Firm employment growth:
the influence of related variety

A study on firm employment growth in Flevoland

Master thesis Economic Geography
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Index

Preface

After months of hard work I, Miles Copping, am very pleased to present to you my thesis on the relation between related variety and firm employment growth in Flevoland. This thesis is part of my master's degree in Economic Geography at Utrecht University. I have worked hard to prove to my supervisor(s), prospective employers and above all myself, that I am able to independently carry out a scientific research. This includes (but is not limited to) the formulation of a research question, searching for relevant literature, selecting appropriate research methods and analysing the results. I found it challenging at times and are relieved to have finished it. Looking back at how I started, I am proud of what I have accomplished.

Even before I had even started my master's I had already been looking at subjects for my master thesis. I was especially interested in the economic development of rural British Columbia, Canada. In fact, it was the main reason for me for wanting to study Economic Geography in the first place. This may come as a spoiler but as you might have guessed from the title of this thesis, my actual thesis is not about the economic development of rural British Columbia but on the influence of related variety on firm employment growth in the Dutch province of Flevoland. Well how then did my thesis topic change so drastically?

After spending hours and hours contacting local development agencies, municipalities, universities and even the Dutch Consulate-General in Vancouver, Canada, the forecast of me finding an internship in rural British Columbia began to look bad. For that reason I started to look at alternatives within the Netherlands. An internship at a consulting agency (Bureau BUITEN) located just here in Utrecht, on the economic development of Flevoland came to my eye. Although not as exciting as an internship in Canada I applied for the internship and was selected as the candidate. Although I could have chosen to still proceed with writing my thesis on the economic development of rural British Columbia, the opportunity to use an extensive firm level dataset at Bureau BUITEN for my thesis made me decide differently.

My thesis was supervised by both prof. dr. Veronique Schutjens and dr. Pierre-Alexandre Balland. Veronique Schutjens advised me on the computation of my main research question. Furthermore she assisted me with the writing of the literature overview as well as with the empirical analysis. Unfortunately Veronique Schutjens had to hand over my thesis due to private circumstances. Pierre-Alexandre Balland took over the supervision and assisted me in completing my thesis. I would like to take this opportunity to express my gratefulness to both of them. I would like to thank Veronique Schutjens for inspiring me at times I felt lost. I would like to thank Pierre-Alexandre Balland in picking up the supervision so smoothly and for his input for the completion of my thesis.

Abstract

There has been a long tradition to explain regional employment growth with the regional portfolio of firms. While Marshall (1890) argues that regional specialisation is most beneficial for regional employment growth, Jabobs (1969) argues that a diversified region is most beneficial for regional employment growth. The most recent addition to the specialisation/diversification debate comes from Frenken et al. (2007). In their paper *Related variety, unrelated variety and regional economic growth* they argue that regions that have a portfolio of different but related firms, termed related variety, are most likely to see employment growth. Empirical studies tend to confirm this relation.

Referring to among others Coleman (1987), this thesis rejects the existence of any such relation between related variety and regional employment growth. As employment growth does not stem from regions but indeed from firms, the only appropriate level to study employment growth is at the level of the firm. Hence, this thesis focusses on the relation between related variety and firm employment growth.

This thesis has empirically studied the influence of related variety, operationalised as the amount of related employment within the municipality of the firm, on firm employment growth in the Dutch province of Flevoland between 1989 and 2014. For this purpose a comprehensive firm year dataset was developed. The results of the empirical study in this thesis are clear. While related variety may be positively related to regional employment growth there is no significant correlation between related variety and firm employment growth, controlled for other factors.

1. Introduction

Economic geographers and spatial economists have for a long time been interested in the factors that shape and maintain regional employment and the development of this. The reason for this general interest is that jobs allow for supporting one's self and others, developing the self-worth that comes from work, having stakes in society and conformity, and building prosocial relationships of a community (Latessa, 2012). In other words, employment has got a manifold of advantages for a region and its inhabitants.

Linked to this, uneven employment development is of interest for at least two reasons (Shaoguang, 2006). First of all regional disparities are an ethical issue. Both employment growth and fairness in the distribution of employment is desirable. These two goals unfortunately sometimes conflict with each other. Employment growth of one region may have a negative trade-off to the other region. Secondly, regional disparities in employment development are of political significance. Large regional employment differences will likely force the (central) government to interfere in such a way that high employment regions have to subside the low employment regions. The people in the high employment region will probably not perceive any kind of such policy as efficient and rational.

For the reasons outlined above, much research has been undertaken on the subject of regional employment growth resulting in a long list of determinants for regional employment growth. Already before the turn of the nineteenth century into the twentieth century, Marshall (1890) mentioned the importance of agglomerations for regional employment growth in his "Industrial District-argument" (Van der Panne, 2004). Marshall (1890) argued that when firms agglomerate, this results in external economies to firms which on its turn will be beneficial for the employment development of the firms within the agglomeration. The growth of firms will ultimately lead to regional employment growth in this line of reasoning.

Although Marshall was the first to acknowledge the economic benefits of (firm) agglomerations, he was definitely not the last. The relation between the agglomeration of firms and regional employment growth has numerously been revised and fine-tuned and has resulted in multiple different subtheories.

Marshall (1920), Arrow (1962b) and Romer (1986) and formalised by Glaeser et al. (1992) argued that the agglomeration of similar firms would be most beneficial for regional employment growth. They emphasized that firms within a specialised region will benefit from intra sector knowledge spillovers which will cause firm employment growth and hence regional employment growth.

Jacobs (1969) on the other hand mentioned that regional diversification would be mostly beneficial for firm employment growth. She stressed that within a diversified region, firms will benefit from complementary knowledge across diverse firms and economic agents. These externalities will cause the firms within the region to grow in employment.

Frenken et al. (2007) have recently come up with one further addition to the debate on the relation between firm agglomerations and regional employment growth. They argue that the portfolio of firms within the region should be related to one another in order to let the regional employment grow. They call this portfolio of related firms (or employment) related variety. The cognitive distance

of the firms within a region should not be too close or too big in order to create regional employment growth.

While economic geographers and spatial economists have been interested in the relation between agglomeration economies and regional firm employment growth, some scholars in the field of strategic management have rejected the existence of any relation between agglomerations and regional employment growth, stating that regional employment growth is in fact the result of employment developments on the micro level (Van Oort et al., 2012). The dependent variable of the micro approach is the growth of single firms. The advantage of such a study is that the main dependent variable is not aggregated and allows for a more sophisticated testing as firm-specific variables can be included in the analysis and inner-regional heterogeneity can be observed (Duschl et al., 2015).

Hence a manifold of studies have been conducted connecting regional specialisation (measuring, Marshall's localisation economies) and regional diversification (measuring Jacobs externalities) with micro level firm employment growth (see Duschl et al., 2015 for overview). What is surprising however, is that while many scholars have studies how localisation economies and Jacobian externalities are related to firm employment growth, there is a lack of studies that have looked at the relation between related variety and firm employment growth (Schimke and Brenner, 2012). Accordingly, Van Oort et al. (2012) state, more research should be done on the relationship between related variety and firm employment growth.

This thesis is designed to fill the knowledge gap that relates the concept of related variety to micro level firm employment growth.
On the one hand, this thesis is similar to studies by among others Frenken et al. (2008), Bishop and Gripaios (2010) and Hartog et al. (2012), in that this thesis examines the influence of related variety on employment growth.
On the other hand this thesis is substantially different to the above cited studies about related variety in that it does not take regional employment growth as factor to be explained but rather firm employment growth.

With the filling of this knowledge gap, the results of this thesis are highly valuable for policy makers that are concerned with employment (growth). Referring to economic clusters like Silicon Valley, policy makers have often tried to stimulate the co-location of similar firms because they believe this will accelerate the growth of the involved firms. This thesis will test whether such policies are indeed beneficial for the employment growth of the firm.

An important implication of using the concept of related variety for studying firm level employment growth is that the measure of related variety must be adjusted so that it is well fitted to explain firm employment growth. The way in which it is currently operationalised in existing literature is not well fitted to explain employment growth at the firm level as it is based on the portfolio of firms. For that reason a new measure of firm level related variety will be developed in this thesis.

This new measure will be used to empirically explain firm employment growth between 1989 and 2014 in the Dutch province of Flevoland. Owing to the fact that firm employment growth is influenced by a wide array of other factors beside related variety, a number of control variables will be included in the study. Both firm specific (internal) characteristics and regional (external)

characteristics will be taken into account in the analysis. In this way this thesis is interdisciplinary using knowledge from the fields of (among others) economics, management and geography.

As already mentioned, this thesis presents the special case of Flevoland. The current province of Flevoland used to be open water up until the middle of the last century. Only after the land was reclaimed settlement began in Flevoland[1]. In this way the province was planned from scratch. Flevoland was planned as a mainly rural province focussing on agriculture. However, due to the proximity to the Randstad Region (the economic heartland of the Netherlands), the southern part of Flevoland has developed into a suburb for Amsterdam. Since 1976, the city of Almere in the southern part of the province has grown out to be the seventh largest city of the Netherlands.

Related to the high population growth, the employment of the municipality has also grown substantially. Nevertheless, the proximity of the Amsterdam Metropolitan Area has played an important role in the employment development of the municipality. Partly due to the proximity to Amsterdam, the province suffers from a relatively low level of employment (Bureau BUITEN, 2015). This has resulted in many inhabitants of Flevoland to be dependent on jobs outside of the province (Bureau BUITEN, 2015).

The main research question is:

To what extent does related variety influence firm employment growth in Flevoland between 1989 and 2014?

To answer this question, it is necessary to first look at the concept of related variety. Secondly, the concept of related variety should be linked to firm employment growth. Thirdly, as related variety is believed to have an influence on firm employment growth the other factors that are shown to be related to firm employment growth must be detected.

The following subquestions are formulated:

1. What is related variety and how does this concept influence regional employment growth according to the literature?
2. How can the concept of related variety be used to explain firm employment growth?
3. What other factors are of influence on firm employment growth?
4. To what extent does related variety influence firm employment growth in Flevoland between 1989 and 2014 controlled for other factors in an empirical analysis?

This thesis covers three literature reviews and one empirical analysis.
The first literature study concerns the concept of related variety. The concept is rather new but has gained a lot of attention and the literature is growing. In much of the existing literature the concept has been linked to regional employment growth.
The second literature study concerns firm employment growth. As this study believes that related variety is of influence on firm employment growth, all other factors that are shown to be of influence must be detected so that they can be included in the empirical study. In addition to the literature studies, this thesis conceives an empirical analysis. The availability of an extensive dataset on firm employment enables the conduction of a quantitative research. The used dataset has exclusively

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[1] With the exception of Urk and Schokland

been made accessible to the author by the provincial government. The dataset includes information on all firms in the province. Data is available for all years between 1989 and 2014. Additional regional level information will be collected through Statistics Netherlands (CBS).

Chapter 2 introduces related variety and relates this concept to regional employment growth. Since that the concept of related variety builds heavily on theories on agglomeration economies and the cognitive distance of spillovers, these will also be outlined in this chapter. Subsequently in chapter 3, supported by among others the concept of Coleman (1987), it will be argued that employment growth should actually be measured on the level of the firm and not on the level of the region. Hence this chapter stresses that related variety (or the fundamental theories behind this concept) should be related to firm employment growth and not regional employment growth. As this thesis indeed is interested in firm employment growth and not regional employment growth, this thesis must also detect the other factors that are shown to be of influence on firm employment growth. These factors will also be introduced in chapter 3. This chapter also marks the last part of the literature study of this thesis. Chapter 4 and chapter 5 are concerned with the empirical study. First of all in chapter 4 the research design is outlined. Furthermore, the dataset is introduced in this section as well as the operationalisation of the variables and the descriptives of these variables. The actual empirical analysis will follow in chapter 5. Finally, chapter 6 will discuss the results of the study and will introduce some policy recommendations.

2. The essence of related variety

In 2007, Frenken, Van Oort and Verburg published their paper *Related variety, unrelated variety and regional economic growth* and thereby introduced the concept of related variety. The paper has been widely cited and the concept of related variety has gained much attention after its publication. In their paper the authors explain regional employment growth by means of the regional portfolio of firms. They argue that related variety (a portfolio of different but related firms) will be most beneficial for regional employment growth. Starting point in their argument are the theories on agglomeration economies and knowledge spillovers. For this reason this chapter will begin with an outline on agglomeration economies and knowledge spillovers. After these concepts have been addressed, the concept of related variety will be introduced.

2.1. Agglomeration economies

In the field of economic geography and spatial economics there has been a long tradition in explaining regional economic growth with theories on agglomeration. Already before the turn of the nineteenth century into the twentieth century, Marshall (1890) pointed to the importance of agglomerations for regional employment growth in his "Industrial District-argument" (Van der Panne, 2004). He stated that when firms agglomerate, the firms within the agglomeration experience certain benefits from being located near one another (Frenken et al., 2012). The advantages a firm experiences from being located within an agglomeration have become known as agglomeration economies. According to Marshall these agglomeration economies will positively influence the employment of the firm and hence also the employment of the region the firm is located in. With this supposition, Marshall is the founding father of the theories on agglomeration economies.

2.1.1. Three streams of agglomeration economies

Over the years the theories on agglomeration economies have numerously been revised and fine-tuned. This has resulted in different subtheories within the broader theory of agglomeration economies. Generally three agglomeration economies are distinguished. These are localisation economies, urbanisation economies and Jacobs externalities. They are outlined below.

2.1.1.1. *Localisation economies*

Marshall (1890) and later modified and formalised by Arrow (1962a) and Romer (1986), put forward a concept which has become known as the Marshall-Arrow-Romer (MAR) model. The main assumption behind the model is that firms are able to economically benefit from the presence of similar firms (co-location of firms). The economic advantages to the firms that result from co-locating are called localisation economies.

Several sources of localisation economies have been put up.
First of all, if two or more similar firms co-locate, the firms have a neighbour with whom they can seek a supplier/customer relation. This not only saves the firm a lot of time and money in finding a new supplier/customer but also positively influences the costs and time associated with deliveries when the co-located firms decide to trade.

Secondly, two or more related firms will draw more specialised employees to the region than one single firm. For that matter, when a manifold of similar firms co-locate, this will result in the development of a highly knowledgeable local labour pool. This reduces the time and money firms need to spend in finding employees. Firms may even "steal" employees from other co-located firms.

Besides the fact that the knowledgeable local labour pool eases the search for employees, it also accelerates the spread of knowledge in the region due to knowledge transfers. This thesis returns to the concept of knowledge transfers in section 2.1.2.

An important notion in the MAR model is that the co-located firm needs to be similar to the firm in order to economically benefit from it. If the co-located firm is different, it is unlikely that the firm will trade with the co-located firm. Neither will two different firms draw specialised labour to the region. Hence as a firm is only able to take advantage of co-located firms if these firms are similar, Marshall calls for regional specialisation.

2.1.1.2. *Urbanisation economies*
Another strand of literature focused on the relation between the advantages cities have got to offer to firms and firm performance. The advantages that a firm faces that are related to being located in an urban area are called urbanisation economies. Several features of a city that are believed to be beneficial to (the performance of) the firm that is located in the city might be mentioned. For example, urban areas often offer extensive transportation possibilities. Urban regions are also likely to house universities, research laboratories, trade organisations and other knowledge generating organisations (Frenken et al., 2007). It is likely that the firms located in the city will take advantage of these assets. Urbanisation economies in this way are based on sharing basic assets, recourses and institutions (Malmberg, 2000). Since less populous areas offer less of these assets, recourses and institutions, firms in these areas lack the possibility of sharing these. Some authors have also emphasized the circulation of information within cities as source for urbanisation economies (Pred, 1966, 1977 in Malmberg, 2000).

2.1.1.3. *Jacobs externalities*
Jacobs, as MAR , also believes that a firm is able to economically benefit from the presence of other firms. Yet the conditions under which the firm will benefit from the co-location of one or more firms is different. Jacobs states that firms economically benefit of the presence of different firms. The beneficiaries to the firm that stem for the presence of different firms are referred to as Jacobs externalities.

The notion of innovation is especially important to Jacobs. She believes that innovations are the heart of firm growth. The reason for this is that innovations will lead to the creation of new markets and new products and hence innovation will enable the firm to grow. Referring to Schumpeter's Neue Kombinationen, Jacobs states that innovations are a result of combining different knowledge factors (Schumpeter, 1934 and 1943). The co-location of different firms allows for the exchange of skills necessary for these innovations (Harrison et al., 1996). A diversified set of co-located firms will enlarge the possibilities of the local exchange of divers knowledge and skills and will through this exchange cause new ways of thinking, new ideas and new innovations (Frenken et al., 2012). According to Jacobs, agglomeration economies are all about bringing different knowledge factors together. For that reason Jacobs calls for regional diversification.

2.1.2. The importance of knowledge spillovers for agglomeration economies
While the underlying regional structure of localisation economies (regional specialisation), urbanisation economies (urbanisation) and Jacobs externalities (regional diversification) differs, they are all, to a greater or lesser extend, partly based on the believe that knowledge spillovers are an important source for the agglomeration economies. Knowledge spillovers occur if an innovation or

improvement implemented by a certain firm,increases the performance of another firm without the firm that is benefiting from this innovation or improvement,fully paying for this (Glaeser, et al., 1992; Schimke and Brenner, 2010). In this way knowledge spillovers can be beneficial for employment growth.

2.1.3. The geographic dimension of knowledge spillovers

Figure 1 Simplified assumed relation between geographic distance and quantity of spillovers
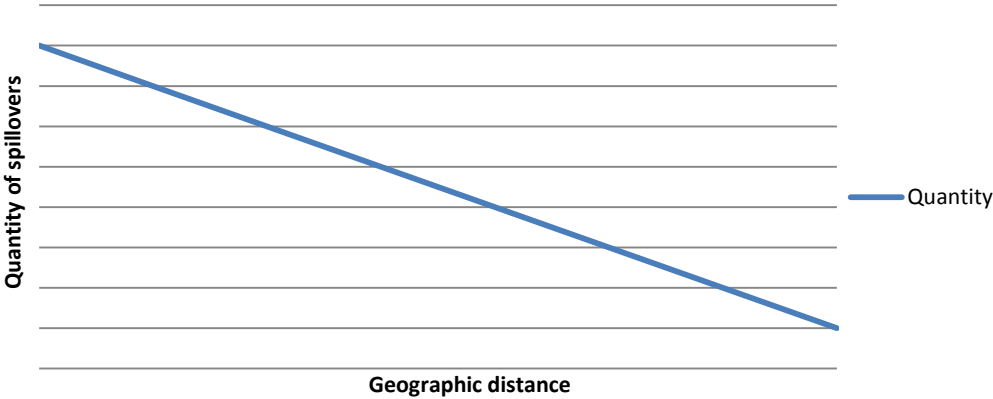
Source: own work

Knowledge spillovers and knowledge sharing in general have been widely studied in the field of economic geography (Batheldt et al., 2004; Malmberg and Maskell, 2006 in Pinch and Sunley, 2015). Economic geographers have frequently pointed to the fact that knowledge sharing and knowledge spillovers occur over relatively short geographic distances. Accordingly, the quantity of knowledge spillovers diminishes with geographic distance (see figure 1).

To understand the relation between knowledge sharing and knowledge spillovers and the geographic distance over which knowledge is shared, it is important to note that knowledge is embedded in people. In the transmission of knowledge one can therefore always distinguish a person that is sending the knowledge and a person that is receiving the knowledge[2].

Generally speaking, knowledge can be transmitted from one person to another through two modes:

- Transportation
- Communication

The most direct (and oldest) way to transfer knowledge is through face to face interaction (both planned and serendipitous). Face to face interaction requires that both the sending person and the receiving person are physically located at the same place. If the actors involved in the knowledge transfer are not located at the same place, one or both of the actors need to travel.

Empirical studies have found that the amount of face to face interaction between people is a negative function of the geographic distance between the actors (Hoekman et al., 2010). This implies that people interact more often with people that are at close distance than with people that are further away. Since that interaction is a condition for knowledge transfers, the amount of face to

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[2] If the knowledge that was received was also understood, remains outside of the scope of this study.

face knowledge transfers is also a negative function of the geographic distance between the actors. This makes a single person's knowledge, to some extend, bounded to the region he/she is located in.

Yet knowledge may also be transferred through (modern) means of communication. The advantage of transferring knowledge through (modern) means of communication is that it does not require the sending and receiving person to be physically located near one another. Postal services and (more recently ICT) indeed facilitate the transmission of knowledge over long distances without requiring the sending person or the receiving person to travel.

However, there are at least two reasons why traditional and modern means of communication are not used for the transmission of knowledge to the degree that might be expected at first sight.

First of all, knowledge can only be transmitted through commutation modes up to a certain degree. Before knowledge can successfully be transmitted through communication infrastructure, it has to be codified. Codified knowledge is expressed in a format that is compact and standardised (David, 1993 in Foray and Lundvall, 1998). The codification of knowledge is a process of reduction and conversion which renders especially easy the transmission, storage and reproduction of knowledge (Foray and Lundvall, 1998). Yet a lot of knowledge is so to speak tacit (Polanyi, 1957). In contrast to codified knowledge, tacit knowledge is hard/impossible to codify and hence it is not possible to transfer this knowledge through ICT (or postal service). Skills are an important kind of tacit knowledge. To summarize, because of the complexity of tacit knowledge, it can only be transmitted from person to person through face to face contact (Howells, 2002).

Secondly, there is the issue of trustfulness. As knowledge transfers are extremely sensitive to social context (Foray and Lundvall, 1998), it takes time and trust for people to share their knowledge with someone. Meeting one another in person is a crucial aspect in building trust. The use of ICT and other communication forms remain subordinate for building trust among actors. Hence people are not likely to share knowledge through ICT means because people are not able to assess the trustfulness of the other actors involved in the knowledge transfer (Malmberg and Power, 2005).

2.1.3.1. *Empirical proof of the geographic dimension of knowledge spillovers*
In empirical research on knowledge spillovers it has often been cited that "Knowledge spillovers are invisible; they leave no paper trail by which they may be measured and tracked" (Krugman, 1991). However, Jaffe et al. (1993) point to the fact that knowledge spillovers do leave a visible trail in the form of patented inventions. This is why most empirical studies that have been concerned with knowledge transfers have focused on patents (Carlino, 2001). Focussing on the geographic dimensions of knowledge spillovers, Jaffe et al. (1993) indeed find "a new patent is five to ten times more likely to cite patents from the same metropolitan area than one would expect" (Carlino, 2001). This result indicates that geographic distance is indeed important for knowledge transfers.

2.1.4. The cognitive dimension of knowledge spillovers
While scholars in the field of economic geography have focused on the relation between geographic distance and knowledge spillovers, scholars in the field of innovation have emphasized the importance of other dimensions of distance for knowledge spillovers.

Nooteboom (2000) has especially gained interest with his work on the relation between the cognitive distance between actors and knowledge spillovers. Taking both the comprehensibility and the

effectiveness of knowledge spillovers into account he states that there is an optimal cognitive distance.

Figure 2 Simplified assumed relation between cognitive distance and quantity of spillovers
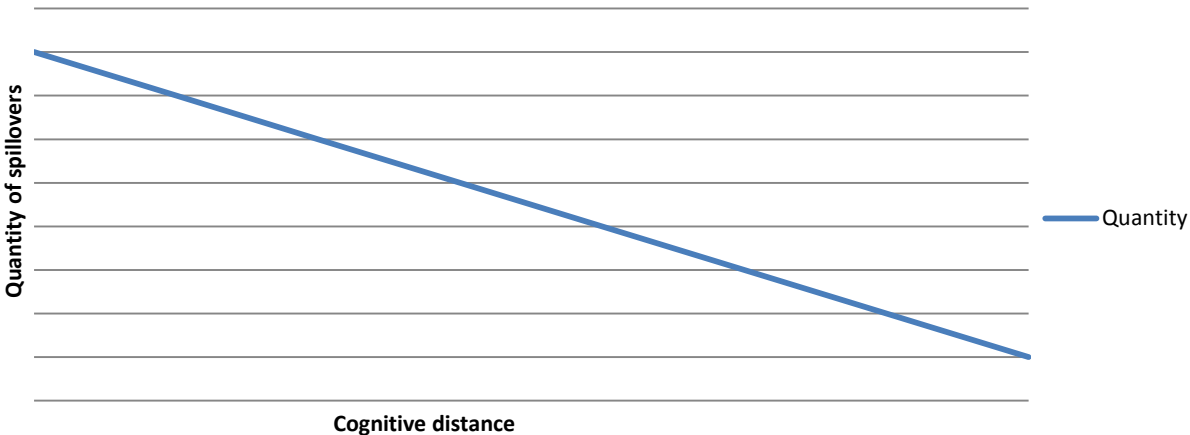
Source: own work

Figure 2 displays the assumed relation between the cognitive distance between actors and the quantity of knowledge spillovers that will occur. It is assumed that the relation between the cognitive distance between the sending and receiving actor and the amount of knowledge spillovers is negative (Boschma, 2005). The further the cognitive distance between the two actors the less likely it is that a knowledge transfer will take place between the two actors. The reason for this is related to the notion of absorptive capacity (Petruzzelli, 2011). A knowledge spillover will only take place when the sending actor of the knowledge transfer has a similar basic knowledge level base as the receiving actor. In their paper, Lane and Lubatkin (1998) prove that actors (organisations in this case) at close cognitive distance have indeed a greater relative absorptive capacity than actors at high cognitive distance, and hence the chance that these actors learn from one another is also higher (Petruzzelli, 2011). People that are at close cognitive distance (e.g. a bartender and a server) understand each other and this will facilitate knowledge transfers/spillovers. People that are at greater cognitive distance (e.g. a bartender and a shoemaker) from one another do not understand each other and this will hinder knowledge spillovers to occur.

Figure 3 Simplified assumed relation between cognitive distance and quality of spillovers
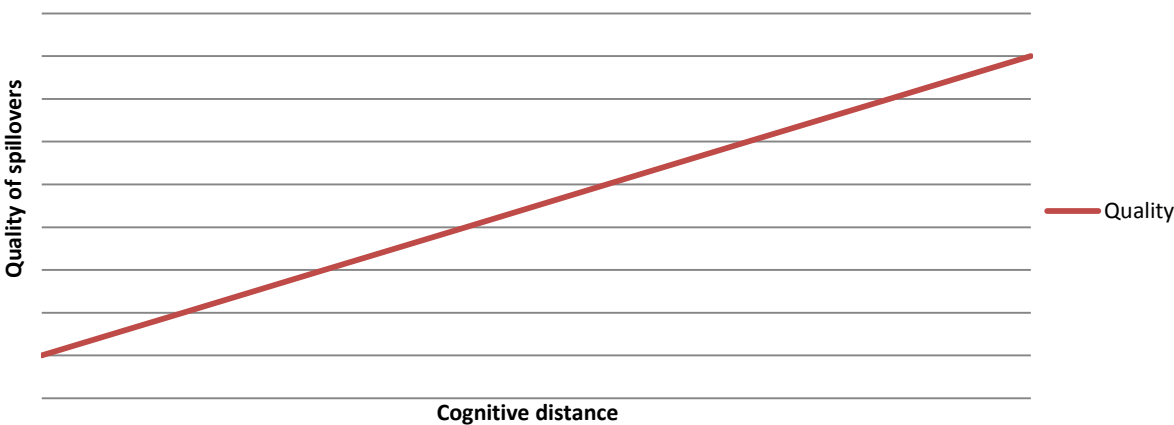
Source: own work

While the cognitive distance between actors is believed to have a negative influence on the amount of knowledge spillovers, at the same time it has been argued that the cognitive distance between the actors may have a positive influence on the novelty value of the knowledge spillover (Wuyts et al., 2005). The cognitive distance between actors matters for the employment generating power of the knowledge spillover, since that different cognitive distances result in different kinds of innovations.

Knowledge spillovers over long cognitive distances are believed to bring about radical product innovations. The combinations of very different knowledge create new markets, new products and hence new employment (Schumpeter, 1934 and 1943). When the sending and the receiving actor have a very common knowledge base, the knowledge spillovers between the two actors will be of a kind that could possibly generate process innovations (Cohen and Klepper, 1996). These process innovations lead to an improvement in a production technology and hence improve efficiency. The chances that this kind of innovation will lead to employment growth are limited since indeed these innovations improve efficiency. So a knowledge transfer over short cognitive distance leads to efficiency improvements that may even be negative for employment. To summarize, while knowledge transfers over low cognitive distance improve the efficiency and have little effect on the employment, knowledge transfers over high cognitive distance sprung radical product innovation that leads to employment growth (see figure 3).

As has been outlined above, the quantity of knowledge spillovers is believed to go down when the cognitive distance between actors goes up. Yet, each knowledge spillover at higher cognitive distance is believed to yield more employment growth. To derive the net employment growth of all knowledge spillovers one has to multiply the amount of spillovers by the average quality (amount of employment created) of the spillovers.

Equation 1

$$Jobs\ generated\ by\ knowledge\ spillovers = \\ quantity\ of\ spillovers * average\ quality\ of\ spillovers$$

2.1.5. Knowledge spillovers in agglomeration economies

Now that the basics of knowledge spillovers have been discussed, this section returns to the theories on agglomeration economies. In this section the assumed influence of knowledge spillovers will be addressed for localisation economies and Jacobs externalities.

2.1.5.1. *Localisation economies*

Figure 4 shows the assumed relation by Marshall between the cognitive distance between actors and the quantity and quality of spillovers. Marshall, Arrow and Romer believe that spillovers are most likely to occur between actors at low cognitive distance. A low cognitive distance between actors eases the spread of knowledge. For this reason MAR states that a specialised region will see a higher regional employment growth than diversified regions as the cognitive distance between actors in specialised regions is lower than in a diversified region. In a diversified region, on the contrary, the cognitive distance between the actors is high which will cause the actors in the region to have difficulty in understanding each other. This hinders the occurrence of knowledge spillovers in diversified regions. As regional employment growth is a factor of the amount of knowledge spillovers according to MAR, diversified regions will see little regional employment growth.

Figure 4 Simplified assumed relation by Marshall between quantity of spillovers and net employment growth
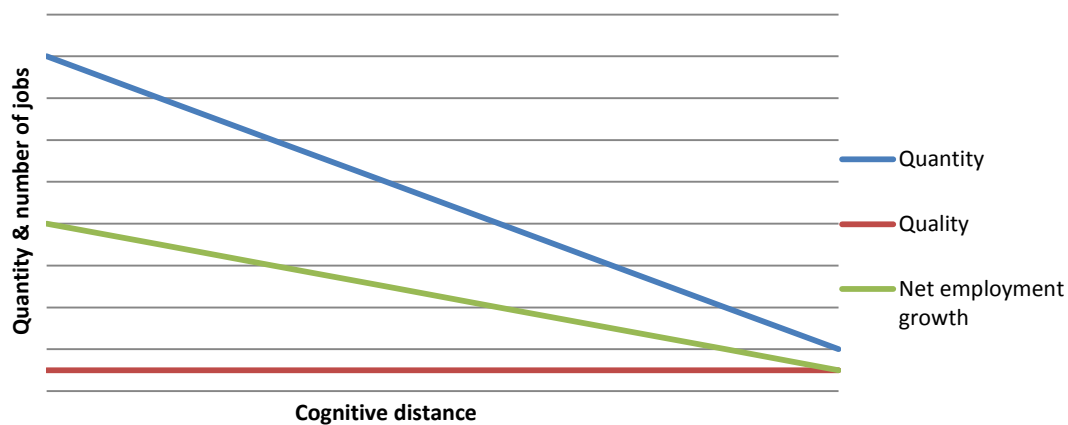
Source: own work

Marshall does not (fully) incorporate the fact that the quality (employment generating power) of each spillover increases with cognitive distance between actors. At least he does not incorporate any level of cognitive distance in the development of the localisation economies. Marshall argues that the more a region is specialised, the more the region will facilitate knowledge spillovers between firms and the more the region will see employment growth. This results in a downward sloping net employment growth line in figure 4.

2.1.5.2. *Jacobs externalities*

Figure 5 shows the assumed relation by Jacobs between the cognitive distance between actors and the quantity and quality of spillovers. According to Jacobs a diversified portfolio of firms within a region will create highly valuable knowledge spillovers which, on its turn, will cause regional employment growth (Jacobs, 1969; Lambooy, 1984; Becattini et al., 2003; Van Oort, 2004 in Boschma et al., 2012). She argues that by only looking at intra-sector knowledge spillovers, one ignores the important and employment generating inter-sector knowledge spillovers. The occurrence of these inter-sector knowledge spillovers is particular high in diversified regions. Jacobs for that matter believes that a diversified economy will yield more positive externalities (Jacobs, 1969; Lambooy, 1984; Becattini et al., 2003; Van Oort, 2004 in Boschma et al., 2012) and hence will experience a higher regional employment growth.

Figure 5 Simplified assumed relation by Jacobs between quantity of spillovers and net employment growth

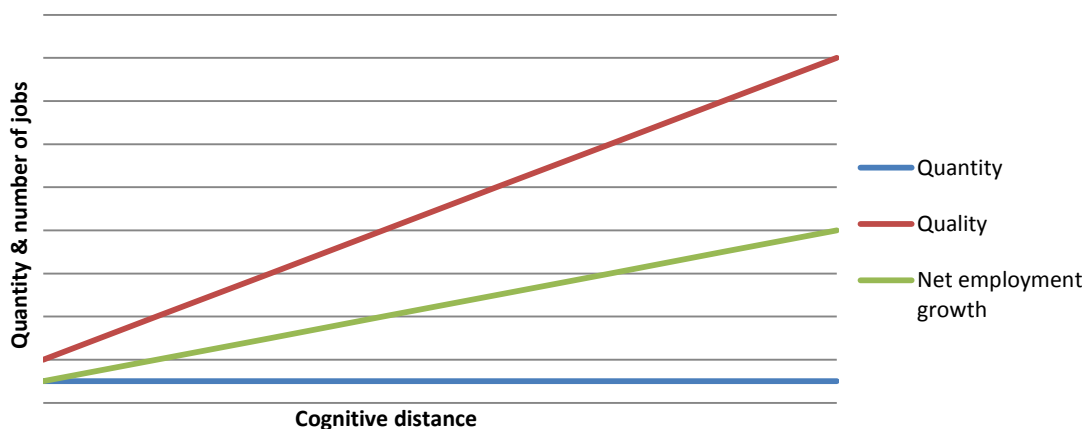Source: own work

Jacobs believes that the quality of the spillovers increases with the cognitive distance between firms. She does not (fully) incorporate the fact that the quantity of spillovers decreases with cognitive distance. She takes the quantity of the spillovers as a given. This results in an upward sloping net employment growth line in figure 5.

From the discussion above it becomes clear that Marshall focuses on the relation between cognitive distance and the **quantity** of knowledge spillovers while Jacobs emphasizes the relation between the cognitive distance and the **quality** (denoted as the average amount of jobs each knowledge spillover creates) of knowledge spillovers.

Yet to fully assess the influence of cognitive distance on net employment development, one has to incorporate both the **quantity** of knowledge spillovers and the **quality** (denoted as the average amount of jobs each knowledge spillover creates) of knowledge spillovers. This is true because the total new employment created by all knowledge spillovers is found by multiplying the quantity of spillovers by the quality (average amount of jobs created per spillover) of those spillovers.

2.1.5.3. *Related Variety*
In 2003, Porter already stated that the distinction between Marshall's localisation economies and Jacobs externalities is too simplistic as it does not incorporate a degree of cognitive distance. Porter believes that regional diversification will not necessarily lead to knowledge spillovers that will cause employment growth. Regional diversification may result in sectoral portfolio of firms that are cognitively too far away from one another to effectively communicate with each other. The low quantity of knowledge spillovers will outweigh the high quality of knowledge spillovers within the region. Neither does Porter believe that Marshall's localisation economies will per se enhance employment growth. Regional specialisation may not foster employment growth since the firms in the region may be too similar to each other. This results in a high quantity of spillovers but the quality of the spillovers is likely to be low. Yet some degree of cognitive-distance is needed for high quality spillovers to occur (Nooteboom, 2000).

Continuing on Porter (2003) and building on knowledge on the relation between cognitive distance and knowledge spillovers, Frenken et al. (2007) disentangle Jacobs externalities in two aspects: related variety and unrelated variety (and implicitly no variety).

17

One can speak of related variety within a region when firms in a region are in close cognitive proximity, yet they are diverse. Frenken et al. (2007) believe that this is beneficial for regional employment growth.

One can speak of unrelated variety within a region when the firms show a very high cognitive distance from one another. This is believed to hinder employment growth. As the distinction between related variety and unrelated variety is made based on the cognitive distance between firms within a region, Mameli and Iammarino (2012) consider related variety the most supportive factor for effective knowledge transfers.

Figure 6 Simplified relationship between quantity and quality of spillovers and net employment growth in related variety scheme
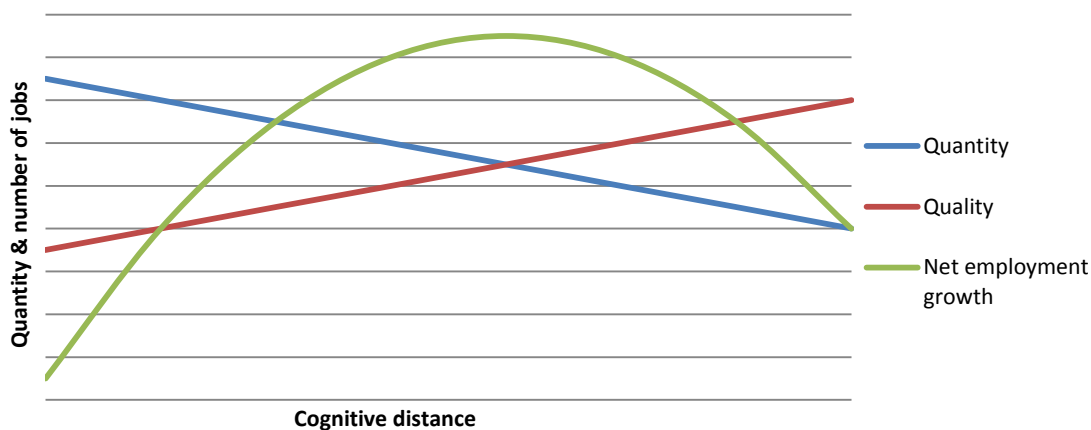
Source: own work

Figure 6 graphically shows the assumed relation between the cognitive distance between firm and the net employment growth of knowledge spillovers in the context of related variety. The green line in figure 6 denotes the net employment growth. It is calculated by multiplying quantity by quality. What becomes clear is that the net employment growth is negatively influenced by spillovers at low cognitive distance (due to efficiency) but rises when the cognitive distance gets bigger (the quality gain overrules the quantity loss). In the example in figure 6, the net employment growth peaks at the cognitive distance of four. If the knowledge spillovers would occur at larger cognitive distance, the loss of quantity would overrule the gain in quality and the net employment growth would decrease.

Empirical studies on the influence of related variety on regional economic growth are numerous. As the founding fathers of related variety, Frenken et al. (2007) found in their empirical work on the Dutch NUTS-3 regions that related variety within a region was significantly positively associated with regional employment growth. Similar studies on the correlation between related variety and regional productivity and regional employment growth have been done in a variety of regions (see Essletzbichler, 2007; Boschma and Iammarino, 2009; Bishop and Gripaios, 2010; Quatraro, 2010; Antonietti and Cainelli, 2011; Brachert et al., 2011; Boschma et al., 2012; Hartog et al., 2012; Mameli et al., 2012 in Castaldi et al., 2015). The empirical results tend to be in line with the results of Frenken et al. (2007).

3. Zooming in to the firm level

Many scholars in the field of economic geography and spatial economics have studied the relation between urbanisation (measuring localisation externalities), diversification (measuring Jacobs externalities) and related variety and employment growth at the regional level (Frenken et al., 2007; Glaeser et al. 1992; Henderson et al. 1995; Porter 2003; Spencer et al. 2010). There have also been quite a few studies that have linked urbanisation and regional diversification with employment growth at the firm level (see Duschl et al., 2015 for overview).

What is surprising however is that there has been little research so far that have studied the relation between related variety and employment growth at firm level.

This chapter argues that the influence of related variety could and should be studied on micro level. Furthermore, this chapter will outline some others factors that have empirically been shown to be of influence on firm employment growth. Based on the literature overview in chapter 2 and the current chapter and in preparation of the empirical analysis of the next chapters, this chapter will end with the introduction of the main hypothesis.

3.1. Relating related variety to firm employment growth

The lack of research on the relation between related variety and firm level employment growth is surprising. The reason for this lack of research to be surprising is that the reasons to conduct such a study have been discussed extensively by the scholars that have rejected any relation found between urbanisation and regional specialisation/diversification and employment growth at the regional level (Van Oort et al., 2012).

Van Oort et al. (2012) argue that authors concerned with the relation between agglomeration economies and employment growth have often left the firm out of their study (Acs and Armington, 2004; Martin et al. 2008). Many studies indeed have focused exclusively on the level of the region. Yet regional employment growth itself is an aggregated characteristic. Employment and employment growth does not stem from regions but indeed from firms. Regional employment (growth) in this sense is simply the sum of firm level employment (growth).

Because firm level characteristics are not included in studies that connect agglomeration economies with regional employment growth, any effects found in area-based studies may be purely compositional (Macintyre et al. 1993 in Van Oort et al., 2012). It is likely that the composition of firms within a region is important for explaining regional employment growth. For example it has been shown that firm size is of influence on firm employment growth. Regions with a high concentration of firms with a certain firm size are in this way more likely to see regional employment growth than regions with a low concentration of large firms, irrespective of the degree of related variety in the region.

Also, it may be true that firms with high growth ambitions are drawn to specific regions (Combes et al., 2008). A concept which is called spatial sorting.

Findings on the regional level for this reason may not be generalised to the firm level. This is true because firm level variance between firms is lost when using aggregated regional level data (Van Oort and Burger, 2009). This statistical error is referred to as cross level fallacy (Alker Jr., 1969) and ecological fallacy (Robinson, 1950).

Some authors (Burger et al., 2008; Van Oort et al., 2012) have associated the relation between agglomeration economies and regional employment growth with the bathtub model of Coleman (1987). According to Coleman, system level phenomena (like agglomeration economies) influence system outcomes (like, regional employment performance) through their effect on firms' orientations and performance (Van Oort et al., 2012). In order to gain complete understanding of this relationship one has to consider all levels: both the macro level of the region and the micro level of the firm (Van Oort and Burger, 2009).

Figure 7 Bathtub model of Coleman
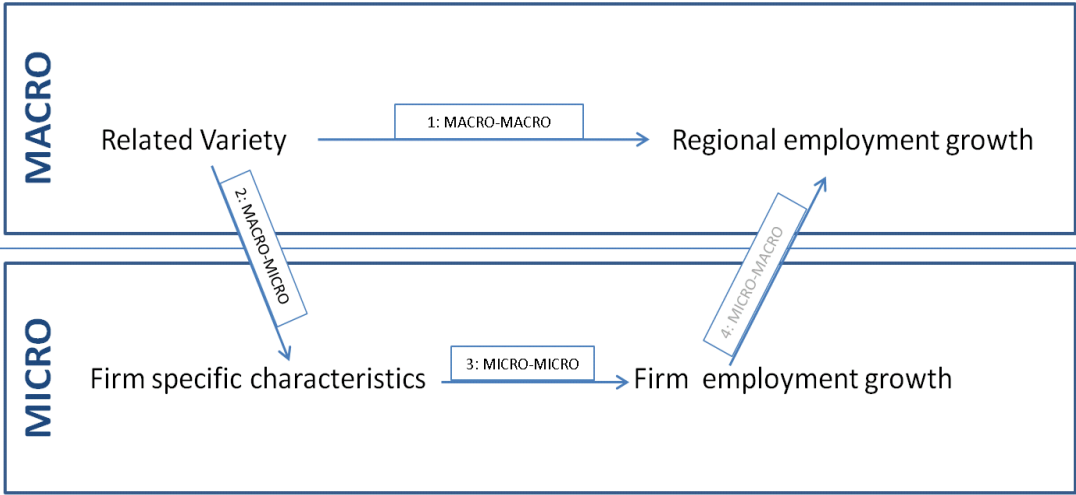
Source: own work

Van Oort and Burger (2009) give a comprehensive description of the bathtub model of Coleman in regard to the connection between regional specialisation/diversification and regional economic growth. It may also be used to describe the concept of Coleman in regard to the assumed link between related variety and regional economic growth (see figure 7).

In most existing literature, related variety is directly connected to regional employment growth (e.g. Essletzbichler, 2007; Boschma and Iammarino, 2009; Bishop and Gripaios, 2010; Quatraro, 2010; Antonietti and Cainelli, 2011; Brachert et al., 2011; Boschma et al., 2012; Hartog et al., 2012; Mameli et al., 2012 in Castaldi et al., 2015). This relationship ignores the employment development of the firms at the micro level. It connects a macro phenomenon with another macro phenomenon. This relationship is displayed as relationship 1 in figure 7.

Coleman (1987) however reasons that the relationship between agglomeration economies and regional economic growth is influenced by the performance of the firm. The macro characteristics of the agglomeration (such as related variety) is external to the firm but is of influence on the firm specific characteristics. This relation is displayed as relationship 2 in figure 7.

Firm specific characteristics (characteristics that influence the amount of opportunities and constraints the firm faces) on its turn will influence the performance of the firm. This relation is displayed as relationship 3 in figure 7.

Finally, regions a relatively large number of successful firms (firms that with firm characteristics that foster firm employment growth) will see a relatively higher regional employment growth than regions with a relatively small number of successful firms. This relation is displayed as relationship 4 in figure 7.

Studies that connect related variety directly to regional employment growth skip two relationships. Because of this, the results of these studies may be subject to error. First of all it is important to note that the firm specific characteristics are not only influenced by the degree of related variety. Many other firm specific characteristics can be distinguished and many of these characteristics will influence the employment development of the firm (the micro-micro relation). All of these characteristics (see next section) need to be taken into consideration in studies that connect related variety to regional employment growth. Studies that do not take the other firm characteristics into consideration are not able to check if any found relation between related variety and firm employment growth is the result of a certain firm composition.

Secondly, while regional employment growth is indeed dependent on firm employment growth, it is not the only factor that is of influence on regional employment growth. From a geographic perspective the amount of jobs within a region increases when firms start up, firms expand or firms move in from elsewhere. On the other hand the job base decreases when firms shut down, lay off people or move out. Birch (1981) refers to this as respectively births, expansion and in-migrants; and deaths, contradiction and out-migrants. A finding that related variety is positively related to regional employment growth does not say anything about how this is achieved: an increase in firms births, expansions and in-migrants or a decrease in deaths, contradiction and out-migrants.

As Birch indicates, regional employment growth is the results of three separate developments (birth and death, expansion and contradiction and in-migrations and out-migration) it remains unknown which of these three developments is most important for the relationship between related variety and firm employment growth. This thesis will focus on the influence of expansion and contradiction. The influence of related variety on firm birth and death as well as in-migration and out-migration is beyond the scope of this thesis.

To summarize, since jobs come from firms, employment growth is best assessed at the micro level of the firm. The effect of related variety on regional employment growth ignores the behaviour of individual firms. This thesis does take the firm seriously and tries to understand the relation between related variety and firm expansion and contradiction (henceforth, firm growth) leaving birth and death and in-migration and out-migration out of the scope of the thesis. The same holds for the relation between firm employment growth and regional employment growth; this will not be investigated in this thesis.

3.2. What else matters for firm growth?

As this thesis is concerned with the influence of related variety on firm level employment growth, what needs to be taken into consideration are the other factors that are of influence on firm employment growth. These factors need to be controlled for in the empirical study in chapter 5. In the short summary that follows, a summary will be given of the determinants that have been linked to firm employment growth in empirical studies. Some of these determinants are well embedded in

theories. Unfortunately however, the influence of many determinants lack a theoretical foundation (Davidsson et al., 2007).

A long list of literature has tried to explain firm employment growth using a large range of characteristics. Storey (1994), Delmar (1997), Wiklund (1998) and Ardishvili et al. (1998) have respectively reviewed 25, 55, 70 and 105 studies for compiling determinants of firms growth (Davidsson and Wiklund, 2006: P39). The most recent review is by Davidsson et al. (2007). As in most studies that focus on determinants of firm employment growth, the literature overview in this thesis will make a distinction between three sets of factors: firm external factors, factors related to the firm and factors related to the entrepreneur.

3.2.1. Firm external factors

As already mentioned in the theoretical overview on related variety, economic geographers and spatial economists have placed great emphasize on the geography of firm employment growth. The agglomeration economies that are found in urban areas have especially gotten a lot of attention.

Agglomeration economies are often divided in urbanisation economies and localisation economies.

- Urbanisation economies are advantages passed on to a firm that result from the large scale operation of a city. These urbanisation economies are often also found to be of influence on firm employment growth. On the other side of the coin lies the believe that as firms in urban areas are thought to perform better than overall, firms in rural areas are thought to under perform. This believe is confirmed by Dahlqvist et al. (2000) in their study.

- Localisation economies are advantages passed on to the firm that result from the co-location of certain sectors. On the one hand, Marshall states that a concentration of similar firms offers many advantages for firms and hence might stimulate firm growth. On the other hand Jacobs believes that regional diversification is important for firm performance and hence firm growth.

The social-economic situation of the region is also believed to be important for firm employment growth. Regions with a relatively high unemployment level are economically not doing very well. This also limits the possibilities for firms to grow. Duschl et al. (2011) include the unemployment rate of the regional labour market as a proxy for the social-economic situation of the region and find that firms grow significantly less in regions suffering from a high unemployment rate.

As knowledge is important for firms and firm growth, Acs and Armington (2004) place great emphasize on the need for studying the influence of human capital endowments of regions on firm growth. Firms located in regions with few highly educated people will have some trouble in finding knowledge employees and this will hinder firm (employment) growth.

Furthermore Kangasharju (2000) focuses on the demand and supply external to the firm. He found that the demand for a firm's product is positively associated with firm growth. A lack of supply of production factors hinders firm growth. Related to the work of Kangasharju (2000) it is argued that the business cycle is of influence on firm employment growth. Several studies have connected firm growth variation to the business cycle (Coad, 2007). Higson et al. (2002, 2004) have done so and found that firm growth indeed accelerated in times of economic expansion.

3.2.2. Factors related to the firm

Even though many scholars in the field of geography have placed great emphasize on the external (regional) factors, Maskell (2001) states that firms survive and thrive primarily because of factors within themselves, with firm size being one of the most commonly studied determinants. Starting point for a lot of studies on this relation is Gibrat's law (see Coad, 2009). It states that growth rates are independent of firm size. Even though the theoretical background for this finding is rather limited (Coad, 2009), this has not stopped scholars to empirically investigate this relationship. Contrary to the law of Gibrat, several empirical studies find that firm growth is not independent of the initial firm size. Most, if not all, empirical studies find a significant relation between firm size and firm growth. However the sign of the correlation varies (Davidsson et al., 2005).

Probably the second most investigated characteristic in the research on firm growth is the firm age. One of the first investigations on this relation dates back to 1968. Fizaine (1968) found a negative effect of firm age on firm growth. Recent studies have found similar relations (see Geroski and Gugler, 2004; Yasuda, 2005). The literature suggests that the observed negative correlation between firm age and firm growth is the result of learning. As older firms have benefited from previous experience they are more likely to overcome difficulties. Accordingly young firms are prone to liabilities of newness (Stinchcombe, 1965).

According to a study by Harhoff et al. (1998) firms under limited liability have a significantly higher growth rate than firms with a different legal status. An explanation for this relation may be that high risk projects that may generate a lot of new employment are more likely to be carried out under a limited liability form than under other legal forms (Stiglitz and Weiss, 1981). In his meta study, Storey (1994) furthermore found evidence that growth rates vary by sector. Davidsson and Delmar (2003) come with a similar conclusion in the way that high growth firms are overrepresented in growing sectors.

An explanation for this could be that growing sectors offer relatively more opportunities (Coad, 2007). Growing firms in declining sectors have often found a market niche within these sectors (Storey, 1997; Wiklund, 1998). Additionally, there is a positive effect of the number of founders on firm growth according to Davidsson et al. (2005). All members bring in their own personal skills. The lack of knowledge of one of the members is covered by another member (Cooper et al., 1994 in Davidsson et al., 2005). This diversity is beneficial for the performance of the firm. Yet also similarities within the team of founders are found to be positive for the firm (Ruef, et al, 2003 in Davidsson et al., 2005). For example joined work experience among the members is thought to speed up decision making (Eisenhardt and Schoonhoven, 1990 in Davidsson et al., 2005).

Because entrepreneurs learn about their abilities over time (Jovanovic, 1982), it is sometimes assumed that when a firm starts to grow, it is likely that the firm has found its way to successful operation and will continue to grow. Orser et al. (2000) confirm this assumed relation between previous growth and current growth.

Finally, Dunne et al. (1989) observe that plants that belong to large companies generally grow quicker than stand-alone plants.

3.2.3. Factors related to the entrepreneur

According to many firm financiers and entrepreneurs themselves, the characteristics of the entrepreneur are among the most important factors for successful entrepreneurship and firm growth (Sexton, 2001; Smith and Smith, 2000). Especially in entrepreneurial studies the importance of the characteristics of the entrepreneur for the firms employment development is emphasized.

Baum and Locke (2004) show in their research that if well defined the traits of the entrepreneur can have quite some effect on firm growth (Davidsson et al., 2005).
The growth aspiration is often cited as an important factor for the employment development of the firm. Growth motivation, commutated vision and goals are also found to be positively related to firm growth (Baum & Locke, 2004; Baum et al., 1998; Delmar & Wiklund, 2003; Kolvereid & Bullvåg, 1996; Mok & van den Tillaart, 1990; Wiklund, 2001; Wiklund & Shepherd, 2003 in Davidsson et al., 2005).

Human capital embodied in the owner/manager is significantly positively associated with firm growth according to Almus (2002; in Coad, 2007). Storey (1994) mostly found a positive effect of education on firm growth. Wiklund and Shepherd (2003) add that education is especially important for firm employment growth if the founders also state they want to expand their firm.

Management skills are important for a variety of different reasons (Zahra and Filatotchev, 2004). Davidsson et al. (2007: p100): "managers need to have the necessary knowledge and expertise to make decisions about the scope of the firm and the scale of the operations (Daily et al., 2002); to access funding (Pissarides, 1999); to develop and cultivate network relationships (Lechner and Dowling, 2003), and to decide on the allocation of limited resources."

It is argued that prior sector experience of the manager/owner of a firm gives the firm an advantage over firms with a manager/owner that lacks such experience (Wiklund, 1998). Two factors may lay behind this assumption.

- A manager/owner with sector experience is likely to know the sector pricing policies. The manager/owner is for that reason able to make better decisions that will enhance the firm's performance.

- Prior sector experience may provide the manager/owner with a personal network of potential customers, which gives easier access to the market (Wiklund, 1998).

Some studies have found that women-owned firms grow less than men-owned firms (Cooper et al., 1994; Fischer et al.,, 1993 in Davidsson et al., 2005). However, it is very likely that these findings are spurious. If one would control for sector or growth aspiration, the findings that women-owned firms grow less than men-owned firms does not longer hold (Cliff, 1998; Du Rietz and Henrekson, 2000 in Davidsson et al., 2005). Women are not less able to effectively use resources or reach one's goals (Cliff, 1998; Du Rietz and Henrekson, 2000; Watson, 2002).

Other determinants that have been included in research are previous unemployment, prior self employment, age of the entrepreneur and social marginality (Storey, 1994).

3.3. Conclusion of literature overview and drawing hypothesis

While the concept of related variety has usually been applied to studies that are concerned with regional employment growth, it may and should be used to explain employment growth at the firm level. This is exactly what this thesis will do.

Firm employment growth is believed to be a function of the degree of related variety within the region the firm is located in through the agglomeration economies that are involved with related variety. Related variety is believed to positively influence spillovers and hence related variety may also be beneficial for firm employment growth if the firm is able to change the spillovers in employment generating activities. This reasoning results in the following hypothesis.

Hypothesis 1: Related variety is positively related to firm employment growth

3.3.1. Control variables

Yet firm employment growth is not dependent on one single factor, such as related variety. Indeed firm employment growth has been shown to be influenced by a wide array of other factors. To make sure that any found results are not caused by any particular composition, one needs to consider all these factors. However, as this thesis will make use of external data sources, not all factors could be considered in the upcoming empirical study. Still the same, the use of external data allows controlling for 11 factors. The factors that will be controlled for are split into 4 firm external factors and 7 factors related to the firm. As the gender of the entrepreneur is the only factor related to the entrepreneur that will be controlled for, this factor has for simplicity been assigned to factors related to the firm.

3.3.1.1. *Firm external control factors*

The first firm external factor that will be controlled for in the analysis on firm employment growth is the degree of urbanisation. Urbanisation gives rise to urbanisation economies. These urbanisation economies are beneficial for firms and may lead to firm employment growth.
The second factor that will be controlled for has got to do with regional specialisation. Concentrations of similar firms within a region could be beneficial for firm employment growth according to Marshall (1890) and hence will be controlled for.
Third, some have pointed to the state of the local economy as determinant for firm employment growth. When the local economy is booming, opportunities for firms will spread and firm employment is likely to be high. This will be controlled for by including the unemployment level in the analysis (see next chapter).
Finally, as firms may grow due to the circulation of knowledge within the region, the regional level of knowledge endowment is also controlled for.

3.3.1.2. *Control factors related to the firm*

The first control factor is the gender of the manger/entrepreneur. Even though scholars have generally pointed to the fact that any found relations between the gender of the manager/entrepreneur and firm employment growth is due to the composition, the analyses in this thesis will also control for the gender of the legal person.
Secondly, the firm size at the start of the first year will also be included as a control factor as a majority of studies on firm employment growth has shown that smaller firms grow faster than larger firms.
Thirdly, as firm age is related to firm employment development according to many previous studies,

firm age is also included as a control factor.

Fourthly, in the upcoming regression analyses, firm age is controlled for. Because the literature overview has outlined the possible relation between the sector the firm is active in and firm employment growth, the empirical analyses that will follow will control for the firm's sector.

Previous studies have also found that the legal status of the firm is related to firm employment growth. The legal status of the firm will be controlled for in the empirical part of this thesis. This is the fifth control factor related to the firm.

The sixth (firm related) control factor is branch type. It has been found that firm employment growth differs by branch type (Dunne et al., 1989).

The final control factor is previous employment development as Orser et al. (2000) found that this is also of influence on current employment growth.

4. Research design

Chapter 2 has introduced the concept of related variety. The (empirical) literature points to a positive influence of related variety on regional employment growth. What became clear from chapter 3 however, is that the relationship between related variety and regional employment growth might actually be a spurious relation. The bathtub model of Coleman pointed to the firm as the most appropriate research level. Van Oort (2012) has also emphasized to take the firm more serious in studies on agglomeration economies.

This thesis follows Van Oort (2012) and will empirically study the relationship between related variety and firm level employment growth. The research strategy for this empirical study is outlined in the first part of this chapter.

The second part will introduce the dataset used to empirically test the relations between firm employment growth and related variety, continuing with the operationalisation of the variables in the third section. Detailed descriptives of the variables will also be given

4.1. Research strategy

This thesis aims to answer the following question:
To what extent does related variety influence firm employment growth in Flevoland between 1989 and 2014?

First of all it needs to be decided which research strategy will be used to answer this question. Two different research strategies may be employed to answer the main thesis question (Bryman, 2008).

The first option is to conduct a qualitative study using for example semi structured interviews with firm managers. Qualitative studies are characterised by the study of words. Because qualitative studies are concerned with social processes and the interpretation of these processes, qualitative research has been especially fruitful for understanding social processes.

The second option is to conduct a quantitative study in which the relation between related variety and the other factors mentioned in chapter 3 and firm employment growth is statistically tested. Quantitative research is generally used for the statistical testing of theories (Bryman, 2008). It aims to explain processes. The results of quantitative studies are generally well fitted for generalisation.

It has been decided that a quantitative research strategy will be employed in this thesis. This discussion is for a large part pragmatic as the availability of a unique annual firm level dataset enables the conduction of such a study. Yet the inclusion of the variable related variety in this thesis also points in the direction of a quantitative study. As the variable is a complex ratio measure, so far all studies on related variety have employed a quantitative research strategy.

4.2. Study type

The second decision concerns the study type. Two study types are available for a quantitative research.

On the one hand one can conduct a cross-sectional study. Cross-sectional studies compare different actors at a single point in time. The advantage of such a study is that it allows the inclusion of many variables and detects the relations among these variables at one specific point in time. The disadvantage of a cross-sectional study is that it is not well fitted to detect cause-and-effect relationships as it only considers the characteristics of the cases at one point in time.

On the other hand it is possible to conduct a longitudinal study. In longitudinal studies a sample is surveyed at one occasion and is surveyed again on at least one further occasion (Bryman, 2008). This study type is often used in studies that are concerned with the sequence of events because of its ability to detect cause-and-effect relationships.

As firm employment growth and decline necessarily happens over time, it necessarily needs to be studied in a longitude design (Penrose, 1959 in Davidsson et al., 2005). For this reason (and because the used dataset allows for it), this thesis will indeed study firm employment growth in longitudinal design. Firm employment growth is believed to be influenced by pre-occurring "events".

Yet as this thesis is also concerned with the difference between firms, the longitudinal study in this thesis is used cross-sectional. This will allow comparing different populations.

4.2.1. The use of firm years

Regarding the use of a longitudinal design, the discussion point is the time period between the survey occasions within the longitudinal study. Some literature on firm growth have argued it is problematic to only use first year and end year data for growth calculations as this models firm employment growth as one giant leap (Davidsson and Wiklund, 2000 in Davidsson et al., 2007). The dataset in this thesis includes annual firm level data between 1989 and 2014 which sets the minimal time period between the two survey occasions to one year. In this thesis it has indeed been decided to focus on yearly firm employment development. In doing so firm years are chosen as the research units.

Firm years are the cases in the empirical study of this thesis. Firm years are one year periods over which a firm develops. Firm employment growth per firm year, (or firm growth) is the main dependent variable in this thesis. Firm employment growth (within the firm year) is detected by comparing the employment level of the firm at the beginning of the firm year with the employment level of that same firm at the end of the firm year (Risselada et al., 2013). The beginning of the firm year is denoted as Y_{t0} and stands for 1 January of the firm year. The end of the firm year is denoted as Y_{t1} and stands for 1 January of the year following the firm year in question.

An important implication of the use of firm years is that single firms enter the firm year's analysis multiple times when the firm was active in multiple years. If for example a firm in Flevoland had people employed from the year 2002 to 2005 the firm enters the firm year analysis a total of three times. The firm will be in the firm year dataset as separate firm years for the periods of 2002-2003; 2003-2004 and 2004-2005.

In this thesis it is believed that firm growth is to be explained with (or correlated with) the independent variables measured at occasion Y_{t0}. Hence all but one independent variables in this thesis have a survey occasion of Y_{t0}. Previous firm employment growth however is calculated by comparing the level of employment at Y_{t-1} and Y_{t0}.

4.3. Advantages and disadvantages of the use of official statistics.

The quantitative part of this thesis will make use of official statistics. The use of official statistics has got numerous advantages (Bryman, 2008).

First of all, Bryman states that the use of official statistics saves the researcher a lot of time in collecting data.

Secondly, the problem of reactivity is much less pronounced than when data is collected purely for research purposes.

The third mentioned advantage of the use of official statistics in research is the prospect of analysing data cross-sectional and longitudinal at the same time, which is exactly what is being done in this thesis.

The fourth and final mentioned advantage mentioned by Bryman, is the prospect of cross-cultural analysis. This is so because similar statistics are often available for multiple other countries (or in the context of this thesis other provinces).

4.4. The dataset

Vestigingenregister Flevoland (VR) forms the basis of the quantitative part of this thesis. This database is constructed by the province of Flevoland and includes annual data on all establishments in Flevoland between 1989 and 2014.[3] The dataset includes a field on the employment of the establishments, its legal form, branch type, the name of the legal person of the establishment and a field that denotes the geographic location of the establishment. In order to run the analysis in this thesis several adjustments have to be made to VR. This section will outline how the original dataset VR was changed to the dataset for the analysis.

VR comprises information on all establishments. Yet this thesis is only interested in firms. Only the establishment that were registered as sole trader, general limited partnership or private limited partnership are considered to be a firm in this thesis and are included in the analysis. Obviously the establishments that do not fall within this definition of a firm have been removed from the dataset.

Furthermore, as establishments in agriculture were not recorded properly until 2009, all establishments in that sector have also been removed. VR includes a total of 40.672 establishments that fall within the used definition of a firm.

The initial dataset VR is ordered annually. It has to be converted to a dataset on which the yearly firm development can be analysed. This new firm year dataset was computed as follows.

Firms in the VR-spreadsheet of 1989 were compared to the firms in the spreadsheet of 1990. Based on their unique firm number one was able to trace if firms were active in both years. When this was the case the firm from the dataset of 1989 was joined with the firm from the dataset of 1990 resulting in one case comprising fields for both the year of 1989 and 1990. Firms that were present in 1989 but not in 1990 were added to the dataset of 1989-1990 leaving all fields of 1990 blank. The vice versa goes for those firms that were not present in the spreadsheet of 1989 but occurred in the spreadsheet of 1990. This procedure was repeated for the VR-spreadsheets of 1990 and 1991; 1991 and 1992; 1992 and 1993 and so on up until 2013 and 2014. This results in 25 spreadsheets

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[3] VR uses the following definition of an establishment: "A location of an enterprise, agency or sole practitioner (i.e., every factory, workplace, office, shop or other premises, or any complex thereof) in or from which an economic activity or independent (free) profession is practiced by at least one employed person" (Lisa, 2013). Note that some establishments have partly been excluded from the dataset. For all years up until 2008, data on individual firms in agriculture is missing in the dataset. Only municipality level employment statistics are available for these years. Employment agencies are not included in the dataset since the people they employ are counted at the firm they are working for.

comprising firm years for the periods 1989-1990, 1990-1991, 1992-1993 and so on up until 2013-2014.

The last step was joining these datasets. All firm years (cases) of the spreadsheet on 1990-1991 were added to the spreadsheet on 1989-1990. After that also the cases of all the other periods were added to the spreadsheet on 1989-1990. **This gives a dataset of firm years for all periods.**

The 40.672 firms in VR convert to a total of 259.797 firms in the firm year dataset. The fact that there are more firms in the firm year dataset than in the firm dataset indicates that some firms have been active in Flevoland for multiple firm years. On average a firm occurred in 6,4 firms years.

One final adjustment was made to the firm year dataset. As the main research question indicates, this thesis is concerned with firm growth and firm decline and not with firm birth or death and in-migration and out-migration. Yet the firm year dataset also includes firms that had no people employed at Y_{t0} or Y_{t1}. For that reason all firms that had no people employed at either Y_{t0} or at Y_{t1} were removed from the dataset. These cases concern firms that have entered or exited (as a result of birth and death as well as in-migration and out-migration) during that specific time (see Birch, 1981).

Firms that had no people employed in year Y_{t0} but did have people employed in year Y_{t1} are so-called starters. These firms have either moved in from elsewhere (in-migrants) or have newly been established somewhere in that specific firm year (birth). Firms that had people employed in year Y_{t0} but had no people employed in year Y_{t1} have either moved elsewhere or have "died". This is not a field this thesis is interested in. Furthermore, some firms did not have any people employed at Y_{t0}, neither did they have people employed at Y_{t1}. These firms have also been removed from the dataset.

Table 1 Active, entering, exiting and inactive firms per year

Year	Active	Entering	Exiting	Inactive
1989-1990	1.479	2	11	1
1990-1991	1.796	2	10	13
1991-1992	2.079	6	17	10
1992-1993	2.557	6	31	12
1993-1994	2.830	13	32	22
1994-1995	3.103	19	34	19
1995-1996	3.532	12	40	21
1996-1997	4.004	22	38	31
1997-1998	4.402	10	75	46
1998-1999	4.841	41	75	69
1999-2000	5.280	84	64	100
2000-2001	5.827	85	124	98
2001-2002	6.449	140	185	109
2002-2003	7.436	134	120	123
2003-2004	8.243	229	80	65
2004-2005	9.532	107	97	82
2005-2006	10.512	97	81	146
2006-2007	12.245	135	86	118
2007-2008	14.227	35	55	181
2008-2009	16.632	219	114	19
2009-2010	19.451	48	152	11
2010-2011	22.992	66	429	74
2011-2012	24.699	102	2.471	90
2012-2013	24.720	25	3.520	51
2013-2014	26.224	26	3.530	58
Total firm year	245.092	1.665	11.471	1.569

Source: VR; own editing

Table 1 gives an overview of the amount of active firm years (the cases this thesis deals with) per period. It also displays the number of entering firm years and the number of exiting firm years per period as well as the amount of inactive firm years[4]. The amount of active firm years has shown an annual growth. The total amount of active firms over the entire period comes out at 245.092.

At a side note, as can be seen in table 1 the amount of entering firms and exiting firms have also shown quite some variance. The period 2003-2004 saw the highest number of entering[5] firms. A total of 229 firms entered in that period. The period 2013-2014 saw the highest numbers of exiting firms; a total of 3.530 firms exited[6].

4.4.1. Operationalisation variables

Now that the original VR dataset has been converted to a dataset that covers all active firm years, the next step is to compute the variables in the dataset. This thesis includes one dependent variable, firm employment growth. Related variety is the main independent variable. Furthermore based on chapter 3, a total of 11 control variables are distinguished. All of the variables will be operationalised in this section. The descriptives of the variables will also be given in this section; for the firm dataset as well as for the firm year dataset.

4.4.1.1. *Dependent variable*

Firm employment growth

Firm employment growth is the dependent variable of the analysis[7]. It denotes the **absolute** difference in employment between Y_{t0} and Y_{t1}. The difference between these values is calculated for all firms and is added to the dataset. Note that in this thesis absolute employment growth rather than relative employment growth is taken as the dependent variable. The reason for this lies in the fact that many policy makers are mainly interested in absolute growth. One more person employed brings down employment public benefit expenditure with one unit. The effect of an increase in employment of 10% does not say anything significant about employment benefit expenditure since it remains unknown how many people are involved with this relative growth.

The operationalisation of growth in studies on firm growth has been found conceptually problematic (Davidsson, 2006). The reason for this becomes clear if one considers the difference between relative firm employment and absolute firm employment growth. If all firms (whatever their size) in a certain population would grow by 1 employee, small firms will have a higher relative firm employment growth than larger firms. If all firms (whatever their size) in a certain population would grow in employment by +1%, large firms will have a higher absolute employment growth than their smaller counterparts. Regardless of the measure of firm growth (relative or absolute), firm growth is always related to firm size. Focussing on relative growth would favour the growth of small firms while focusing on absolute growth would favour growth of large firms.

---

[4] Firms with no people employed at Y_{t0} and no people employed at Y_{t1}

[5] These include newly started firms and firms that entered Flevoland from elsewhere

[6] These include firms that have stopped and firms that have moved elsewhere

[7] Employment (and all variables that are calculated with this measure for that matter) is defined as *a person providing paid labour at or from a firm: entrepreneur/owner (director, holder) working family members, independent workers, employees and temporary workers through temporary employment agencies* (Lisa, 2013). Full time as well as part time jobs are covered. Temporary workers are also counted in this variable.

To avoid this problem it has been opted to control for firm size (Davidsson, 2006). This will eliminate firm size as an explaining factor behind the difference in firm employment growth (absolute growth in this thesis) between small and large firms. As has already been mentioned in chapter 3, the upcoming empirical analysis on firm employment growth will indeed control for firm size.

Furthermore as relative firm employment growth and absolute firm employment growth are often negatively related to one another or not related at all, it is true that the factors that are of influence on absolute firm employment growth may not be of influence on relative firm employment growth (Davidsson, 2006). It may even be so that a factor that contributes to absolute firm employment growth at the same time hinders relative employment growth. This thesis will only focus on absolute firm employment growth and for that reason one has to consider that the results are not suitable to explain relative firm employment growth.

Figure 8 Firm employment growth per year
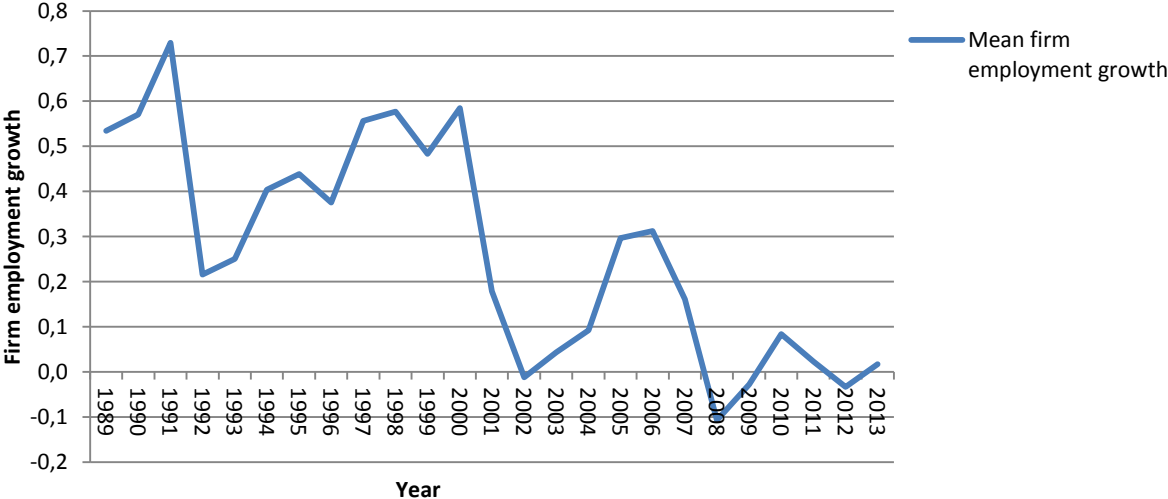
Source: VR; own editing

In the firm dataset, the mean annual firm employment growth per year ranged between -0,11 and 0,73 between 1989 and 2014 (see figure 8). In this period a general downward sloping trend is observed when it comes to firm employment growth. From 2008 onwards, mean annual firm growth has been close to or just below zero. With an N of 245.092 in the firm year dataset, firm employment growth averaged at 0,128 in the firm year dataset (see table 2). Yet the range of firm employment growth is large. The distribution of this variable is highly positively skewed indicating the likely existence of outliers in this variable. These outliers will have a negative influence on the fit of the upcoming regression analysis. For this reason it was decided to exclude all firm years with a Z-score exceeding 3,29 positive or 3,29 negative in the regression analyses.

Table 2 Descriptives of firm employment growth

Firm employment growth	
N	245.092
Missing	0
Minimum	-1.150
Maximum	1.804
Mean	0,128
Median	0
Skewness	41,73
Kurtosis	17320,77

Source: VR; own editing

4.4.1.2. *Independent variables*

Related variety

Chapter 2 introduced the relation between related variety and regional employment growth. Regions that have a high degree of related variety are more likely to see regional employment growth than regions that have a low level of related variety according to empirical studies. Recognizing that related variety is important for firm employment growth is one thing, calculating the level of related variety is a whole other thing. This section will demonstrate how this measure was operationalised in this thesis.

In this thesis the measure of related variety is calculated with employment data stemming from VR. The reason why it has been decided to focus on variety in employment and not variety in firms (what would have been the other option) is pretty straightforward if one reconsiders the nature of knowledge transfers and spillovers (one of the most important sources for agglomeration economies within diversified regions). Knowledge is embedded in a person and can only be transmitted from one person to another person. The receiving person may employ his or her newly received knowledge at a firm. In this way firms (may) benefit from knowledge spillovers but they are not the actors between which the knowledge spillovers take place.

Another related topic when it comes to knowledge spillovers is the size of the region in which spillovers are most likely to occur. It would make sense to calculate the level of related variety of the corresponding region.

In this thesis however, the choice of the scale of the region was purely pragmatic. The only regions that were identifiable in the dataset are the six municipalities of Flevoland. This means that the level of related variety on the municipality level was calculated.

Finally the concept of related variety incorporates a level of cognitive distance between the actors (employees) within a region. This cognitive distance is used to identify related variety and unrelated variety. In this thesis the cognitive distance between employees is considered with the aid of Dutch Standard Industrial Classification. An example on how this classification relates to the cognitive distance between sectors is outlined below.

- At the lowest detail level, the Dutch Standard Industrial Classification distinguishes 21 broadly defined economic one digit sectors. ´Wholesale and retail trade; repair of motor vehicles and motorcycles´ (G) and ´Mining and quarrying´ (B) are examples of two such sectors. The people employed in these two (or any other two) one digit sectors are

concerned with totally different activities. Their employment requires totally different skills. This means that the employees are at far cognitive distance from one another.

- At a slightly higher detail level, the classification distinguishes 'sale and repair of motor vehicles, motorcycles and trailers' (45) from 'wholesale trade' (46) and 'retail trade' (47) in the one digit sector 'wholesale and retail trade; repair of motor vehicles and motorcycles' (G).These two digit sectors within the same 1 digit sector are cognitively at much closer distance from one another than the different one digit sectors.

- At yet a higher detail level, within the two digit sector 'motorcycles and trailers' (45), one is able to differentiate between: 'sale of motor vehicles and trailers, also if combined with repair' (451), 'specialised repair of motor vehicles' (452), 'sale of motor vehicle parts and accessories' (453) and 'sale and repair of motorcycles and related parts' (454) at the three digit sector. It goes without saying that the employees active in these sectors are at an even closer cognitive distance from one another that the two digit sector.

- Finally, at the highest detail level the 'sale of motor vehicle parts and accessories' (453) is split into three four digit sectors: 'wholesale and commission trade of motor vehicle parts and accessories' (4531) 'retail trade of motor vehicle parts and access' (4532) and 'sale and repair of motorcycles and related parts' (4540). The cognitive distance between these sectors is very small. Knowledge will flow freely between the employees of the different four digit sectors.

While the former illustrates that the cognitive distance between sectors is highest between the one digit sectors and lowest between the four digit sectors within one three digit sector, this does not distinguish between related and unrelated sectors yet.

In this thesis it is believed that when two sectors share the one digit sector, the sectors are related to each other. The employed people in these sectors understand each other and information spreads easily. The quantity of knowledge spillovers will be high. Yet in order to get high quality (employment generating spillovers), there must also be some cognitive distance between the sectors. In this thesis firms must differ at the four digit level. To summarize, in this thesis related variety is defined as variation in four digit sector within one digit sectors. Variation in four digit sector across one digit sectors indicated on the other hand is labelled unrelated variety.

Deriving a firm level related variety measure
The operationalisation of related variety in Frenken et al. (2012) is not well suited for explaining firm employment growth. The reason for this is that their operationalisation is based on the portfolio of employment within a region. Related variety based on the portfolio of the regional employment says something about the relation between the total employment within a region but nothing about the amount of employment in related sectors of the firm. A portfolio of related firms may indeed foster the total amount of spillovers within a region and hence to regional employment growth but the portfolio of employment is unlikely to have an effect on the spillovers of one specific firm and hence to employment growth of the firm.

For this reason in this thesis the concept of related variety is adjusted so that it is well suited to explain firm employment growth. For doing so it is necessary to compute a firm specific variable so that each firm has a unique level for related variety. In this thesis related variety is derived with the following equation:
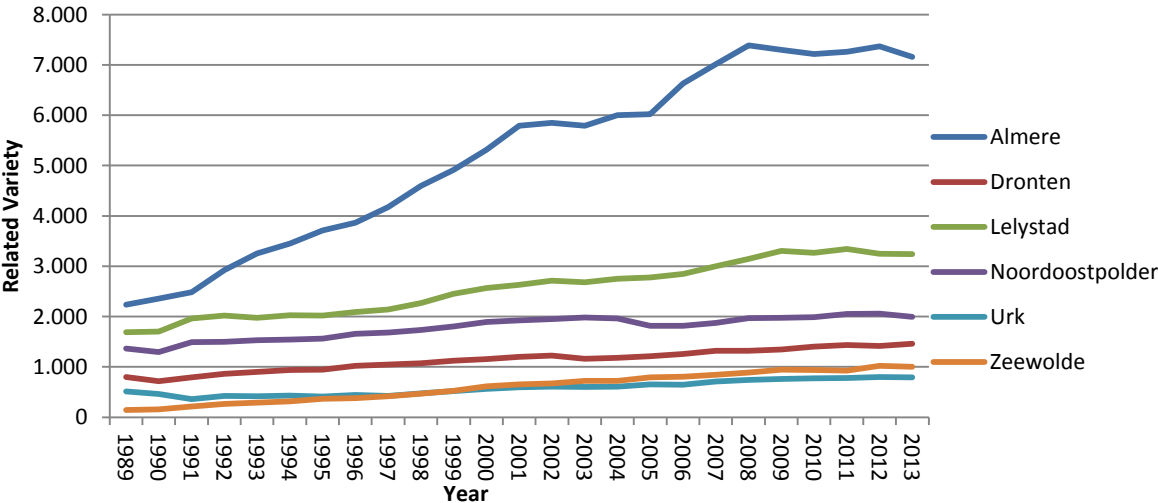
$$Related\ Variety = Municipal\ employment\ in\ the\ firms\ one\ digit\ industry - municipal\ employment\ in\ the\ firms\ four\ digit\ industry$$

The first step was to assign a value for the total municipal employment in the one digit sector of the firm to all firms in the firm year dataset. For this purpose a new separate spreadsheet was developed. In this spreadsheet the annual total amount of employment in all one digit sectors per municipality was calculated. This resulted in a huge dataset with unique year*municipality*one digit sector combinations. With this newly developed dataset one was able to assign all firms in the firm year dataset a value for municipal employment in the one digit sector of the firm.

The second step was to assign a value for municipal employment in the four digit sector of the firm to all firms in the firm year dataset. Again, a separate spreadsheet was developed for this with unique year*municipality*four digit sector combinations. This dataset then was used to assign a value for municipal employment in the four digit sector to all firms in the firm year dataset.

After this was done, all firms in the firm year dataset included a value for municipal employment in the one digit sector of the firm and a value for municipal employment in the four digit sector of the firm. The municipal employment in the one digit sector signals the total amount of related employment but also includes the employment that is similar to the employment of the firm. By subtracting all employment in the four digit sector of the firm, all employment that is too similar to the employment of the firm in order to speak of variety, one is left with all municipal employment at firms that share the one digit sector of the firm but differ at the four digit sector of the firms. One has now arrived at the operationalisation of related variety of this thesis.

Figure 9 Mean related variety in the municipalities of Flevoland

Source: VR; own editing

In all years the level of related variety is highest in the municipality of Almere (see figure 9). Even though the average amount of employment in a firm's related sectors has grown in all municipalities, the growth is especially large in Almere. On average in 1989 a firm in Almere had about 2.200 people employed in related sectors within the municipality. This value has risen to over 7.000 in 2013. Firms in Urk and Zeewolde see relatively little employment in related sectors within the municipality. A related variety value was recorded for all firms in the firm year dataset (see table 3). The degree of related variety ranged from 0 (no municipal employment in related sectors) to 18.406. The mean recorded related variety value is 4.024 while the median is 2.492. Related variety suffers from a small positive skewness.

Table 3 Descriptives of related variety

Related Variety	
N	245.092
Missing	0
Minimum	0
Maximum	18.406
Mean	4024,479
Median	2.492
Skewness	1,688
Kurtosis	2,272

Source: VR; own editing

Population density

Urbanisation gives rise to urbanisation economies. It therefore needs to be controlled for. The degree of urbanisation can be measured with the population density. The population density is defined as the number of inhabitants per hectare (ha). In this thesis the annual population density of the six municipalities of Flevoland is calculated with statistics on municipal population and municipal acre from Statistics Netherlands (Centraal Bureau voor de Statistiek, 2016b and 2016c).

Figure 10 Population density per municipality per year
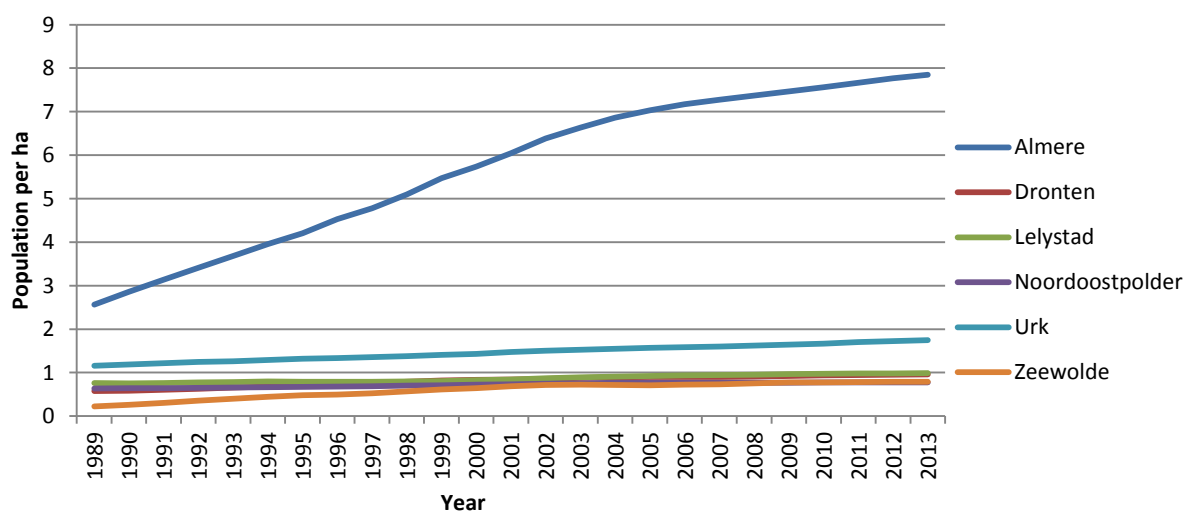
Source: CBS; own editing

In all years between 1989 and 2013, Almere had the highest population density (see figure 10). Furthermore, the growth of the population density of Almere exceeded the growth of the other municipalities. Lelystad holds the second place in all years when it comes to the population density. Note that the population of this municipality is concentrated in the town of Lelystad with a large part of the municipality uninhabited (Oostvaardersplassen National Park). Dronten, Noordoostpolder, Urk and Zeewolde all had similar population densities between 1989 and 2013 (less than 1 person per ha). The minimum value for population density in the firm year dataset was 0,22 while the maximum was 7,85 (see table 4). The mean population density (3,68) is somewhat higher than the median population density (1,26) due to the high population density in one single municipality (Almere).

Table 4 Descriptives of municipal population density

Municipal population density	
N	245.092
Missing	0
Minimum	0,220471
Maximum	7,847128
Mean	3,680763
Median	1,262056
Skewness	0,298714
Kurtosis	-1,81576

Source: CBS; own editing

Regional specialisation

Regional specialisation gives rise to localisation economies which may foster firm employment growth. For that reason the empirical part of this thesis will control for regional specialisation. Regional specialisation has generally been measured with the location quotient (Malmberg et al., 2000) and hence this is what is done in this thesis.

The location quotient quantifies the concentration of a particular sector in a particular region compared to the concentration of that same sector in a larger reference region. This thesis compares the share of the sectoral employment in a municipality with the share of sectoral employment in the entire province. Four municipal location quotients will be included measuring the specialisation in respectively one digit, two digit, three digit and four digit sectors.
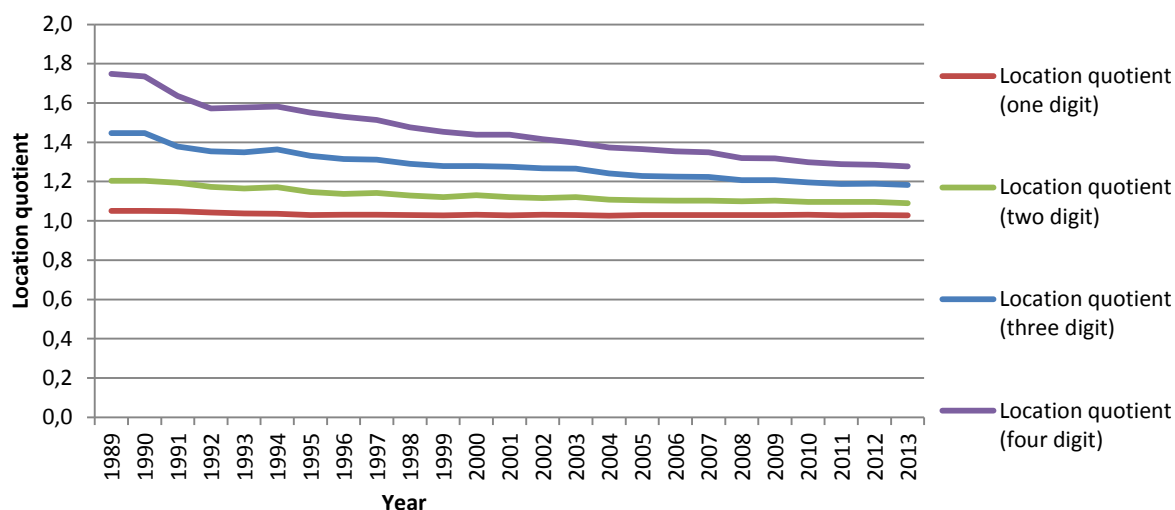
Source: VR; own editing

The annual mean development of the four municipal location quotients considered in this thesis are shown in figure 11. The mean one digit municipal location quotient started with 1,05 in 1989 but declined quickly to 1,03 in 1995. From 1995 the mean one digit municipal location quotient hardly changed. The average municipal location quotient at the two digit level started at 1,20 in 1989. By 2013, this value had declined to 1,09. The mean municipal location quotient at the three digit level ranged from 1,45 in 1989 to 1,18 in 2013. Finally, the mean four digit municipal location quotient started at a level of 1,75 in 1989 but gradually decreased to 1,28. In the firm year dataset, the average municipal location quotient at the one, two, three and four digit level is respectively 1,03; 1,14; 1,26 and 1,36 (see table 5).

Table 5 Descriptives of municipal location quotient (one digit, two digit, three digit and four digit)

	Municipal location quotient (1 digit)	Municipal location quotient (2 digit)	Municipal location quotient (3 digit)	Municipal location quotient (4 digit)
N	245.092	245.092	245.092	245.092
Missing	0	0	0	0
Minimum	0,062	0,011	0,005	0,003
Maximum	14,297	30,531	30,531	30,531
Mean	1,030	1,142	1,260	1,358
Median	1,022	1,0049	1,045	1,066
Skewness	8,524	11,325	9,924	7,693
Kurtosis	184,326	203,943	122,361	72,564

Source: VR; own editing

Municipal unemployment rate

As some have pointed to the state of the local economy as determinant for firm employment growth this thesis will also control for that. Duschl et al. (2011) have used the local unemployment rate as proxy for the state for the local economy in their study. In this thesis the annual unemployment rate on the municipality level is also included. The data on municipal unemployment is derived from Statistics Netherlands (CBS, 2016d).

Figure 12 Unemployment rate per municipality per year
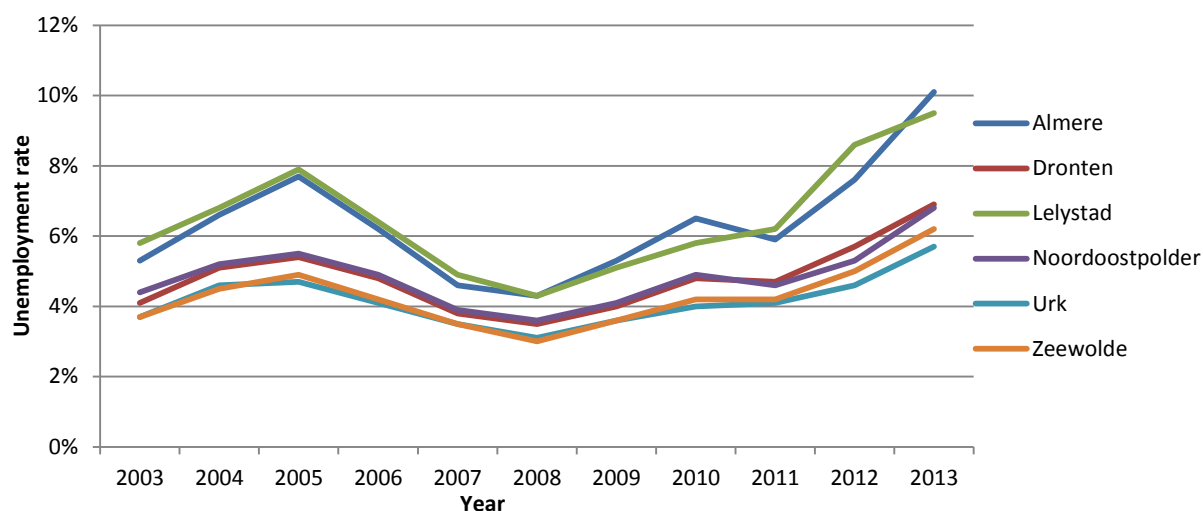
Source: CBS; own editing

The local annual unemployment rate over the entire period is shown in figure 12. Almere and Lelystad have a substantial higher unemployment rate than the other municipalities in Flevoland. Zeewolde and (recently especially) Urk are performing better than the others. What also becomes clear from figure 12 is that since 2008 the unemployment level in all municipalities has increased.

Due to the fact that municipal unemployment figures are only available for the years of 2003 and beyond, approximately 55.600 firm years have a missing value for municipal unemployment (see table 6). The mean municipal unemployment rate of the 189.477 firm years that do have a value for this variable is 6,0. The minimal recorded municipal unemployment rate is 3 and the maximum is 10,1.

Table 6 Descriptives of municipal unemployment

Municipal unemployment rate	
N	189.477
Missing	55.615
Minimum	3
Maximum	10,1
Mean	6,008
Median	5,8
Skewness	0,837
Kurtosis	0,057

Source: CBS; own editing

Municipal rate of high quality jobs

The regional knowledge endowment is positively related to firm employment growth and will be controlled for. However, unfortunately there is no municipality level data on the knowledge or education level. In order to still control for the regional knowledge endowment, a proxy will be used. The municipal share of high quality jobs was used as a proxy for the municipal share of people with higher education.

Statistics Netherlands (CBS) distinguishes four joblevels.

Joblevel one jobs includes jobs that require simple and routines tasks. Jobs with joblevel one sometimes require basic reading and writing skills (CBS, 2016a).

Joblevel two jobs includes jobs that require advanced linguistic and mathematical skills. Bus drivers, police officers, sales clerks and hairdressers are categorised in this joblevel.

Joblevel three jobs includes jobs that require expansive (technological) knowledge of procedures in a specific field. They require higher education. Examples of jobs in this joblevel are medical laboratory staff and legal secretary staff.

Joblevel four jobs includes jobs such as marketing managers, doctors and engineers. The jobs require complicated problem solving skills.

It is assumed that the jobs in joblevel three and joblevel four are most valuable to firm employment growth. The jobs in these two joblevels are termed high quality jobs.

Figure 13 Rate of high quality jobs
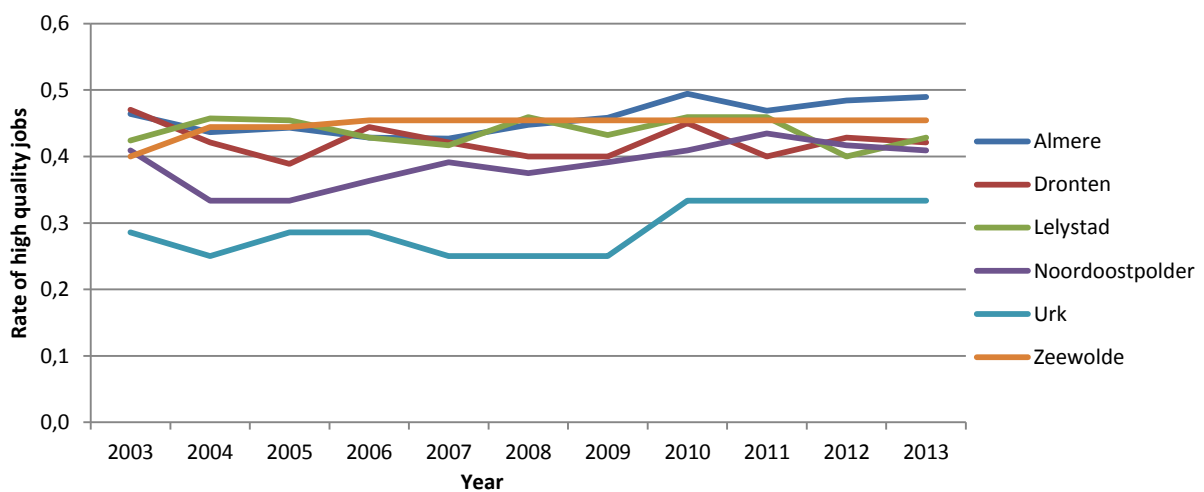
Source: CBS; own editing

The municipal share of high quality jobs is available for all years between 2003 and 2013. Figure 13 shows these shares. Urk had the lowest share of high quality jobs in all years. There are relatively many high quality jobs in Almere and Zeewolde in the period between 2003 and 2014.

Since that the municipal share of high quality jobs is only available from 2003 onwards and the first year in the firm year dataset is 1989, the firm year dataset has a missing value for this variable for all years prior to 2003. A total of 47.251 firms in the firm year dataset do not have a recorded value.

A total of 162.218 firms have got a value for the municipal share of high quality jobs. The mean value for this variable is 0,43 (see table 7).

Table 7 Descriptives of municipal rate of high quality jobs

Municipal rate of high quality jobs	
N	189,477
Missing	55.615
Minimum	0,25
Maximum	0, 49
Mean	0,438
Median	0,448
Skewness	-1,672
Kurtosis	4,026

Source: CBS; own editing

Gender of the legal person of the firm

The gender of the manager/owner of the firm is not of influence on firm employment performance according to the literature but can still offer interesting insights. Therefore it will be included in the empirics. VR does not include a gender of the manager but it does include a value which depicts the name of the legal person of the firm. Most of these values also included a title on which the gender of the legal person could be traced. This will be used to empirically test the influence of the gender of the owner/manager.

Table 8 Gender of the legal person per firm

	N	Percent	Valid Percent
Male	23.108	56,8	66,5
Female	11.659	28,7	33,5
Total	34.767	85,5	100,0
Missing	5.905	14,5	
Total	40.672	100,0	

Source: VR; own editing

Of about 86% of the firms in Flevoland between 1989 and 2014, the gender of the legal person could be traced (N=40.672). Of those firms 66,5% had a male as the legal person and the remaining 33,5% had a female as the legal person.

In the firm year dataset, the percentage of firms with a male as the legal person is 72,3% (N=193.071; missing values=52.021). See table 8. Since the percentage of firms that had a male as the legal person was slightly lower in the firm dataset, one can conclude that firms with a male as the legal person are active for a longer period than firms with a female as the legal person.

In the firm year dataset over 21% of the cases have a missing value for gender of the legal person of the firm. This is not very problematic if it was so that the missing values were purely random (Bryman, 2008). However, it would not be unthinkable that the missing values are in fact related to the legal form of the firm. Contrary to sole traders and general partnership firms, private limited firms are legal entities so it is unlikely that these firms have a registered legal person.

Indeed the share of missing values differs greatly per legal form (see table 9). Of 98% of all sole traders in the firm year dataset the gender of the entrepreneur could be traced. The share of missing values for this variable is also relatively low at general partnerships (6,6%). The share of missing

values is more troublesome at private limited firms (62%). Due to the high share of missing values, the amount of private limited firms will be very small in the regression analysis.

Legal form	Gender	N	Percent	Valid Percent
Sole Trader	Male	109.384	65,6	66,9
	Female	54.091	32,4	33,1
	Total valid	163.475	98,0	100,0
	Missing	3.308	2,0	
	Total	166.783	100,0	
General Partnership	Male	26.248	70,6	75,6
	Female	8.469	22,8	24,4
	Total valid	34.717	93,4	100,0
	Missing	24.72	6,6	
	Total	37.189	100,0	
Private limited firm	Male	29.606	34,4	89,9
	Female	3.321	3,9	10,1
	Total valid	32.927	38,2	100,0
	Missing	53.205	61,8	
	Total	86.132	100,0	

Source: VR; own editing

Firm size

Since some have found a relation between firm size and firm growth, this thesis will control for firm size. The initial firm size is operationalised in this thesis with the amount of people employed at the firm at the beginning of the firm year.
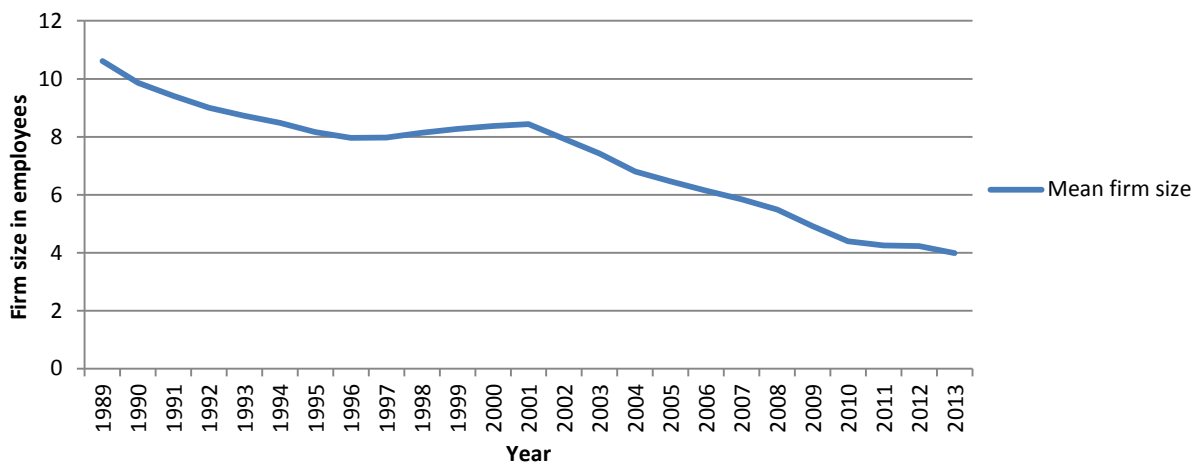
Source: VR; own editing

The mean firm employment size was 10,6 in 1989 (see table 10). This value gradually decreased over time to an average firm employment growth of just 4 in 2013 (see figure 14). In the firm year dataset, the average firm size is 5,8. The largest firm in the dataset had 1.800 employees while the smallest firms had just 1 employee. The variable firm size is highly skewed and contains relatively many outliers. All firm years with a Z-score exceeding 3,29 positive or 3,29 negative are considered as outliers and are not included in the upcoming regression analysis.

Table 10 Descriptives of firm size

Firm size	
N	245.092
Missing	0
Minimum	1
Maximum	1.851
Mean	5,80409
Median	1
Skewness	22,59161
Kurtosis	1.098,932

Source: VR; own editing

Firm age

Firm age is also sometimes mentioned as determinant for firm employment growth. It will be controlled for in the empirical part of this thesis. The variable firm age was computed manually in the dataset. The year of establishment was determined by assessing the first year in which a firm had at least one person employed. Whenever this was the year of 1989 the firm did not get a year of establishment assigned to it as it remains unknown how many years the firm had people employed before the year of 1989 (this was the first year over which firm data was available). Firm age was calculated by deducting the year Y_{t0} from the year of establishment.

Figure 15 Mean firm age per year
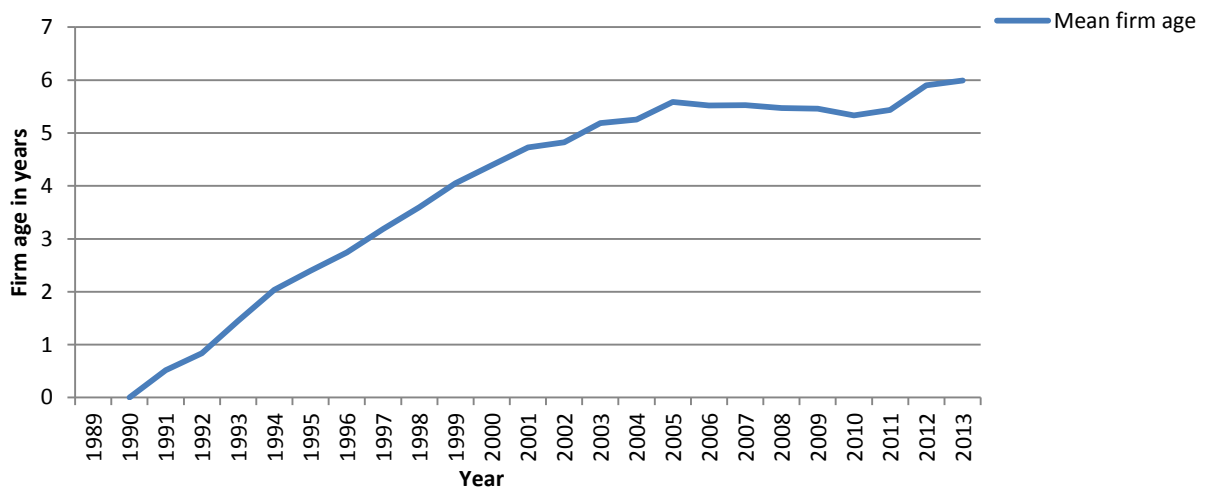
Source: VR; own editing

Mean firm age in 1989 was 0. This value gradually increased to a mean firm size of 5,6 in 2005 (see figure 15). Average firm size decreased between 2005 and 2010 but had reached 6 in 2013.

In the firm year dataset, about 209.000 firms have a value for firm age (see table 11). The minimum firm age is 0 and the maximum firm age was 23. The mean firm size in the firm year dataset is 5,2.

Firm age	
N	209.184
Missing	35.908
Minimum	0
Maximum	23
Mean	5,24215
Median	4
Skewness	1,135216
Kurtosis	0,641001

Source: VR; own editing

Sector

The sector of the firm may also have some influence on the growth of the firm. The sector of the firm will be taken into account at the empirical study in this thesis. In VR each firm is classified into one sector, based on the Dutch Standard Industrial Classification (CBS, 2015)[8].

Table 12 Digit level of sectors in the Dutch Standard Industrial Classification

Name	Detail level	Number of sectors at level	Example
SBI section	One digit	21	H Transportation and storage
SBI division	Two digit	67	49 Land transport
SBI group	Three digit	173	493 Passenger transport by road
SBI class	Four digit	694	4939 Transport by bus, tram and subway (no urban transport)

Source: CBS (2015)

Table 12 illustrates that the classifications is hierarchical. The decision on which detail level sector to include in the analyses, is influenced and limited in some way by the statistical tests that will be run further on in this thesis. For now it is useful to note that the regression models that will be computed do not allow categorical variables to be included before converting them to multiple dummy variables. For each category in a nominal variable (such as the sector), a single dummy needs to be computed. This means that nominal variables with a lot of categories will result in a large amount of dummy variables in the regression analyses.

Even if was chosen to include the one digit sector as variable in the analysis, this would mean that the model will include 20 dummy variables which is still a large amount and hence unfeasible. For that reason a new classification was made based on the one digit sector level. Four sectors are distinguished in the analysis: 'utilities, manufacturing and building', 'trade and consumer services', 'business services' and 'semi-public services'. For a detailed description of the sectors see table 13.

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[8] Note that when one firm is active in multiple sectors the entire firm is categorised in the sector that accounts for the highest share of employment in the firm. Accordingly all employment at the firm is allocated to that specific sector.

Table 13 New classification in sector

	One digit sector	New classification
A	Agriculture, forestry and fishing	N/a
B	Mining and quarrying	Utilities, manufacturing and building
C	Manufacturing	Utilities, manufacturing and building
D	Electricity, gas, steam and air conditioning supply	Utilities, manufacturing and building
E	Water supply; sewerage, waste management and remediation activities	Utilities, manufacturing and building
F	Construction	Utilities, manufacturing and building
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	Trade and consumer services
H	Transportation and storage	Business services
I	Accommodation and food service activities	Trade and consumer services
J	Information and communication	Business services
K	Financial institutions	Business services
L	Renting, buying and selling of real estate	Business services
M	Consultancy, research and other specialised business services	Business services
N	Renting and leasing of tangible goods and other business support service	Business services
O	Public administration, public services and compulsory social security	Semi-public services
P	Education	Semi-public services
Q	Human health and social work activities	Semi-public services
R	Culture, sports and recreation	Trade and consumer services
S	Other service activities	Trade and consumer services
T	Activities of households as employers; undifferentiated goods and service- producing activities of households for own use	N/a
U	Extraterritorial organisations and bodies	N/a

Source: CBS; own editing

Approximately 37% (N=40.672) of the firms in VR were active in the sector labelled 'business services'. 'Trade and consumer services' accounted for 34% of the firms. Another 15% and 13% of the firms were active in the sectors labelled 'utilities, manufacturing and building' and 'semi-public services'. None of the 40.672 firms did not have a sector assigned to them.

The sectoral distribution of the firms in the firm year dataset is slightly different to the sectoral distribution of the firms in the firm dataset. In the firm year dataset 38,4% (N=245.092) of the firms were active in the sector 'trade and consumer services' (compared to 34,4% of the firms in the firm dataset). 'Business services' firms accounted for 34,2% of the firms. 'Utilities, manufacturing and building', and 'semi-public services' respectively represented 17,5% and 9,9% of the firms in the firm year dataset.

Legal form

The legal form is also a control variable in this thesis as it has been found that the legal form of a firm may have some influence on firm employment growth. The used dataset in this thesis includes a variable on the legal form of the firm. Three legal forms are distinguished: sole traders, general partnerships and private limited firms. The owners of sole traders and general partnership firms are personally liable for any possible debts of the firm (Ondernemersplein, 2016a & 2016b). Due to the

fact that a private limited firm acts as juridical entity neither the owners (shareholders), nor the management are liable for the debts of the firm (Ondernemersplein, 2016C).

About 69% (N=40.672) of the firms in VR are sole traders. Private limited firms make up 21% of the firms in VR. The remaining 10% are registered as a general partnership.

In the firm year dataset only 56% (N=245.092) of the firms are sole traders. The share of private limited firms is relatively high in the firm year dataset with 31%. Approximately 13% of the firms have a legal form of general partnership.

Branch type

In this thesis a distinction is made between 'headquarters' and 'branches and subsidiaries'. Nearly all firms in VR have a value for branch type. Only 2 out of the 40.672 firms have a missing value. A majority of 78% of the firms in the dataset are headquarters. Only 22% of the firms are registered as branch or subsidiary. The legal status of 2 (less than 0,0%) firms remains unknown (N=245.092). When converted to firm years, 81,5% of the firms are headquarters and 18,5% are registered as branch or subsidiary.

Previous firm employment growth

This variable is very similar to the dependent variable yet with the sole difference that it focuses on the growth in the previous firm year rather than the current firm year. It takes the difference in firm employment between Y_{t-1} and Y_0. As with current firm employment growth, this variable also measures the absolute growth in employment.

Figure 16 Mean previous firm employment growth per year
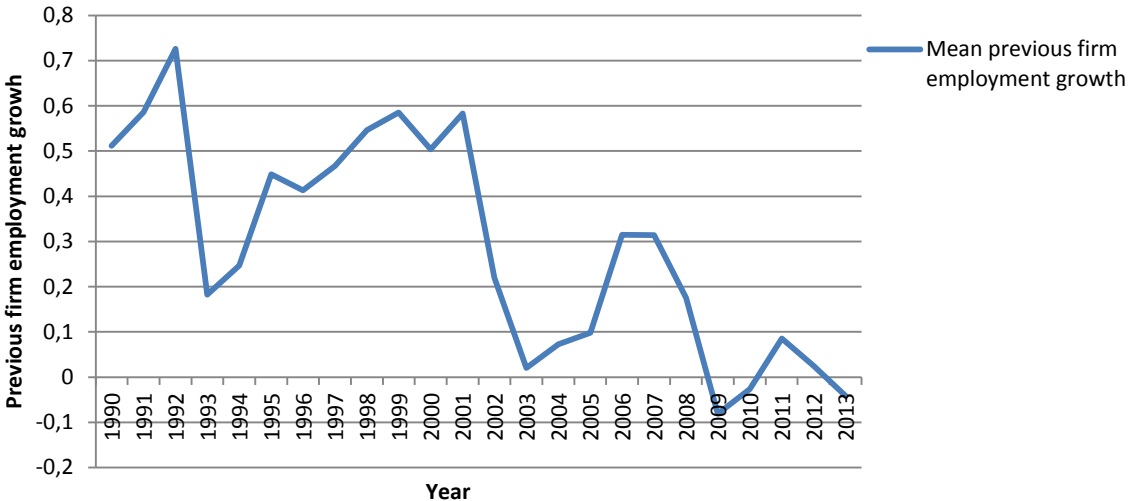
Source: VR; own editing

The variable previous firm employment growth is available for the years between 1990 and 2013. Firm employment growth in 1989 was not available since the firm size was not available for the preceding year on which this variable is based. Figure 16 shows the mean previous firm employment growth per year. Unsurprisingly, the figure looks much like the figure on firm employment growth (figure 8). In the firm year dataset, 211.790 firms have a value for the variable previous firm employment growth (see table 14). As with the dependent variable firm employment growth,

previous firm employment growth is highly positively skewed and contains quite a few outliers. Hence it was decided to exclude all firm years with a Z-score exceeding 3,29 positive or 3,29 negative in the regression analyses.

Table 14 Descriptives of previous firm employment growth

Previous firm employment growth	
N	211.790
Missing	33.302
Minimum	-1.150
Maximum	1.804
Mean	0,18
Median	0,00
Skewness	41,202
Kurtosis	15.749,013

Source: VR; own editing

5. Firm employment growth explained empirically

Firm employment growth is dependent on a wide range of factors according to the literature overview in chapter 2. This thesis is aimed to investigate what matters for firm employment growth in Flevoland.

Is related variety of influence on firm employment growth in Flevoland between 1989 and 2014? What is the influence of the other geographic factors on firm employment growth in Flevoland between 1989 and 2014? How are the firm characteristics of influence on firm employment growth in Flevoland between 1989 and 2014?

This chapter will empirically answer these questions. In order to answer these questions, statistical tests will be run.

5.1. Partial correlations among variables

First of all, simple bivariate (or correlation) analyses will be done. These analyses will show whether the independent variables X_1 to X_n are correlated with dependent variable Y: firm employment growth. These simple tests are a good first introduction but also have some important disadvantages over other statistical tests such as regression analyses. The most important of which, is the fact that correlation studies do not account for the fact that any correlation found in bivariate correlation tables may be explained by a third variable. For this reason regression analysis will be performed in the next section.

Another reason for the exploration of the partial correlations among the variables is related to the upcoming multiple regression analysis. In order to conduct a multiple regression analysis one has to be assured that the independent variables in the model do not show a high degree of correlation among them. A high correlation level among the variables (multicollinearity) will negatively influence the multiple regression analysis. In this thesis when independent variables show a mutual correlation that exceeds 0,8 this is considered as troublesome for the regression analysis and hence one of the two variables will be excluded from the analysis.

5.1.1. Related variety

Table 15 displays the partial correlations between all ratio variables in this thesis. Most interesting in the light of this thesis is the correlation between related variety, the main independent variable, and firm employment growth, the dependent variables. The Pearson correlation value of -0,012 indicates the existence of negative correlation (significant at the 0,01 level). This means that the higher the degree of related variety within the municipality, the lower the firm employment growth. This finding is surprising since that the literature pointed to a positive correlation. Having a high degree of employment in related sectors within a municipality does not seem to foster employment (generating innovations) at the firm level as the theory predicts.

Related variety and municipal population density show quite a high significant correlation (0,572). This is unsurprising since that the amount of related employment in the municipality is a function of the total employment in the municipality. The total employment of the municipality on its turn is likely to be closely linked to the population density. The municipal location quotient also has quite a high and significant correlation with related variety (0,572). Again this is unsurprising since that both variables are calculated with the amount of municipal employment in the firm's one digit sector.

The Pearson correlation among variables in thesis

Table 15 The Pearson correlation among variables in thesis

	Firm employment growth	Related Variety	Municipal population density	Municipal location quotient (one digit)	Municipal location quotient (two digit)	Municipal location quotient (three digit)	Municipal location quotient (four digit)	Municipal unemployment rate	Municipal share of high quality jobs	Firm size	Firm age	Previous firm employment growth
Firm employment growth		-,012**	-,012**	,003	,005*	,008**	,008**	-,010**	-,015**	-,011**	-,025**	-,130**
Related Variety			,549**	,040**	-,036**	-,066**	-,096**	,234**	,351**	,021**	,035**	-,010**
Municipal population density				,027**	-,009**	-,056**	-,105**	,359**	,549**	-,056**	-,021**	-,013**
Municipal location quotient (one digit)					,527**	,410**	,327**	-,051**	-,100**	,056**	,003	,011**
Municipal location quotient (two digit)						,810**	,649**	-,073**	-,173**	,111**	,012**	,017**
Municipal location quotient (three digit)							,845**	-,097**	-,220**	,151**	,027**	,022**
Municipal location quotient (four digit)								-,130**	-,268**	,162**	,035**	,025**
Municipal unemployment rate									,436**	-,047**	,000	-,025**
Municipal share of high quality jobs										-,060**	-,040**	-,017**
Firm size											,146**	,156**
Firm age												-,035**
Previous firm employment growth												

Source: VR and CBS; own editing

** correlation is significant at the 0,01 level (two-tailed)

* correlation is significant at the 0,05 level (two-tailed)

The high level of correlation between related variety and municipal population density and municipal location quotient (one digit) will probably have some effect on the multiple regression as this signals that there is some kind of multicollinearity. Yet both correlation levels are smaller that 0,8 so they are not considered as troublesome.

5.1.2. Geographic variables

According to table 15 the Pearson correlation between municipal population density and firm employment growth is -0,017 (significant at the 0,01 level). This means that firm employment growth is higher when municipality level population density is lower. Furthermore, the municipal population density shows a fairly high positive correlation with municipal share of high quality jobs (0,549). This correlation level falls well within the limit of 0,8.

The municipal specialisation in the one digit sector does not have a significant effect on firm employment growth according to table 15. However, firms that are located in a municipality that has a high concentration of jobs in the two, three or four digit sector, that the firm is located in, are more likely to see a high employment growth than firms that are located in a municipality that have a low concentration of jobs in the two, three and four digit sector that the firm is located in. This significant finding confirms the existence of localisation economies at the two, three and four digit sector level but rejects the existence of localisation economies at the one digit sector. Firm employment growth is only positively effected by a high municipal concentration of very similar employment.

Important to note for the assumption of multicollinearity is that the correlation between the municipal location quotient at the three digit level is highly and significantly correlated with the municipal location quotient at the two digit level (0,810) as well as with the municipal location quotient at the four digit level (0,845). The correlation level between two digit and four digit municipal location quotient is slightly lower (0,649). Note that these high correlation levels can partly be explained with the fact that there are only few three digit sectors and some two digit sectors. A high specialisation in the three digit sector will than automatically mean that there is also a high specialisation in the two digit sector. The same holds for the high correlation level between the three digit and the four digit municipal location quotient.

Because the correlation between the three digit municipal location quotient and the two digit municipal location quotient, as well as the correlation between the three digit municipal location quotient and the four digit municipal location quotient exceeded the critical point of 0,8, the municipal location quotient at the three digit level will be excluded from the regression analysis. The correlation between the two digit municipal location quotient and four digit municipal location quotient falls within the boundaries of the assumption of multicollinearity.

The municipal unemployment rate is negatively correlated with firm employment growth according to table 15. The Pearson correlation of -0,010 is significant at the 0,01 level. A possible explanation for this negative correlation is that firms may take advantage of cheap labour that results from a high level of municipal unemployment. In this way municipal unemployment will trigger firm employment growth. The municipal unemployment level is fairly strongly correlated with the municipal share of high quality jobs. This correlation value of 0,436 is not considered as problematic for the assumption of multicollinearity.

The significantly negative correlation (at the 0,01 level) between the municipal share of high quality jobs and firm employment growth, indicates that the lower the municipal share of high quality jobs, the higher firm employment growth will be. This is surprising as the literature overview indicates that having a local source of highly educated people, of which the municipal share of high quality jobs is a proxy, will likely foster innovation and hence firm employment growth.

5.1.3. Firm characteristics

Table 16 Mean firm employment growth per gender of the legal person

Gender	N	Mean firm employment growth	Mean related variety
Male	139.292	0,05	3.752
Female	53.398	0,02	4.121

Source: VR; own editing

According to bivariate analyses, firms with a male as the legal person had an average employment growth of 0,05 (see table 16). Firms that had a female as the legal person only grew with 0,02 employees on average. Generally speaking, firms led by a female are located in a municipality or sector with more related employment than firms lead by a male. For the upcoming regression analysis in chapter 5.2, one reference category needs to be selected for all nominal variables. The regression analysis will compare all categories with the reference category. All results in the regression model will depict the difference between the reference category and one other category which will be included in the regression analysis as a dummy variable. In the regression analysis in chapter 5.2 firms with a female as the legal person are set as the reference category.

At a significance level of 0,01, firm size is negatively correlated with firm employment growth. The larger the firm, the lower the firm growth will be. Firm age is also negatively correlated with firm employment growth at the 0,01 level. Young firms will outperform old firms in firm employment growth.

Table 17 Mean firm employment growth per sector

Sector	N	Mean firm employment growth	Mean related variety
Utilities, manufacturing and building	42.486	0,091	2.158
Trade and consumer services	93.768	0,085	5.405
Business services	83.559	0,073	3.085
Semi-public services	24.268	0,062	5.193

Source: VR; own editing

Firm employment growth is not equal among all sectors (see table 17). Annual employment growth differs from an annual mean growth of 0,062 employees in 'semi-public services' to a growth of 0,091 in 'utilities, manufacturing and building'. 'Trade and consumer services' had an average annual employment growth of 0,085 while firms in 'business services' have only grown with 0,073 on average.

As 'trade and consumer services' is the largest sector, it is not surprising that the average value for related variety is also the largest for this specific sector. A firm in that sector had on average 5.405 people employed in related sectors within the municipality. Firms in 'utilities, manufacturing and building' on the other side only had 2.158 people employed in related sectors within the municipality.

Table 18 Mean firm employment growth per legal form

Legal form	N	Mean firm employment growth	Mean related variety
Sole Trader	136.237	0,00	3.848
General Partnership	32.719	0,09	3.673
Private Limited Firm	75.125	0,22	4.498

Source: VR; own editing

Of the three legal forms considered in this thesis, firms that are sole traders have shown the least employment growth (see table 18). Not surprisingly (referring to the name sole traders), these firms have not shown any growth[9]. General partnerships have seen a mean firm employment growth of 0,09. Private limited firms have seen an average employment growth of 0,22 between 1989 and 2014. The highest mean value for related variety is for private limited firms. General partnerships have the lowest value. General partnerships are the reference category in the upcoming regression analysis with dummy variables for sole traders and private limited firms.

Table 19 Mean firm employment growth per branch type

Branch type	N	Mean firm employment growth	Mean related variety
Headquarters	199.035	0,08	3.824
Branch and Subsidiary	45.030	0,07	4.913

Source: VR; own editing

Average firm employment growth of headquarters is 0,08 (see table 19). The average firm employment growth of branch and subsidiary is slightly lower with an average annual growth of 0,07. In the regression analysis, branch or subsidiary is the reference category with a dummy variable for headquarters included in the regression model. Compared to headquarters, branch and subsidiaries have relatively more related employment in the municipality. Finally, previous firm growth is negatively correlated with firm employment growth. This correlation is significant at the 0,01 level.

5.2. Regression analysis based on control variables categories

In contrast to bivariate analyses, multiple regression analyses allow multiple independent variables to be included in the model at the same time. This will give a good estimate of what is important for firm employment growth. For this reason regression analyses will be run. Three regression models are introduced in this section (see table 20). Model 1 only includes related variety, the following two models will step by step add the geographic variables (model 2) and the firm level variables (model 3).

5.2.1. Model 1: related variety

The first regression model relates related variety to firm employment growth (see table 20). This model does not include any other variables. A total of 209.454 cases have been analysed in the regression model.

This simple model shows that there is a very small but significantly negative correlation between related variety (-0,126) and firm employment growth. The more people employed in similar sectors, the lower the employment growth of the firm. The model has only very little explanatory power however. The Nagelkerke R-square indicates that only 0,014% of the variance in firm employment growth is explained with model 1.

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[9] Note that sole traders in practise are able to have more than one person employed.

5.2.2. Model 2: related variety and geographic variables

The second regression model adds the geographic variables to model 1 (see table 20). Approximately 162.200 cases are included in the model. Model 2 is a small improvement to model 1. The variables jointly account for 0,024% of the total variance in firm employment growth.

While related variety was significantly related to firm employment growth in model 1, when controlled for the municipality level variables, this relation is not longer significant. This is likely the result of the inclusion of the population density variable. As seen in the bivariate analyses, this variable shows quite a high correlation with related variety. When holding population density constant, the correlation between related variety and firm employment growth seems to loose its significance.

The municipal population density, the municipal unemployment rate and all three municipal location quotients are not significantly correlated with firm employment growth in model 2. Based on the regression results it assumed that these variables are not of influence on firm employment growth. Controlled for the other factors, the municipal share of high quality jobs is significantly negatively related to firm employment growth. Firms located in a municipality with a high share of high quality jobs show more growth than firms located in a municipality with a low share of high quality jobs.

5.2.3. Model 3: related variety, geographic variables and firm level variables

The third regression model adds the firm level variables to model 2 (see table 20). Besides the variables that were already included in model 2, model 3 includes all firm level characteristics. A total of 121.777 firm years were analysed. Model 3 is a substantial improvement in comparison to model 2. Model 3 explains nearly 2% of the total variance in firm employment growth whereas model 2 explained less than 0,1% of the total variance in firm employment growth.

As in model 2, related variety is not significantly correlated with firm employment growth in model 3. This means that even when firm characteristics are accounted for, related variety is not significantly correlated with firm growth.

In contrast to in model 1 and 2, in model 3 the municipal location quotient (two digit) is significantly related to firm employment growth. The higher the municipal specialisation in the firm's two digit sector, the higher the firm employment growth. The fact that this correlation was not found in model 3 points to the fact that firm level characteristics are important for this correlation.

Furthermore model 3 finds that firm size is significantly negatively correlated with firm employment growth controlled for all other firm characteristics and geographic characteristics including related variety. This means that, controlled for other variables, large firms experience a lower employment growth than small firms. The significantly negative parameter of firm age indicates a negative correlation between firm age and firm employment growth. Young firms grow faster than old firms when controlled for the other factors.

Table 20 Regression analyses of firm employment growth; models 1, 2 and 3

	Model 1			Model 2			Model 3		
	B	SE	Beta	B	SE	Beta	B	SE	Beta
Constant	,101	,006***		,270***	,059		,279***	,050	
Related Variety	-5,731E-6	,000***	-,012	2,150E-07	,000	,001	-4,193E-07	,000	-,001
Municipal population density				-,002	,002	-,004	,001	,002	,003
Municipal location quotient (one digit)				-,006	,019	-,001	-,004	,014	-,001
Municipal location quotient (two digit)				,000	,009	,000	,020**	,007	,011
Municipal location quotient (four digit)				,003	,004	,002	-,005	,004	-,005
Municipal unemployment rate				-,005	,003	-,004	-,003	,002	-,004
Municipal share of high quality jobs				-,464***	,139	-,011	-,420***	,108	-,014
Male legal person							,005	,009	,002
Firm size							-,005***	,001	-,021
Firm age							-,007***	,001	-,027
Utilities, manufacturing and building							-,003	,012	-,001
Business services							-,021*	,011	-,008
Semi-public services							,023	,015	,006
Sole traders							-,040***	,006	-,028
Private limited firm							,018***	,002	,029
Headquarters							,041***	,012	,010
Previous firm employment growth							-,119***	,003	-,123
N	209.454			162.204			121.777		
Nagelkerke R-square	*0,000138*			*0,000252*			*0,018219*		

Source: VR and CBS; own editing

* = p<0,1

** = p<0,05

*** = p<0,01

When it comes to the sector the firm is active in, it turns out that only the firms in the sector 'business services' significantly differ in firm employment growth from the firms in the reference sector 'trade and consumer services'. Firm growth in 'business services' is slightly lower than in the 'trade and consumer services' controlled for all other factors in model 3. Not that surprising is the finding that sole traders see a significantly lower firm employment growth than general partnerships, controlled for other factors. Private limited firms on the other side have a significantly higher firm employment growth than general partnerships, controlled for other factors. Additionally headquarters firms see a significantly higher firm employment growth than branches and subsidiaries controlled for all factors in model 3.

Finally, model 3 indicates the higher the previous firm employment growth of the firm, the lower the current firm employment growth, controlled for other factors. This correlation is significant at the 0,01 level.

5.3. Conclusion of analysis

Hypothesis 1: Firm employment growth is positively related to related variety

While the literature clearly points to a positive influence of related variety, the empirical results of this thesis are not in line with this. In Flevoland, the research area of this thesis, firms that have a relatively lot of employment at related firms in the municipality, do not perform any better than firms that have relatively little employment at related firms in the municipality. In fact when not controlled for any other factors, firms with little related employment in its surroundings perform better than firms with a lot of related employment in the municipality.
When the firm characteristics and municipality characteristics are kept constant however, there is no longer a significant effect of the amount of related employment in the municipality on firm employment growth.

Because this thesis finds no significant relation between related variety and firm employment growth or a significantly negative relation between related variety and firm employment growth (not controlled for any other factors), hypothesis 1 has been rejected. Even though related variety may be of influence on regional employment growth, this thesis shows that the degree of related variety is not related to firm employment growth.

6. Conclusion and discussion

6.1. Conclusion

It has empirically been demonstrated that when there is a high degree of relation (based on cognitive distance) between the employment within a region (generally referred to as related variety), this will foster regional employment growth (Frenken, 2007). Yet studies that connect related variety to regional employment growth ignore the fact that the correlation between related variety and regional employment growth may actually be caused by the interference of the firm. The actual route from related variety to regional employment growth goes through the firms within the region (Coleman, 1987). Indeed, the firms are the source of employment. (Van Oort, 2012). Any found correlation between related variety and regional employment growth may for that reason be caused by the composition of firms within the region.

Fortunately, the underlying concepts of related variety are also believed to influence employment growth on the micro level of the firm. Especially the belief that knowledge spillovers may cause employment generating innovations is useful for connecting related variety to firm employment growth. This on its own however, is not a new notion. It has long been addressed that knowledge spillovers may spread innovations and consequently employment growth. What the concept of related variety adds to the relation between knowledge spillovers and employment growth is the perception of cognitive distance. Authors concerned with related variety state that for effective (employment generating) knowledge transfers to occur, the knowledge must spill over between actors that are neither at too far cognitive distance from one another nor at too close cognitive distance.

This thesis has indeed focused on the relation between related variety and firm employment growth. The main research question of this thesis was:

To what extent does related variety influence firm employment growth in Flevoland between 1989 and 2014?

In order to get a clear view on the influence of related variety on firm employment growth, one also needs to consider all other determinants that are of influence on firm employment growth. If these determinants are excluded from the analysis, this will result in findings prone to error due to the composition. Hence several other determinants for firm employment growth have been introduced in chapter 3. These determinants include characteristics of the firm (such as firm size, firm age and sector affiliation), characteristics of the entrepreneur (such as motivation and management skills) and firm external characteristics (such as demand for the firm's products and the regional knowledge endowment).

The empirical part of this thesis has tested the influence of related variety on firm employment growth. For the analysis a large dataset was constructed compromising a total of 245.092 firm years. All firm years in the dataset were located in the Dutch province of Flevoland in two successive years between 1989 and 2014. Even though the dataset comprises 245.092 firm years, the number of actual firms is quite a bit lower with just 40.672.

6.1.1. Empirical results

Average firm employment growth came out at just 0,128 per year. This means that it would take approximately 8 years for a firm to grow by 1 employee. Yet firm employment growth shows quite some variance over the years. The mean level for firm employment growth was highest in 1991 when average growth exceeded 0,7. The levels have been very low or even negative since the worldwide economic crisis from 2008 onwards.

Between 1989 and 2014 the average amount of related variety (employment at firms that share the one digit sector code of the firm but differ at the four digit sector code within the municipality of the firm) is 4.024. This means that an average firm has 4.024 people employed at related firms within the municipality. Like firm employment growth the average level of related variety differs quite strongly both over the years and over the municipalities. The highest levels are generally found in the most recent years. Almere has got higher levels for related variety than the other five municipalities. This is not surprising since that Almere is also the largest municipality (in employment).

In Flevoland in the period 1989-2014 specifically, the amount of related employment in the municipality has a negative influence on firm employment growth, not controlling for any other factors. This is surprising since that the theory clearly points to a positive correlation between related variety and firm employment growth (due to the employment generating knowledge spillovers). A clarification for this surprising finding may be found by looking at the control variables in the analysis of this thesis. Variables that are positively correlated with related variety but negatively correlated with firm employment growth can cause the relation between related variety and firm employment growth to become negative even though a positive correlation was expected. This also holds for variables that are negatively correlated with related variety but positively correlated with firm employment growth.

The correlation matrix points to 8 control variables with different correlation signs for related variety and firm employment growth.
Firstly, the variable municipal population density is most likely to interfere with the correlation between related variety and firm employment growth. The level of related variety is positively related to the total amount of employment within the municipality. The total amount of employment within the municipality is likely to be closely associated with the population density. Indeed, Almere (the largest municipality by the amount of employees) also has the highest level for municipal location density. Yet the bivariate analyses in this thesis also demonstrated that firm employment growth was relatively low in this municipality. The negative correlation between related variety and firm employment growth may be due to the fact that firms with a high level of related variety are located in a municipality that generally has lower values for firm employment growth.
Secondly, the negative correlation between related variety and municipal location quotient (two, three and four digit) together with the positive correlation between municipal location quotient (two, three and four digit) and firm employment growth can also partly explain why the correlation between related variety and firm employment growth is negative rather that positive. The positive correlation between municipal location quotient and firm employment growth has been well embedded in the existing literature. A clarification for the negative correlation between the municipal location quotient and related variety is missing.
Thirdly, the fact that the municipality level unemployment rate is negatively related to firm employment growth but positively related to related variety can also partly explain the negative sign

for the correlation between related variety and firm employment growth. The reason why the unemployment rate of the municipality is negatively related to firm employment growth has already been discussed in chapter 3. The municipal unemployment rate depicts the overall economic situation of the municipality. A high rate indicates a bad economic situation which will hinder firm employment growth. A clarification for the positive relation between related variety and municipal unemployment growth has not yet been given. Yet there is quite some literature on this correlation. Frenken et al. (2007) state that "a region specializing in one sector, or a group of sectors with correlated demand, runs the risk of a serious slowdown in growth and high rates of unemployment as a result of a demand shock".

Fourthly, the municipal unemployment rate has a different correlation sign for related variety and firm employment growth. Being located in a municipal with a share of high quality jobs, hinders firm employment growth. This finding is in itself surprising as the literature pointed to a positive correlation. Being located in a municipal with a share of high quality jobs shows a positive correlation with related variety. Firms with a high degree of related variety are located in a municipal with a high share of high quality jobs. This correlation is probably heavily influenced by the firms in Almere, that generally have a high value for related variety and a high value for municipal share of high quality jobs.

Finally both firm size and firm age are negatively related to firm employment growth but positively related to related variety. Small firms and young firms grow relatively fast in Flevoland. Yet these firms are located in sector/municipality combinations that have a lower than average level for related variety.

Only two control variables have the same sign for their correlation with firm employment growth and their correlation with related variety. The first of which is municipal location quotient (one digit). The second is previous employment growth.

The regression analyses show what happens to the correlation between related variety and firm employment growth when the control variables are kept equal. Controlled for all the municipal level variables, related variety does no longer have a significant influence on firm employment growth. In fact control for all factors in the model, the only municipality level characteristic that is significantly correlated to firm employment growth is the municipality level share of high quality jobs. All other municipality level variables, including related variety, do not significantly correlate with firm employment growth controlled for all variables.

When also controlled for the firm level characteristics, related variety remains unrelated to firm employment growth. Of the municipal level variables only municipal location quotient (two digit) (0,020) and municipal share of high quality jobs (-0.420) are significantly correlated with firm employment growth. Of the firm level variables, firm size, firm age, business services, sole traders and previous firm employment growth all have a significantly negative correlation sign for firm employment growth, while private limited firms and headquarters have a positive correlation sign for firm employment growth.

6.2. Discussion

This thesis is concerned with the effect of related variety on firm employment growth. Yet in order to get a clear view on the effect of related variety on firm employment growth, one needs to control for all other determinants for firm employment growth. Chapter 3 for that reason introduced a wide

range of factors that have empirically been shown to be of influence on firm employment growth. Yet, due to the usage of an external dataset, it was not possible to include all of these factors in the analyses on firm employment growth. Especially the exclusion of the entrepreneur level characteristics is troublesome. This is so because a firm primarily grows because the entrepreneur wants the firm to grow.

Additionally, despite reviewing a long list of assumed determinants for firm growth, the picture is far from clear about what really matters for firm growth according to Davidsson et al. (2007). They state that differences in theoretical and epistemological perspectives and interpretations; operationalisations; empirical contexts; modeling and analysis approaches, as well as the inherent complexity and heterogeneity of the phenomenon itself, are to blame for the incoherent picture.

The very low explanatory power of the regression model in this thesis (a Nagelkerke value of 0,018) indeed indicates that a lot of the variation in firm employment growth is not accounted for with the model. The inclusion of additional variables will probably have made the model a better fit. Furthermore, the inclusion of more variables might also have changed the correlation signs of the already included variables.

A concern for the internal validity of this thesis is the operationalisation of the variables. For example, the 21 initial sectors were grouped so that a total of 4 sectors were formed. Even though the newly formed sectors were created based on commonalities among the 13 sectors, this joining may still cause some error in the results. Even more important is the operationalisation of related variety. As this operationalisation of this variable is new it has not been verified yet that the operationalisation is a good fit to measure related variety. Especially the difference in the amount of four digit sectors within one digit sectors is reason for concern. A positive correlation between the number of four digit sectors within the one digit sector and the amount of related variety is very likely.

Related to the external validity, one has to notice that Flevoland is a special case in the Netherlands. The province was only recently established following the reclamation of the former Zuiderzee. An enormous in-migration followed resulting in very high population growth rates. Yet employment did not follow to the same degree resulting in a relatively low labour/population-ratio (Bureau BUITEN, 2015). More than average in the Netherlands, the employment base of Flevoland suits the local population with high levels of employment in the sector retail and wholesale. This makes the results of this thesis less applicable to other regions.

Moreover, it is worth noting that this thesis has exclusively focussed on absolute firm employment growth. Yet as absolute firm employment growth and relative firm employment growth have been found to be unrelated in some studies (Davidsson, 2006), the results of this thesis might have been totally different if one would have considered relative firm employment growth. For that reason the results of this thesis may not be used to explain relative firm employment growth.

6.3. Policy implication

Despite the fact that many studies found a significantly positive effect of related variety on regional employment growth, based on this thesis there is no reason to believe that related variety is also significantly related to firm employment growth. Policies aiming at clustering or co-locating related

firms for firm growth purposes should be reconsidered. Controlled for other factors, it turns out that firms will not grow more in employment if they are located in proximity of other related firms.

Furthermore, as it is unlikely that firms that have a high degree of related variety will grow significantly more, it would not make any sense for municipality governments to invest in facilitating the growth of these firms. For example, as it is unlikely that firms with a high degree of related variety grow any more than other firms it would not make sense to invest in the infrastructure around these firms to facilitate an increasing amount of traffic related to an expected growth of the firm.

Instead, municipality governments should focus on small and young firms, private limited firms and headquarters if they want to target firms that are expected to grow. The empirical study in this thesis points to these firms as high growth firms. Firms that have a high municipal (two digit) location quotient are also expected to grow more than average. Policies facilitating the growth of sole traders and firms that have shown a great growth in the previous year should be reconsidered as it turns out that these firms will growth little. Yet it is important to note that (even though not included in the empirics of this thesis) also the characteristics of the entrepreneur should be considered when selecting prospective high growth firms.

6.4. Research recommendations

As already mentioned in the discussion, this thesis is concerned with the special case of Flevoland. It may very well be so that in other regions, the relation between related variety and firm employment growth may be different. This is a point for further research.

Even though the results of this thesis point to the fact that firms that show a high degree of related variety do not grow more that firms with a low degree of related variety, the influence on the in-migration and out-migration of firms may be totally different. Firms that have a high degree of related variety may cause more employment growth by in-migration than firms that have a low degree of related variety. As Birch indicated that birth and death also matters for the employment development of a region, it could be that the degree of related variety is of influence on the employment developments stemming from firm births and deaths. The influence of related variety on firm employment developments stemming from firm births and deaths and in-migration and out-migration has remained outside the scope of this thesis but is an interesting topic nevertheless. It is recommendable that further research should be done on this. Related variety does not cause regional employment growth due to firm employment growth according to this thesis but it may well influence regional employment growth due to employment growth stemming from in-migration and births.

7. References

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