelation	-0.069

Standardized Residual of q8303
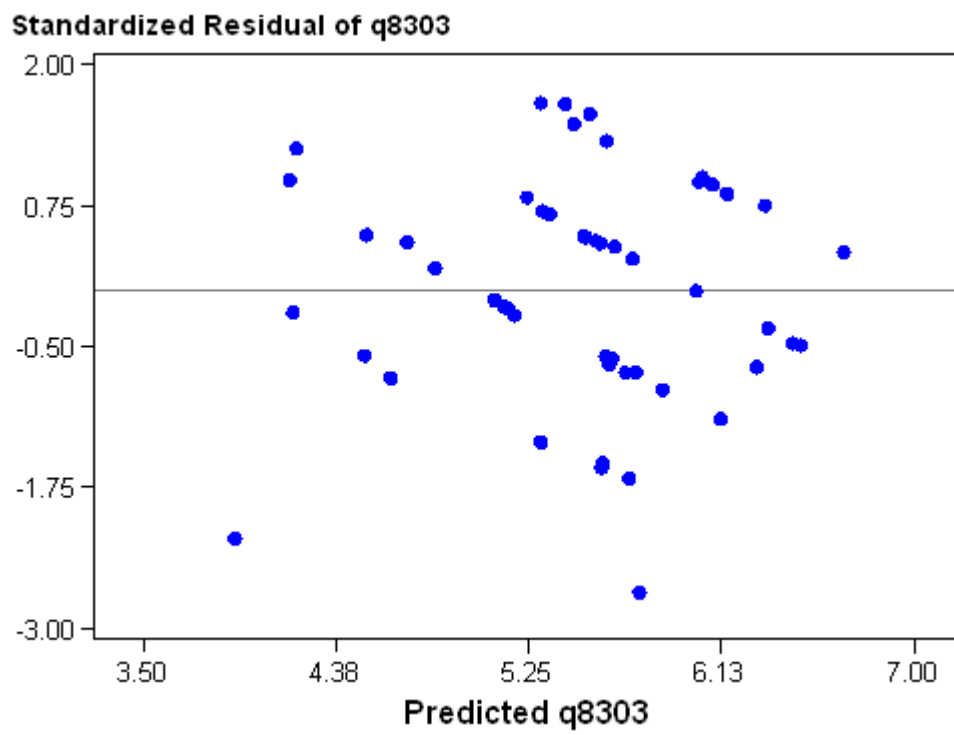
Results of the regression model 2.

Number of Observations Read	55
Number of Observations Used	51
Number of Observations with Missing Values	4

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	17.88056	2.23507	1.92	0.0818
Error	42	48.82532	1.16251		
Corrected Total	50	66.70588			

Root MSE	1.07820	R-Square	0.2681
Dependent Mean	5.47059	Adj R-Sq	0.1286
Coeff Var	19.70897		

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	Intercept	1	4.20145	1.06550	3.94	0.0003	0
q0901	q0901	1	0.30233	0.12894	2.34	0.0238	0.40298
Revenue 2007	Revenue 2007	1	-9.07125E-8	5.525233E-8	-1.64	0.1081	-0.22780
q810101	q810101	1	-0.00964	0.02477	-0.39	0.6992	-0.05442
Employees	Employees	1	0.00000461	0.00000323	1.43	0.1608	0.23881
wFactor1 rec	wFactor1 rec	1	-0.23199	0.10996	-2.11	0.0409	-0.31156

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
wFactor2 rec	wFactor2 rec	1	0.22252	0.13164	1.69	0.0984	0.27431
wFactor3 rec	wFactor3 rec	1	-0.20666	0.14537	-1.42	0.1625	-0.24122
wFactor4 rec	wFactor4 rec	1	0.13746	0.11822	1.16	0.2515	0.18133

Correlation of Estimates

Variable	Label	Intercept	q0901	Revenue 2007	q810101	Employees	wFactor 1 rec	wFactor 2 rec	wFactor 3 rec	wFactor 4 rec
Intercept	Intercept	1	-0.7746	0.0265	-0.3421	-0.4734	-0.3008	-0.1097	0.0857	-0.415
q0901	q0901	-0.7746	1	-0.1174	0.185	0.587	0.0045	-0.0237	-0.2483	0.2858
Revenue 2007	Revenue 2007	0.0265	-0.1174	1	0.1408	-0.0875	0.0634	0.1115	0.0148	-0.2296
q810101	q810101	-0.3421	0.185	0.1408	1	0.0631	0.0736	0.1239	-0.1144	0.1343
Employees	Employees	-0.4734	0.587	-0.0875	0.0631	1	0.1149	-0.0111	-0.2803	0.151
wFactor 1 rec	wFactor1 rec	-0.3008	0.0045	0.0634	0.0736	0.1149	1	-0.1751	-0.2524	-0.0175
wFactor 2 rec	wFactor2 rec	-0.1097	-0.0237	0.1115	0.1239	-0.0111	-0.1751	1	-0.349	-0.2151
wFactor 3 rec	wFactor3 rec	0.0857	-0.2483	0.0148	-0.1144	-0.2803	-0.2524	-0.349	1	-0.2569
wFactor 4 rec	wFactor4 rec	-0.415	0.2858	-0.2296	0.1343	0.151	-0.0175	-0.2151	-0.2569	1

Durbin-Watson D	1.905
Number of Observations	51
1st Order Autocorrelation	-0.033

Standardized Residual of q8303
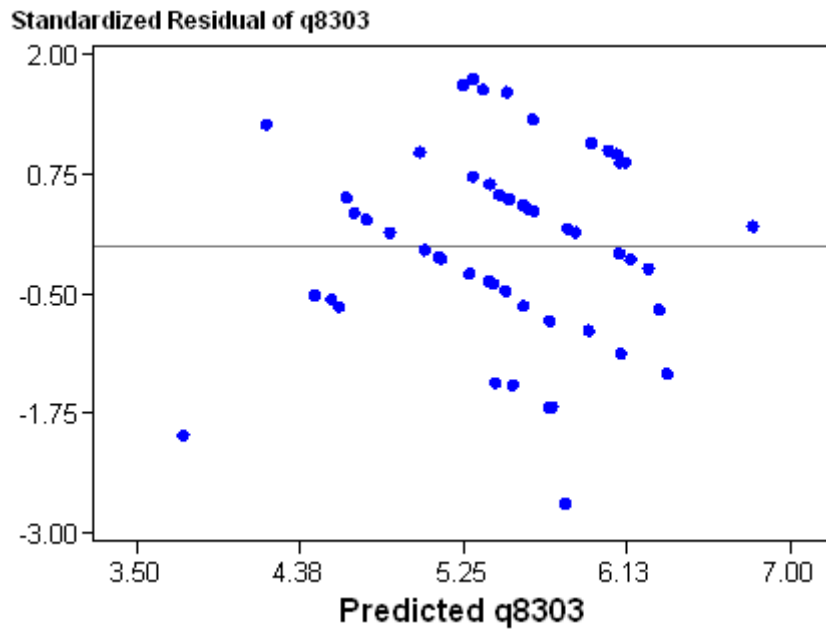
Results of the regression model 3.

Number of Observations Read	55
Number of Observations Used	51
Number of Observations with Missing Values	4

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	17.70461	2.52923	2.22	0.0511
Error	43	49.00127	1.13956		
Corrected Total	50	66.70588			

Root MSE	1.06750	R-Square	0.2654
Dependent Mean	5.47059	Adj R-Sq	0.1458
Coeff Var	19.51351		

Parameter Estimates						
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standardized Estimate**
Intercept	Intercept	1	4.05964	0.99129	4.10	0.0002	0
q0901	q0901	1	0.31161	0.12545	2.48	0.0170	0.41534
Revenue 2007	Revenue 2007	1	-8.76861E-8	5.415949E-8	-1.62	0.1128	-0.22020
Employees	Employees	1	0.00000469	0.00000319	1.47	0.1489	0.24292
wFactor1 rec	wFactor1 rec	1	-0.22884	0.10857	-2.11	0.0409	-0.30734
wFactor2 rec	wFactor2 rec	1	0.22886	0.12933	1.77	0.0839	0.28213
wFactor3 rec	wFactor3 rec	1	-0.21313	0.14298	-1.49	0.1434	-0.24877
wFactor4 rec	wFactor4 rec	1	0.14364	0.11599	1.24	0.2223	0.18948

Correlation of Estimates								
Variable	**Label**	**Intercept**	**q0901**	**Revenue 2007**	**Employees**	**wFactor 1 rec**	**wFactor 2 rec**	**wFactor 3 rec**	**wFactor 4 rec**
Intercept	Intercept	1	-0.7702	0.0802	-0.4818	-0.2941	-0.0723	0.0499	-0.3963
q0901	q0901	-0.7702	1	-0.1474	0.5866	-0.0093	-0.0478	-0.2326	0.268
Revenue 2007	Revenue 2007	0.0802	-0.1474	1	-0.0975	0.0537	0.0957	0.0315	-0.2533
Employees	Employees	-0.4818	0.5866	-0.0975	1	0.1108	-0.0191	-0.2755	0.1441
wFactor 1 rec	wFactor1 rec	-0.2941	-0.0093	0.0537	0.1108	1	-0.1861	-0.2462	-0.0277
wFactor 2 rec	wFactor2 rec	-0.0723	-0.0478	0.0957	-0.0191	-0.1861	1	-0.3396	-0.2357
wFactor 3 rec	wFactor3 rec	0.0499	-0.2326	0.0315	-0.2755	-0.2462	-0.3396	1	-0.2453
wFactor 4 rec	wFactor4 rec	-0.3963	0.268	-0.2533	0.1441	-0.0277	-0.2357	-0.2453	1

Durbin-Watson D	1.886
Number of Observations	51
1st Order Autocorrelation	-0.022

Standardized Residual of q8303
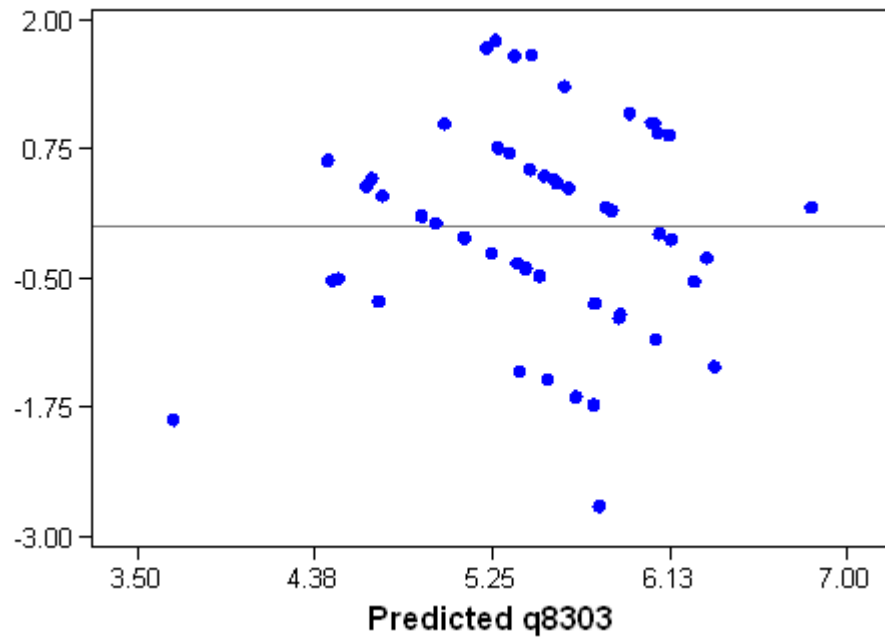
Results of the regression model 4.

Number of Observations Read	55
Number of Observations Used	51
Number of Observations with Missing Values	4

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	11.05992	3.68664	3.11	0.0350
Error	47	55.64596	1.18396		
Corrected Total	50	66.70588			

Root MSE	1.08810	R-Square	0.1658
Dependent Mean	5.47059	Adj R-Sq	0.1126
Coeff Var	19.88996		

Summary of Stepwise Selection									
Step	Variable Entered	Variable Removed	Label	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	wFactor1 rec		wFactor1 rec	1	0.0531	0.0531	5.1367	2.75	0.1036
2	wFactor2 rec		wFactor2 rec	2	0.0635	0.1167	3.6383	3.45	0.0693
3	q0901		q0901	3	0.0491	0.1658	2.9335	2.77	0.1028

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Squared Partial Corr Type I	Squared Partial Corr Type II
Intercept	Intercept	1	4.87925	0.80165	6.09	<.0001	0	.	.
q0901	q0901	1	0.16722	0.10052	1.66	0.1028	0.22289	0.03939	0.05561
wFactor1 rec	wFactor1 rec	1	-0.25941	0.10652	-2.44	0.0187	-0.34839	0.06658	0.11205
wFactor2 rec	wFactor2 rec	1	0.21668	0.11552	1.88	0.0669	0.26712	0.06965	0.06965

Correlation of Estimates					
Variable	Label	Intercept	q0901	wFactor1 rec	wFactor2 rec
Intercept	Intercept	1.0000	-0.6970	-0.3818	-0.3250
q0901	q0901	-0.6970	1.0000	-0.0955	-0.0097
wFactor1 rec	wFactor1 rec	-0.3818	-0.0955	1.0000	-0.3506
wFactor2 rec	wFactor2 rec	-0.3250	-0.0097	-0.3506	1.0000

Durbin-Watson D	1.888
Number of Observations	51
1st Order Autocorrelation	0.002

Standardized Residual of q8303