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MSc Thesis

Readjusting Stereotypes: The Regional Employment Effects of Shrinking Areas in Groningen

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Foreword

Dear reader,

Here it (finally) is! My completed thesis for the master's program of Economic Geography, which investigates the link between characteristics of shrinking areas and economic development in the province of Groningen. It has been almost a year ago since I started this project in February 2020, a year which I definitely didn't expect to go the way it went. If you would've told me back then that, in February 2021, I would still be kept at home by the COVID-19 pandemic ánd would still be working on this thesis, I would not have believed you.

It has certainly been sometimes a drag, but also a process of curious discovery into subjects I was barely familiar with when I started this process. This process has seen periods of enthusiasm, when I dove into new topics and tried to learn everything there was to learn about them, and these periods were also sometimes interchanged with times when I realized that a certain path only added complexity to the concept, without adding value. I've collected documents of notes almost longer than this thesis is now and I no longer dare to count the hours that I've spend writing STATA code, trying to get my data right. Nevertheless, I managed to tie all the pieces together in the end and with it, hopefully finish my master's program.

I would like to express my thanks for the support, guidance and patience I received from my supervisor, dr. Arjen Edzes, who assured the quality of this thesis. I would also like to thank my parents and girlfriend who were always willing to listen to my brainwork and gave me the perseverance to complete this project.

I hope you enjoy your reading.

Milan de Weerd

Abstract

Within the province of Groningen, it appears as if the city of Groningen and the rural areas are moving in opposite demographic directions. While the city is expected to grow, most rural municipalities have been branded as shrinking areas by the government. This thesis investigates whether the demographic characteristics of these shrinking areas also cause the employment in these areas to shrink. After conducting three levels of analysis, GIS analysis, sector analysis and regression analysis, I find that these characteristics do influence employment, but not uniformly in the direction that I hypothesized. A declining population size and lower level of urbanization are correlated with a lower number of jobs, while ageing is positively correlated with the number of jobs, especially jobs in what is called the 'nurturing economy'. Overall, I conclude that the negative effects of these demographic characteristics have not led to a decline of the employment in shrinking areas over my study period but did lead to a lower growth of the employment compared to non-shrinking areas.

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Chapter 1: Introduction

1.1 Setting the scene

Every week, a new hip café seems to open in the city center of Groningen, each trying to add something new to the diverse collection of cuisines and experiences that are available within this square kilometer of the city center. If I were to try to experience all that's on offer, it would take me most likely more than a year of eating out on a daily basis. An immense task, besides the fact that my student budget wouldn't allow it. Standing out from the others appears to be a challenge, as every new bar, restaurant or shop takes the spot of some other business that didn't manage to be profitable enough to remain on the market. Groningen's population is critical and sober, and if the offering of the newcomer isn't good enough of a deal, it will be forced out of the market just as fast as it entered it. Creative destruction in optima forma, just like Schumpeter described it (Schumpeter, 1942). The difference in economic activity couldn't be starker when I leave the busyness of the city of Groningen behind and ride through the rural parts of the province of Groningen on my bicycle. The constant noise of the city, a mix of voices, traffic and construction sounds, fades away and changes into the serene sounds of cows, birds and the occasional church bell. Most small villages I pass by only have one or two cafés, which appear to have been there longer than I am able to ride a bicycle. The typical local village main street has only a handful of shops that look like they would've been out competed years ago were they located in the city. While this obvious rural-urban contrast comes as natural to most people as the sun that rises every day, it is this spatial difference that interests me as an economic geographer. While I enjoy the quietness of the Ommeland while riding my bicycle, I know that this quietness also has socio-economic implications for the people that live there. Less business activities imply less jobs, which generally leads to lower incomes. The more peripheral municipalities in the north and east of the province of Groningen rank among the municipalities with the lowest median income of the Netherlands (CBS, 2018). While some people enjoy the peace and tranquility of living in these villages in the North of the Netherlands, this quietness is in part determined by the absence or sparse distribution of services. This implies that people have to put in more effort, most commonly meaning more travel time, to get the services that they need or desire compared to someone living in the city of Groningen. Children have to travel further to the nearest school and are limited in their afterschool activity options. Adults have to travel further to shops and commute further to work. Unfortunately, being able to overcome the barrier of longer distances is a privilege not everyone enjoys due to health, financial or other personal problems. This makes that the quality of life is lower for the average person. In the yearly inquiry by Elsevier into the quality of life in municipalities in

the Netherlands, municipalities in the east of Groningen score low on the availability of services, labor market and education, and consistently rank among the overall worst places to live in (van Dalen, 2018). The prime minister of the Netherlands has stated that the government promotes equal opportunities for all citizens (Rutte, 2018), but it is an illusion that people will have equal opportunities in spatially unequal societies.

1.2 Problem setting

The current spatial structure of the economy is the result of a long history of slow processes. Economic centers generally do not appear or disappear overnight. Changes in the current spatial structure are hard to recognize and manifest themselves only gradually (Tordoir et al., 2015). Differences in the spatial structure become more pronounced when comparing the structure across longer time periods, and that's when sometimes a certain pattern or critical event can be identified. These changes can have a strong effect on the functioning of the economy and quality of life in the areas undergoing these changes. Within the Netherlands, one pattern that is currently shaping and changing the spatial structure of the future is the emergence of shrinking areas.

Within the province of Groningen, the rural areas in the north and east of the province classify as shrinking areas. Almost all rural areas in the Netherlands are subject to aging populations and leaving young people, which leads to stagnation or a decline of the overall population. In some areas, problems remain limited due to a strong sense of community and large base of inter-municipal shared services. Other areas compensate for potential problems through a strong demand for leisure and healthcare services that boosts the local economy (Tordoir et al., 2015). There are however also areas where there are no beneficial local characteristics that compensate for the negative effect of population decline, or transition as some prefer to call it. Tordoir et al. (2015) put the rural areas in the province of Groningen in the last category. It is especially these areas that have my interest as these areas are most likely to be 'left behind' while the rest of the country moves forward. This would further increase the existing gap and therefore inequality between these areas and the rest of the country (Milikowski, 2020). The increasing economic inequalities between the most productive and least productive parts of the Netherlands have a big social impact and may be associated with conflict driven by diverging lifestyles and interests.

The transition to a new demographic composition and size has impacted and will continue to impact the daily life of people living in areas undergoing this transition. Services in both the

public and private sector have had to be scaled down, restructured or closed due to declining profitability as a result of the declined or changed customer and clientele base. Primary schools are an evident example of sectors that were the first to feel the effects of the transition through a decline of new pupils (Haartsen & Van Wissen, 2012). Statistics Netherlands has projected that between 2006 and 2040, the total number of people between 0-20 years old will decline by 7% for the country as a whole (Garssen & Van Duin, 2006), while the number of pupils in the Randstad is projected to increase during this period. This means that the decline of pupils in rural areas, especially those designated as shrinking areas, will be much higher than 7%. For South Limburg, North East Groningen and Zeeuws-Vlaanderen, the number of pupils is projected to decline by at least 15% to a maximum of 50% (Inspectie van Onderwijs, 2012). The decline also started earlier in these specific regions. For example, the number of pupils in Kerkrade, a small town in South Limburg, already declined by 20% between 1996 and 2005 (Wilms et al. 2007). Especially smaller rural schools with less than 100 students are impacted by the decline. Between 2012 and 2015, the amount of primary schools decreased by 28 (9%) from 314 to 286 in the province of Groningen, compared to the national average of a 5% decrease (Oosting & van Leer, 2015). Given these developments, one would expect that this declining trend is also visible in the spatial distribution of jobs in the education sector.

It is the effect on jobs that this study aims to measure. A lower availability of jobs can have a discouraging effect on the local labor force and is associated with a lower labor participation, which drives a higher share of people inactive on the labor market (Van Ham & Büchel, 2006). Despite the rise of digitalization and remote working, for most people, living and working is still heavily spatially connected. Most daily economic activity takes place within a 45 minute radius (Tordoir et al., 2015). When there is a lack of suitable job options in an area, this may cause especially starters on the labor market to move to an area where there are more jobs and discourage migration from elsewhere into the area (Feijten & Visser, 2005). From a company perspective, an area can be more attractive if it possesses a larger population, which may offer a more suitable or cheaper labor force and/or a larger home market (McCann, 2013). This reinforcing job-population dynamic can become a negative spiral when an area faces population decline and it is therefore interesting to analyze whether this assumption holds for every sector and how strong different sectors react if they do. Furthermore, one study showed that a relation exists (Kooiman & Siemons, 2015), but one downfall of this study was that the relatively short time span of 6 years, which leaves questions whether the developments found were of conjunctural or structural nature. By analyzing the origins of the relationship between

demographics, geography and the labor market and applying a statistical regression analysis on a rich labor market dataset, this study aims to improve the understanding of the structural economic development of regions undergoing a demographic transition of declining nature. With the results of this study, a clearer picture can be drawn on the direction the labor market is headed in these areas. A better understanding can foster a policy approach that prevents the loss of quality of life and the emergence of second-class citizens in these areas.

1.2 Research questions

To evaluate how the labor market has developed in shrinking areas, I assess the impact of several characteristics associated with shrinking areas on the development of jobs in the province of Groningen. For this purpose, I've formulated the following research questions.
The main research question this study will answer is:

How has the labor market in shrinking areas changed over the last 15 years and to what extent have the characteristics of 'krimpgebieden' structurally influenced the development of jobs in the province of Groningen?

To answer the main question, I have formulated a subset of several sub questions based on the characteristics:

1. *What is the influence of population size on the local job development?*
2. *What is the influence of population growth rate on the local job development?*
3. *What is the influence of ageing on the local job development?*
4. *What is the influence of urbanization on the local job development?*
5. *Is the influence of these characteristics the same for all sectors?*

1.3: Structure

In the next chapter, the literature review is presented in which I go into the dynamics that cause shrinking, the characteristics associated with it and the spatial economics literature that explains why jobs are located where they are. With this knowledge, I formulate hypotheses for my research questions, which draws the conceptual framework. In the third chapter, I will discuss the data I've collected and go into the methodology I use for this study. The results of the analysis are presented in chapter 4, which is subdivided into three parts: GIS analysis, sector

analysis and statistical analysis. The result section will be followed by the conclusion and discussion which summarize the main findings and connects them to the theory.

Chapter 2: Theoretical Framework

2.1 Population Decline Dynamics

Population decline takes place at multiple spatial aggregation levels. Looking at a map of Europe, population decline appears to happen mostly in Eastern European countries while Western European countries like The Netherlands mostly grow (Turok & Mykhnenko, 2007). Zooming in to the national level, decline at the regional level within Western European countries becomes evident. Within the Netherlands, 9 areas are defined as 'shrinking areas', areas which have already experience population decline, and 11 areas as 'anticipating areas' which are expected to experience population decline in the near future (Rijksoverheid, 2018). These 9 shrinking areas are all located on the outskirts of the Netherlands, e.g., in Zeeuws-Vlaanderen, South Limburg and North and Eastern Groningen. Population decline in rural Groningen is a process driven by a combination of general and location specific dynamics. On the general level, two related broader dynamics have created the setting in which population decline can occur: the demographic transition and urbanization (Elshof, 2017).

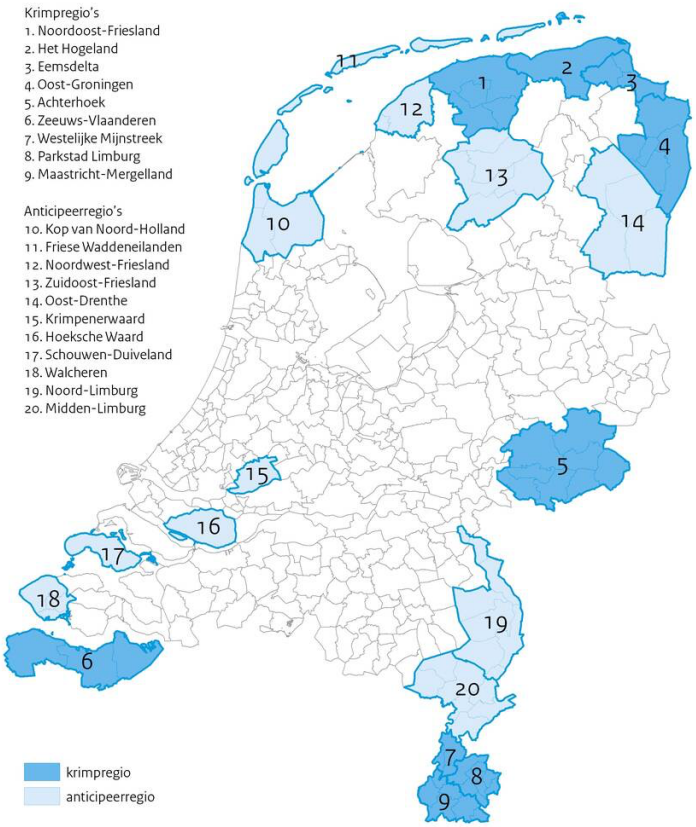


Figure 1: Overview of declining and anticipating areas. Source: Rijksoverheid (2018)

2.1.1 The Demographic Transition and Aging

The demographic transition model, developed by American demographer Warren Thompson, shows the historical phenomenon that both birth and death rates transition from high to low over four phases during the economic development of a country from an undeveloped to a modern nation. Most western-European nations, including the Netherlands, underwent the transition between 1750 and 1960 and are currently in the post-transition phase.

In the pre-transition phase, countries are undeveloped: they have low levels of education, income levels and very low living standards. Health care and hygiene standards are very low and cause a high death rate. As there is no pension system, parents have to rely on their children to take care of them when they are not able to work anymore. Having many children is therefore favourable, also because the chance that a child might die during childhood is high. Birth control and family planning did not exist yet, isn't available or not accepted. This leads to a high birth rate. The absence of adequate medical care meant that these societies were very vulnerable to events like wars or famines, which lead to a highly fluctuating population. Most populations were however small compared to contemporary levels. This was the situation in as good as every country prior to the industrial revolution in the 1700's and while some countries entered the first transition phase much more recently, no country is still in this phase today.

A country enters the first transition phase when it starts to industrialize or develop economically. Due to economic and technological progress, living standards improve and levels of health care and hygiene rise. This causes a rapidly declining death rate, but the birth rate does not decline yet. The economic progress also attracts migrants to the country. This causes the population to rapidly expand. In the Netherlands, like most western countries, the end of the second world-war caused a wave of optimism, which led to the birth of an extra-large cohort, also called the 'baby boom' generation'. During the 20th century, the population of The Netherlands tripled from 5.1 million in 1900 to 15.8 million in 2000 (CBS, 2019). In this period, the average age increased substantially as the life expectancy went up from 49,35 for men and 52,51 for women in 1900 to 76,42 and 81,08 respectively in 2000 (CBS, 2019). It was also a period of de-greening: the percentage of 0-19 year olds fell from 44% in 1900 to 24% in 1997, with exception for the 'baby boom' period after the second world war in which the percentage increased from 36% in 1946 to 38% in 1963 (Derks et al., 2006). In 2019, this percentage was 22% (CBS, 2019).

The second transition phase starts when the birth rate starts to decline. In most countries this happened after the shift from an agricultural economy to an industrial economy. This

caused rising levels of economic standards and also set of mass urbanization of the population. With an increasing urbanized population, modern ideas spread and education of women, gender equality and access to birth control improved. Together with the rising costs of raising children and the creation of pension systems, the birth rate rapidly declines. This causes the population growth rate to slow. In the Netherlands, this happened during the sexual revolution of the sixties and seventies (Boorsma, 2005; Ketting, 1983).

When the birth rate is at the same low level as the death rate, the country enters the post-transition phase, in which it has a large, but stable population. The economy has become advanced and mostly service based. Living standards are high as well as the life expectancy. The percentage of the population of 65 years and older has been increasing since 1924, when it was 6% to 19% in 2019 (CBS, 2019). As the generation of people born during the demographic transition, the 'baby boom generation', is currently nearing retirement age, the society ages and new challenges emerge. As this generation was a bit larger than the generation before it, but much larger in size than the generations that came after it, the relative amount of people on pension plans to the total population increases while the baby boom generation nears the retirement age. At the same time, the average life expectancy has increased due to improved health care and living standards and technological improvements. This 'graying' of the population is expected to peak around 2040, after which it will decrease slightly and then remain stable (CBS, 2019). Until then, the increasing relative cost of the pension system increases its pressure on the government's budget.

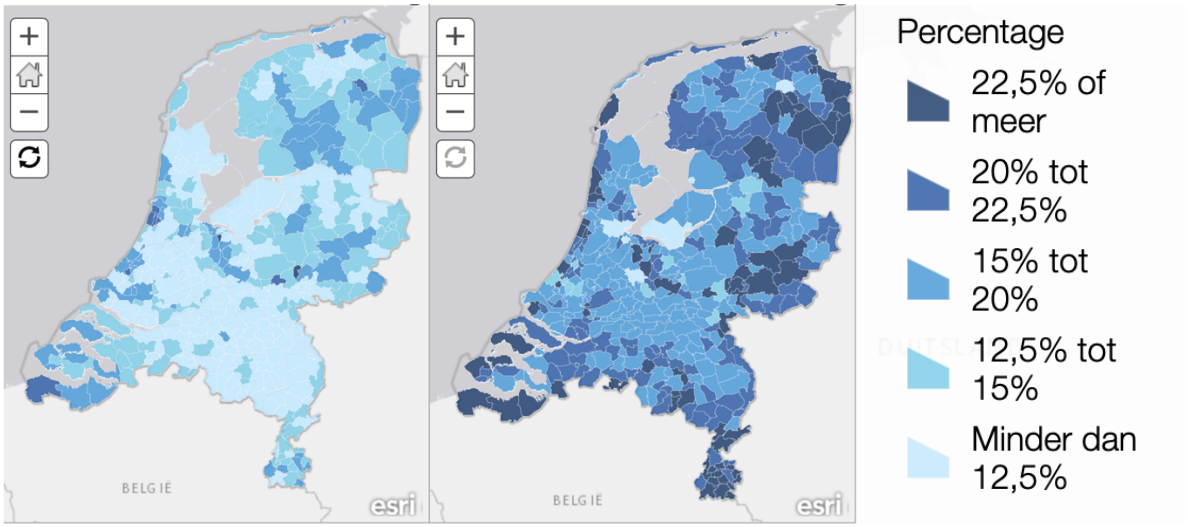


Figure 2: Share of the population that is 65 years or older in 1996 (left) and 2016 (right). Source: CBS (2017)

The lower fertility rate caused by the demographic transition inevitably leads to an aging society during the period that the larger age cohorts reach the retirement age. As these generations pass

away during the coming decades, the death rate is expected to surpass the birth rate for a while, and when it is not compensated for by migration, this will lead to a period of natural population decline. This process however doesn't explain the spatial heterogeneity of population decline in itself. Population projections show that many urban municipalities will grow by 10% or more in the coming decades while some rural municipalities, like several in the province of Groningen, will decline by 10% or more (Haartsen & Venhorst, 2010). In the next part, I will go into this rural-urban divide, which can be explained by a history of urbanization.

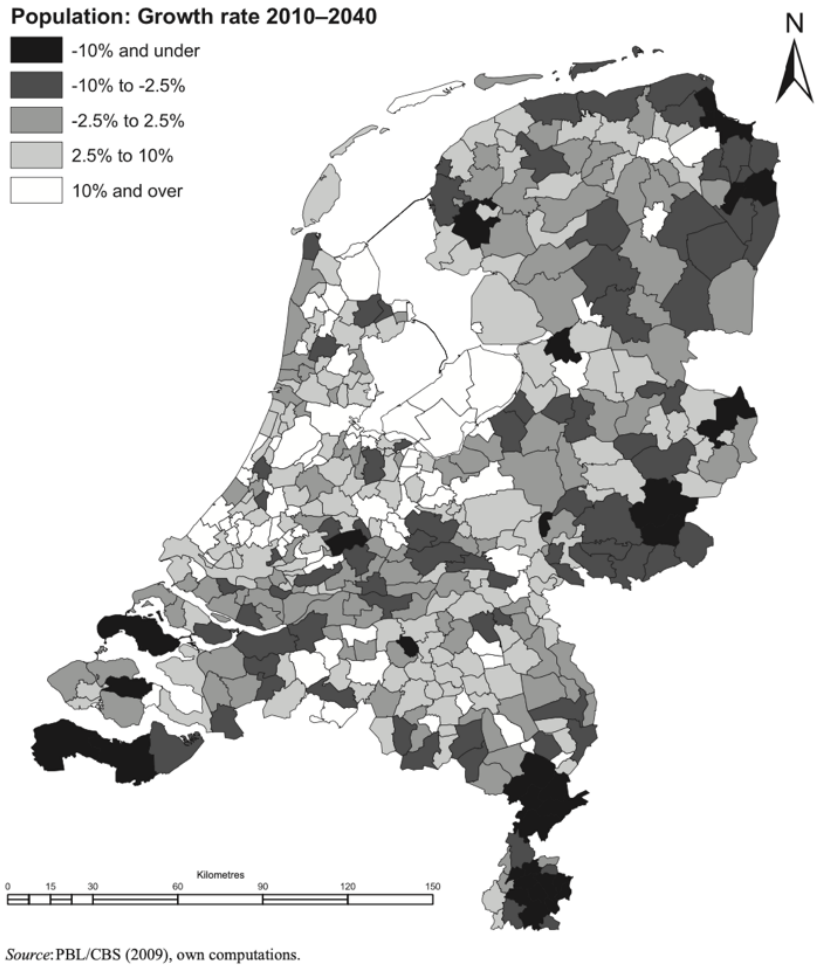


Figure 3: Population Growth rate projections per municipality. Source: Haartsen & Venhorst (2010)

2.1.2 Urbanization

Today, more than half of the world population lives in cities, but this is a relatively recent phenomenon. In the broader picture of human history, mass urbanization has accelerated in a both rapid and recent time frame. To illustrate the acceleration, in 1960, 34% of the world population lived in cities, which steadily increased to 55% in 2018. Whereas in 2007, there were 19 'megacities' with a population of over 10 million, by 2025, there will be 26 megacities. This concentration of the population goes hand in hand with the concentration of economic activity in key cities (Pike, Rodriguez-Posé & Tomaney, 2017). The importance of urbanization for economic development was first noted by Adam Smith, who noted that 'the commerce and manufactures of cities was not the effect, but the cause of the improvement and cultivation of the country' (Smith, 1776). A century later, Alfred Marshal (1890) also noted the fact that productivity and wages are higher in denser areas. The percentage of the population living in cities varies between continents, countries and regions. On a continent level in 2018, North America has the highest percentage of urban population at 82%, Latin America and the Caribbean follow with 81%, thereafter Europe with 74%, Oceania with 68%, Asia with 50% and lastly Africa with 43% (UN, 2018). Urbanization tends to go hand in hand with economic development (Brakman et al., 2020; McCann, 2013; Pike et al., 2017) and in line with the theory, it can be observed that most countries that are considered advanced have an urban population well above the world average, with 69% of the OECD population living in urban areas in 2015 (OECD, 2018).

While some examples of historical large cities exist, e.g. ancient Rome had between half a million and a million inhabitants (Storey, 1997), urbanization really started during the industrial revolution. The technological progress improved agricultural production and reduced the importance of manpower for food production. Food preservation and transportation techniques improved and allowed for longer supply distances to urban centers. This made it possible for more people to move to cities and for cities to grow larger. At the same time, large factories emerged near cities that needed a lot of manpower for their production process. The prospect of jobs and expectation of a better life in cities drew people from rural areas to cities, causing a wave of urbanization. Also, the sanitary revolution in the 19th century greatly improved health conditions in cities. Until then, cities were a filthy place and lacked proper sewer, water and trash disposal systems. The recurring epidemics, like cholera outbreaks, caused cities to have a higher death rate than rural areas. The discovery by British physician John Snow in 1854 that a water well polluted by sewage was the origin of a cholera outbreak in London (Begum, 2016),

led to the improvement of sanitation infrastructure and the separation of drinking water and wastewater. The improved health standards and declining death rate led to a natural population increase within cities and contributed to the growth of urban areas. In the Netherlands, this happened later than in Great Britain, with the first public health law regulating sanitation issued in 1901 (Historama Rond 1900, 2019). This first stadium of urbanization, in which rural-urban migration and improved living standards drove urban growth, lasted until 1960 in the Netherlands.

From 1960 to 1975, the Netherlands was characterized by a wave of suburbanization. In the years following the second world war, income levels of the Dutch middle class rose. Car-ownership became more widespread and improved mobility, allowing people to live outside the city and drive to the city for work on a daily basis. The improved living standard also made people desire larger, better homes with gardens and car parking options. As most city centers couldn't satisfy this demand both in terms of quality and quantity, people looked to the suburbs and nearby villages for their new homes. During the 1960's most large Dutch cities had a leaving surplus (Ter Heide & Smit, 2016), while suburbs grew substantially (Oevering, 2014). During the globalization of industrial production in the '60's and 70's, many production processes were offshored to countries with lower labor costs. This caused many factories in Dutch cities to close their doors, and increased unemployment among former factory workers. The moving of the middle class to the suburbs and the high unemployment rates among the labor class that remained in the cities led to an impoverishment of Dutch cities, which reinforced the outward migration.

From the 1980's onwards, cities started to reconstruct neighborhoods that had fallen into decay under the name of 'city renewal'. The goal was to make the city attractive again for the middle class to live in, who left for the suburbs in the preceding decade, and gentrify the city's population. This plan worked and together with the upcoming service economy, which drew high-skilled workers back to the city, cities were growing again by the start of the 1980's. This was called re-urbanization (Oevering, 2014). For the past 40 years, all cities in the Netherlands have continuously grown, which had led to an increasingly urbanized population. This urbanization was relatively equally spread over all cities in the Netherlands, with no single city growing much faster than the others. Only recently, has the share of the population living in 'very strongly urbanized municipalities', basically the Randstad, Groningen and Tilburg, increased again. The percentage of the population living in rural areas and municipalities have

been decreasing since the 80's, but as of the last couple of years, they have actually experienced absolute population decline as well (Oevering, 2014).

For most age categories, their moving frequency as well as their direction of movement within the country, has been stable for the last four decades. Since the 90's however, the moving frequency of young adults (aged 15-25) and starters (25-35) has steadily increased and their direction of movement has increasingly been towards 'very strongly urbanized municipalities'. This is related to the increase in students in higher education, which has increased from 22% in 1995 to 32% in 2012 of the population aged 15-25 (Oevering, 2014). Students mostly move to cities with higher education institutes, which are mostly located in the very strongly urbanized municipalities. The construction of new housing in 'Vinex' areas in these very strongly urbanized municipalities has increased and improved the housing stock, leading to more starters (25-35) staying in these cities (Oevering, 2014). Migrants, especially those in the young adult age category (15-25) settling in the Netherlands have also mostly settled in these very strongly urbanized municipalities. These developments make these cities 'youthful islands' in an otherwise aging country (Oevering, 2014).

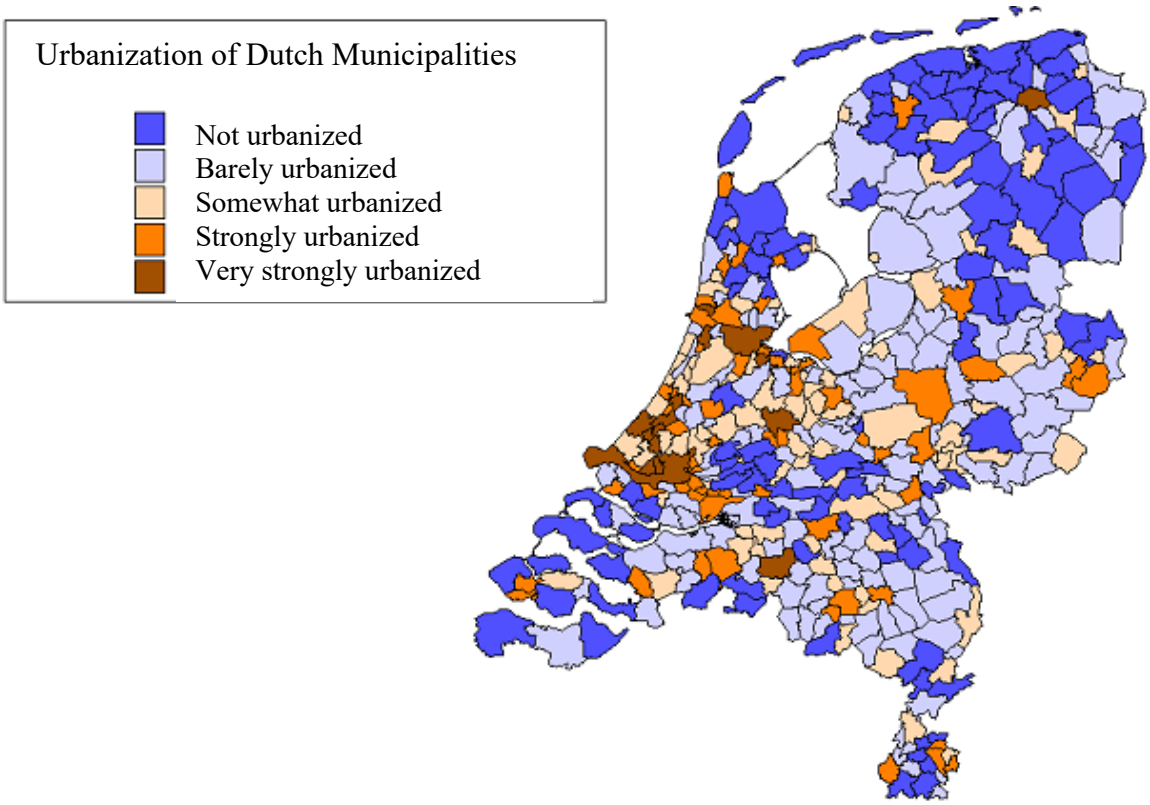


Figure 4: Classification of Municipalities. Source: ABF-Research (n.d.)

While the macrotrends of urbanization and aging explain the general rural decline and urban growth, it does not explain why there are sharp differences within rural areas. Within the Netherlands, rural population developments are very heterogeneous, with both growing, stable and declining rural areas. Local factors and characteristics are the most likely explanation for these differences (Elshof, 2017; Tordoir et al., 2015).

2.2 Spatial Economic Dynamics

Economic activity is unevenly distributed across the world (Brakman et al., 2020). The distribution of economic activity across space is, however, not random and often displays similar patterns across time and different levels of geographical aggregation, global, national, regional and urban. As the spatial pattern of economic activity influences the economic development of nations, regions and cities, understanding what drives these patterns is important and has been widely studied in literature.

The central goal in economic geographic science has always been to explain why a certain economical related activity is happening in the location where it takes place. In this research, I look into where jobs are within the province of Groningen and what factors influence this spatial pattern. In economic geography literature, two major and often intertwined theories have been developed that explain the spatial pattern of economic activities. In the first subchapter, I will provide an overview into the literature of location choice theory, that has in itself produced three different approaches. Thereafter, I will explain the other view on spatial economics: the theory of agglomeration and clustering.

2.2.1 Location choice theory

The geographical distribution of economic activity is influenced by the geographical movements of firms, as well as by their formation, expansion, decline and closure (Brouwer et al., 2004). In the literature, there have been various theories on the drivers of the location choice of firms, which are grouped under the name location choice theory. Within this literature, several approaches exist, each with their own assumptions and frameworks.
The three main approaches within location choice theory are the classical location theory, behavioral location theory and institutional theory (Brouwer et al., 2004).

2.2.1.1 The Classical Approach

The neo-classical approach is based on micro-economic theory that was developed to analyze static economic equilibria (Pike et al., 2017). The theories within this approach use a set of assumptions and concepts that simplify reality, allowing for mathematical analysis. First and foremost, theories within this approach regard people and firms to be rational and behaving in their own interests. Firms are expected to use their limited resources in a way that maximizes profits or income, whereas people desire to maximize their utility from their income (Atzema et al., 2012). The theories within the classical approach were the earliest location theories and

mainly addressed the spatial differences in the costs of factors of production and transportation. Later, the neo-classical theories build on this by also including spatial differences in revenues (Atzema et al., 2012).

Weber's (1909) industrial location theory is one of the fundamental theories of the classical approach to firm location. It assumes that a firm is rational and aims to maximize profits. Following from these assumptions, the location that a firm will choose will be that location in which profits are maximized (McCann, 2013). The core question Weber's model answers is thus: 'at which location will a firm maximize its profits?'. The basic theory that a firm's distance to the market depends on the transportation costs of its product relative to the price of the land was founded by Von Thunen (1826). In Von Thunen's bid-rent model, land is allocated to whichever usage is able to pay the highest rents at a particular distance from the market point, implying that land prices fall the further away from the market as a longer distance incurs higher transportation costs for transportation to the market leading to a lower maximum payable rent (McCann, 2013). The central conclusion is thus that economic activity will be located in concentric rings around the market point with the highest productivity industry located in the first ring. With his theory, he laid the economic foundation for the existence of areas, often cities, in which economic activity is clustered. Whereas Von Thunen's model was one-dimensional, Weber approached the location question two-dimensionally by assuming a simple production firm that turns two inputs into one output product. Assuming that the market points at which these inputs and outputs are traded are not the same and in different locations, a two-dimensional spatial figure, a triangle, can be drawn by connecting the three market points with the lines resembling the distance between each point. The model also assumes that the coefficients of production are fixed, meaning that there is a fixed relationship between the quantities of each input required in order to produce a single unit of output. The firm has to pay transportation cost that equal the distance from a market point to the firm's location times the transport rates per ton kilometer of each input or output good. As different inputs and outputs have different transport rates, the total transport costs payable by the firm differ per possible location. Given that the firm is autonomous in its location decision and aims for profit maximization, the Weber optimum location is thus, ceteris paribus, the location at which the total input plus output transport costs are minimized. In more complex additions to the core model, like adding multiple input sources, multiple market locations or varying factor prices, the firm's optimum location may move outside of the triangle, but the core dynamic of cost minimization remains the same. One key takeaway from the Weber model is that the spatial

economy exhibits evolutionary characteristics, which cause the firm to repeatedly look for new optimum locations if factor prices change or new input suppliers and market output locations emerge (McCann, 2013). Therefore, policymakers can attract economic activity by influencing factor prices. For example, by building infrastructure that reduces transportation costs to or from their region. One critique of the Weber model is that it assumes perfect mobility of firms, meaning that a firm will immediately change its location when it changes input suppliers or output markets. In reality, firms do not relocate frequently (Koster & Venhorst, 2014) because moving a firm is a costly process that involves the dismantling of equipment, moving people and the hiring of new staff (McCann, 2013). These transaction costs incurred by relocation can however be incorporated into the model. A firm will then only move when an alternative location offers factor price reductions that compensate for the relocation costs.

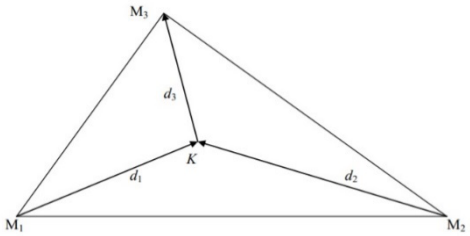


Figure 5: The Weber Triangle. Source: McCann (2013)

Moses (1958) addressed the relationship between input substitution and location behavior that was not addressed in Weber's model. Standard microeconomic analysis shows that substitution is a characteristic feature of firm behavior, and that efficiency conditions mean that firms will substitute in favor of relatively cheaper inputs, ceteris paribus (McCann, 2013). Whereas in the Weber model, transportation costs of input and output goods solely determine the optimum location, in the Moses model, input prices also play a role.

The classical theory cannot fully explain the choice for a certain location of a certain firm, however, it can illuminate the underlying economic incentives driving a location decision (Atzema et al., 2012). The comparison of (potential) costs of potential locations is very much relevant in the location decision process of a firm. From purely a cost perspective, I would expect that demographic changes, and more explicitly the decline of the relevant local labor supply for a firm, negatively affects the pull factors of the locations in which this decline occurs. If located in such a location where the local labor supply declines, the firm would naturally have to extend the area from which it draws employees. Employees living further away from the firm implies, considering only the economic dynamic, that the firm has to pay a larger travel

allowance relative to the situation before the demographic change. From a cost perspective, I would therefor expect a positive correlation between the size of the local population and the local supply of jobs.

2.2.1.2 The Behavioral Approach

The classical approach is deductive, it tries to understand reality following from its economic models. The behavioral approach works the other way around. It evaluates empirical observations and tries to deduct general assumptions from it (Atzema et al., 2012).

Behavioral location theory opposes the (neo)classical assumption that every firm or man is rational and possess perfect information. Instead, they argue that, in reality, most economic agents have imperfect information, which makes them boundedly rational, resulting in sub-optimal outcomes rather than maximum profits (Brouwer et al., 2004). This approach therefor seeks to understand the decision-making process that may influence the location choice. Internal characteristics, such as age and size of a firm, may play a role, and also factors like the familiarity with an area. This approach has mostly focused on empirical research instead of developing an explanatory model for the spatial distribution of economic activity. An example is the work by Koster & Venhorst (2014), which showed that the residential location of starting entrepreneurs highly influences the location decision of their business. Starting entrepreneurs and self-employed are autonomous over their location decision regarding their firm, in contrast with employees. Research on the residential and business location by highly educated self-employed has shown that entrepreneurship is mostly a local event (Koster & Venhorst, 2014). Most firms start local, with local meaning in the same municipality as the founder's residential location, and stay local. There are several potential benefits from starting and running a firm close to one's home. First of all, working close to home increases the benefits from local social ties. Proximity to family and friends is highly valued on a personal level and low-access costs to relevant business sources through the entrepreneurs local network brings value on a business level (Dahl & Sorenson, 2009). Second, obtaining adequate access to capital is one biggest hurdles entrepreneurs face (Kerr & Nanda, 2009) and local ties give access to finance (Jenssen & Koenig, 2002). Besides the benefits, if someone has strong residential preferences for a certain location and adequate job opportunities are absent in that location, this might stimulate becoming self-employed (Baltzopoulos & Broström, 2013). Research has confirmed that these incentives are reflected in location behavior. The study by Koster & Venhorst (2014) on firm and residential locations of highly educated self-employed showed that 86% of graduates in their first 17 years on the labor market had a locational match, meaning that their business and

home were in the same municipality. These graduates also relocated their firms infrequently and if they did, it tended to be locally. Thus, incentives to strive for a locational match between firm location and residential location for entrepreneurs contribute to the discussion on whether jobs follow people or people follow jobs. Self-employed are likely to start their business in the same area of residence because of the benefits of local knowledge and their business' success is therefor likely to benefit the local community of the entrepreneur. This positive dynamic reinforces the local economy of places that are attractive to live in and also suggests that these places may attract jobs because of the entrepreneurial activity. These findings apply mostly to smaller firms. When firms grow larger, their location tends to be less likely matched to their owner's residential area (Koster & Venhorst, 2014).

The neighborhood-effect is a well-known aspect of why experience matters in behavioral location theory. People in general have more information over their own and surrounding areas than they do over areas further away. This makes that people are more likely to let stereotypes and preconceptions influence their opinion of these further away areas than over their own area. As a result of this information bias, people are more likely to favor their own location over unfamiliar locations (Atzema et al., 2012). This would support the hypothesis that when a population declines in size, jobs would also decline as there are simply less people living in the area that will start businesses there.

Due to technological improvements, spatial margins are widening and the area in which a firm can profitably operate is larger than in the past. This makes that 'hard' location factors like accessibility and the local labor market may be less important than they were in the past and that 'soft' factors like an attractive surrounding environment, vibrancy of the neighborhood or reputation of an area may be relatively more important (Atzema et al., 2012). The extent to which soft factors influence the location decision differs however per type of business activity and industry. For example, for firms specializing in business services, soft factors determine for 80% and hard factors for 20% the location decision. For a distribution center, this division is reversed: soft factors matter for 20% and hard factors for 80% (Stec Groep, 2001). Therefore, I expect that the correlation between demographic change and jobs will be different per type of business activity, but also per score on soft characteristics for an area. A location undergoing demographic change which is considered to be in a more attractive area may be able to retain more jobs than a location undergoing demographic change in a less attractive area.

The downside of the behavioral approach is that it does not offer a prescriptive theory as to why a firm chooses a particular location. It should be interpreted as an explanation why the real-world situation may be different from the optimal spatial equilibrium as proposed by the (neo)classical theories. Uncertainty, bounded rationality, imperfect information, conflicting goals and relocation costs are factors that restrict the firm from optimum location behavior and instead make sub-optimal adjustments to restricted alternatives (McCann, 2013).

2.2.1.3 The Institutional Approach

Out of criticism on the classical approach to location theory emerged another approach that is known as institutional theory. In the classical theories, the cost and availability of information is disregarded to simplify and allow mathematical analysis. However, according to institutionalists, this is not reflective of reality in which different problems regarding information occur. The institutional approach mainly focusses on how information is transferred, in which the notion that people and firms have unequal access to information is important (Atzema et al., 2012). The institutional approach assumes, just like the neo-classical approach, that people and firms are rational. However, it states that people act rational within the limits set by the institutional environment. The groundwork on institutions came from the economist Douglas North, who won the Nobel prize for Economics in 1993. He defined two kind of institutions: formal institutions, e.g. laws and regulations, and informal institutions, like norms, values and conventions. This separation is akin to the distinction between external institutions, as declared by bodies of government, and internal institutions that originate from shared experiences. The nature of these institutions is to reduce uncertainty that exists in human interaction as a consequence of imperfect information. Institutions reduce this uncertainty through the enforcement of rules and norms (North, 1989). In an ideal world, rules should be just and enforcement perfect. However, several problems exist that obstruct this scenario. In contrast to what the classical approach prescribes is that it is not costless to measure the performance of agents, the attributes of goods and services and terms of exchange. This makes that enforcement of rules is imperfect, that complete control is neither possible nor affordable for governments and thus enforcement agencies have to weigh the additional cost of monitoring against the marginal benefit of extra policing (North, 1989). Besides the cost of measurement, agent-principal problems also make enforcement imperfect. As markets face therefor a certain degree of imperfection, the structure of the institutions determines the rules of the game and playing field for economic agents. As economic agents are still rational and strive for profit or

income maximization, they will act accordingly but are constrained in their options by the institutional environment.
In the classical approach, the firm is regarded as an active decision-making agent in a static environment. Institutional location theory argues that, in reality, the environment is dynamic and that the interactions between environment and firms shape the pattern of economic activity. "Firm location behavior is the result of firm's investment strategies. It is the outcome of a firm's negotiation with suppliers, government, labor unions and other institutions about prices, wages, taxes, subsidies, infrastructure, and other key factors in the production process of the firm." (Brouwer et al., 2004, p. 337).

The structure of institutions is what determines the cost of transacting, which is more important than transport costs when it comes to realizing well-being (North, 1989). On a global level, differences in the quality and inclusiveness of institutions are what has enabled some countries to make economic progress and become what I consider first-world countries while others have not been able to do so (Acemoglu & Robinson, 2012). In their well-known work 'Why Nations Fail', Acemoglu and Robinson (2012) provide a wide array of examples of how a positive fundamental change in some countries' institutions, has changed their economic trajectory for the better, while others have been stuck in vicious circles of extractive institutions and poverty.

The importance of institutions on firm strategy and thus location choice that follows from the institutional theory implies that the government is able to influence to indirectly guide firm locations. In the Netherlands, the government determines the location possibilities of larger firms through the allocation of certain areas as industrial zones ('*bedrijfsterreinen*') and the land destination plan ('*bestemmingsplan*'). The cost of transacting tends to be lower when firms are located closer to their counterparties and remain longer in the same area, as this strengthens the relationships between firms and formal institutions. This makes that firms in clusters are more effective and efficient.

2.2.1.4 The Evolutionary Approach

Evolutionary location theory is part of the institutional approach. It follows the institutional approach that regards the firm's behavior as an outcome of the firm's interaction and relationship with its environment. It is Darwinian in nature. In an adoptive environment, those firms that are best suited to the needs of the local economy are the firms that survive. In an adaptive environment,

In the real world, information and firms are heterogeneous. It is assumed that every firm would ideally want to optimize its behavior so that its profits are maximized, therefore, every firm will attempt to reduce its information uncertainty. As information improvement is a costly process, small firms perceive themselves to be at an information disadvantage compared to larger firms. The relative costs of information gathering, and analysis is lower for large firms than for smaller firms due to economies of scale. Because large firms will use their information advantage to make a more rational location decision, their location choice will be closer to the optimum location of neoclassical models like that of Weber, Moses or Hotelling. Small firms, who perceive large, market leading firms to be rational in their location choice, will therefor mimic the decisions made by large firms. While new firms may not make an explicit initial location choice and locate near the entrepreneurs area of residence (Koster & Venhorst, 2014), when they grow they might need to move their operations to a location that can facilitate the growth. A change in the number of employees increases the willingness to relocate. When a firm experiences growth in terms of employees, it might desire a location that can accommodate a larger plant, but also a location that has access to a labor market in which the desired employees are present (Brouwer et al., 2004). Large firms are considered to possess the resources necessary to assess the cost and revenue implications location, while smaller firms do not have sufficient resources to gather this information. Being aware of this information disadvantage, smaller firms will look to and imitate the behavior of larger firms, which they perceive to rationally act on the information they acquire. This is an explanation for the common observation that small firms often cluster around large firms (McCann, 2013). Research by Brouwer et al. (2004) found a negative relationship between the age and size of a firm and the likelihood to relocate. The older a firm is, the more embedded it will be in its local environment and the larger a firm is, the higher will be the costs of relocation.

The focus of location theory lies on the optimal location choice, which is determined by the attractivity of a site for firm location. The attractiveness of a site for firm location can be described as the strength of the pull factors of the site, which *pull* a firm towards it. The location theory thus assumes that a firm does not have a location yet and is unbounded and autonomous in its location decision. Relocation theory assumes that a firm is already established in a certain location and therefor considers not only pull factors of locations, but also push factors that may *push* a firm out of its existing location (Brouwer et al., 2004).

Each of the approaches above presents a way of analyzing the effects of various factors on the location behavior of the firm, such as transport costs, cost of transacting, market imperfections and internal characteristics. However in reality, the behavior of firms is often the result of a complex mix of these influences (McCann, 2013). Imperfect information also obstructs a systematic analysis and conclusion true location theory models on whether optimal firm location behavior is more likely to lead to dispersion or to clustering within research.

2.2.2 Clustering

What follows from location choice theory is that economic activity clusters together in space, which leads to the emergence and growth of cities. What follows typically when many people and firms want to be located in the same area is that prices of land in that area go up as the demand rises. As the demand on the local labor market in the area rises, labor costs tend to increase as well. These dynamics cause the local factor prices in cities to go up, which would, ceteris paribus, cause the attractiveness of the area to go down, causing a spatial spreading effect away from cities and centers. However, cities do exist, and economic activity is often clustered in those cities that are very expensive to be in. So, there must be features of clustering that more than compensate for the higher factor prices. These features are known as agglomeration economies (McCann, 2013). In this section, I will go into the dynamics that create these agglomeration economies.

Alfred Marshall (1890, 1920) was the first to describe the sources of agglomeration economies. He perceived that as firms cluster together in space, their clustering must bring some form returns to scale that accrues to all firms located in the cluster. Marshall defined three possible sources of these returns to scale: knowledge spillovers, local non-traded inputs and a local skilled labor pool.

Within clusters, employees from one firm have easy access to employees from other firms. Both in formal and informal settings, like business meetings and at the local sports club, people meet more often, and this allows for tacit information sharing. Tacit information entails information like market trends, new technologies and ideas which is shared on a non-market basis (McCann, 2013). This enriches employees understanding of the market and stimulates innovation, this makes that knowledge ‘spills over’ from one firm to another. When firms are clustered in space, the proximity maximizes the possibility of spillovers and this gives firms in this cluster an information advantage.

Non-traded local inputs emerge when a cluster reaches a certain size which allows for the existence of specialized services in the cluster. Specialized services may entail for example specialist legal, testing and software firms. The highly specialized and knowledge intensive nature of these services dictate that the cost of attracting these services is very high. When many firms who purchase these services are located in the same area, the cost of these services will on average be lower as the firms providing these services can achieve economies of scale of their own. The bigger the cluster, the lower the costs (McCann, 2013).

The costs of the recruitment and training of new employees is an expensive affair for firms. Within industrial clusters, this cost is lowered as the local labor pool contains more workers who already possess the skills necessary to work in the industry. This makes that firms can expand its labor force more quickly and cost-effectively when the market situation demands it, giving them an advantage over firms who are not inside the or a similar cluster (McCann, 2013).

Hoover (1937, 1949) later made another classification of the types of agglomeration economies that exist. Hoover's classification is different from that of Marshall, but it shares some elements. The three types Hoover distinguishes are: internal returns to scale, localization economies and urbanization economies. Internal returns to scale are firm specific and are efficiency gains that occur when the size of the firm grows. As they are internal to the firm, this type of agglomeration economies does not concur with Marshall's agglomeration economies. However, Hoover pointed out that this phenomenon is spatial as they originate from a large amount of investment and activity from a firm in one location, rather than over many different locations. Examples are large factories and complexes of for example automobile manufacturers. These are however less important for the explanation of the spatial distribution of economic activity. Localization economies accrue to industry-specific clusters and all three sources of Marshall's agglomeration economies contribute to them. The cluster in this type is specialized and often contains many firms that produce components for other firms in the same cluster. Besides economies of localization, urbanization economies exist which are city-specific and accrue to firms across sectors. In many large cities, the economy contains more than one industrial cluster which benefit from the sharing of knowledge, non-traded local inputs and local labor pools.

The consequence of theory on agglomeration economies is that it is thus beneficial for firms to cluster in space. This makes that I can expect to find firms of the same industry to be located in the same area and over time for these clusters to grow.

2.3 Conceptual framework

In this section, I will connect the insights gained from the literature review to build a conceptual framework and formulate my hypotheses. Most of the literature on the effect of demographic developments focus on the impact of growth of a population instead of decline. However, I argue that this poses no problem for my research as the direction of the relationships between demographic developments and other developments that is found, will simply be inversed. Coale and Hoover (1958) found that population growth influences economic development through three mechanisms: population size, population growth rate and through the age distribution. These mechanisms are all at play in my study area, with population size differing significantly across the neighborhoods, some areas declining more rapid than others and ageing occurring in almost all areas, but at different speeds and rates of progression. I will take these three as my independent variables and formulate hypotheses based on them. First of all, a growing population in an area is expected to contribute to economic development through a higher demand for products and services in the area. This higher demand creates jobs as providers of these products and services are likely to adapt to the new situation by increasing their capacity (Dam et al., 2006). The reverse can also be expected when an area loses population, and thus consumers. A lower demand for products and services will force providers to scale down their operations to ensure profitability. Therefore, I expect to find a positive relationship between absolute population development and job development.

Based on location choice theory discussed earlier, I would also expect that a correlation exists between population development and economic development. First of all, due to the cost perspective as discussed in the (neo)classical location choice theory, from which I can argue that firms would prefer a location close to a larger population center than a smaller population center, ceteris paribus. Second, following from the behavioral perspective, I can argue that people start firms in the area with which they are familiar, so in an area with a larger population, more jobs will be created. Third, from the institutional perspective and the theories involving clustering, I can argue that firms would see benefits in locating close to each other, which would positively moderate the relationship between economic development and population development based on the cost and behavioral perspective. Furthermore, a larger population size creates economies of scale and reduces the effect of diminishing returns (Coale & Hoover, 1958). Also, the growth rate of the population size matters, as a higher growth rate demands a higher rate of investment in the area as the expectations for what the future demand will be changes with it. One counter argument could be that there are also negative aspects associated

with a larger population, namely congestion, higher land prices and criminality. If these aspects are present, and public and private service providers are incapable of adjusting their operations and infrastructure appropriately within a reasonable timeframe, a faster growth rate could worsen these negative aspects. Feng et al. (2018) found that land prices are more elastic when the size of a population changes. Therefore, based on the issue of demand, location choice theory and agglomeration theory, I formulate the following hypotheses:

Hypothesis 1a: Population size has a positive effect on job development
Hypothesis 1b: Population size has a negative effect on job development

Hypothesis 2a: Population growth rate has a positive effect on job development
Hypothesis 2b: Population growth rate has a negative effect on job development

I've found that aging is a natural phenomenon resulting from the demographic transition. Around 2040, the phenomenon will peak, after which the effect will decline again until there is a relatively stable age distribution. Until then, aging will have an effect on the society and economy. Aging is the phenomenon that the share of people above the retirement age is increasing. As people above the retirement age generally become inactive on the labor market, aging affects economic development through a change in the share of the population active on the labor market relative to the share of the population that is inactive on the labor market (Dam et al., 2006). Thus, I would argue that aging has a negative effect on the number of jobs in an area, because it reduces the supply of labor, which makes the area less attractive to expand operations into for the demand side of labor. Also, studies on occupational choice have found that there exists an inverse U-shaped relationship between age and entrepreneurial activity, and that 40 is the prime age at which people start businesses (Bönte et al., 2009; Parker, 2004). Thus, in an aging area, less entrepreneurial activity can be expected. As entrepreneurial activity is positively associated with job development (Kritikos, 2014), I would argue that aging in an area has a negative effect on job development.

Hypothesis 3a: Aging has a negative effect on job development
Hypothesis 3b: Aging has a positive effect on job development

The other factor that is relevant to examine considering job development is the level of urbanization in an area. Urbanization has long been proven to have a positive effect on

economic development in general (Henderson, 2003). The urbanization movement during the industrial revolution was one of the drivers of the acceleration of economic growth. More recently, urbanization and increasing population density, which go hand in hand, have been proven to have a positive effect on productivity and wages (de la Roca & Puga, 2017). Traditionally, service-based industries have been highly urbanized compared to manufacturing and agricultural industries. There are differences within these categories, as services that serve households rather than other businesses are less urbanized, but still more urbanized than manufacturing industries (Glaeser & Kolko, 2013). That service-based jobs are located mainly in cities is because of the benefits of urban economies as discussed in agglomeration theory, like knowledge spillovers, that are vital for the knowledge-based service economy. With the share of service-based jobs growing relatively to manufacturing and agricultural industries, I can argue that, as these jobs develop in urban areas, that the level of urbanization will have a positive effect on job development in an area. However, urbanization also is characterized by aspects that are not necessarily beneficial for economic activity, such as higher land prices, congestion and criminality.

Hypothesis 4a: Urbanization has a positive effect on job development
Hypothesis 4b: Urbanization has a negative effect on job development

I also consider that some sectors might be influenced more strongly by demographic changes than others. The CBS already indicated in a report in 2015 that sectors belonging to the 'nurturing economy' (government, healthcare, construction, retail, accommodation and food services) would be influenced stronger by a change of the population than sectors belonging to the 'driving' or 'value-adding' economy (industry, information & communication, business services, distribution) (CBS, 2015a). The nurturing economy is more sensitive to local demand than the value-adding economy, which is more separated from the local market. I therefor expect to see a moderating effect of the sectors on the relationship between population development and job development.

Hypothesis 5: The effect of population development on job development is stronger in sectors belonging to the nurturing economy than those belonging to the value-adding economy.

Chapter 3: Data & Methodology

In this chapter, I will go over the approach and steps I take to answer each of my research questions. I will start by elaborating on the study area and data sources I use to provide the reader of a better understanding of the research process.

3.1 Study area

The study area is composed of the province of Groningen. I regard the province of Groningen as a suitable case study due to the heterogeneity of the province in terms of demographic development. The province has both areas which are projected to experience strong growth (City of Groningen) and strong decline (Delfzijl). I conduct my analysis at a low level of spatial aggregation, namely the neighborhood level. Within the province, there is a total of 601 neighborhoods in 2018 the province of Groningen, distributed over 20 municipalities.

3.2 Datasets and sources

The primary data source for the dependent variable, the development of jobs, from 'Stichting LISA', or just LISA. LISA stands for 'Landelijk Informatiesysteem van Arbeidsplaatsen', which translates to National Information System of Job Locations. The dataset contains observations of all plants from every industry together with the exact location in the Netherlands. Available variables include the total number of employees, number of full-time employees, number of part-time employees and SBI industry classification, and the geographical location of the plant, in coordinates, zip-code or municipal level. The dataset is currently available for every year from 1996 to 2018.

The demographical data for my independent and control variables comes from the CBS, or Statistics Netherlands. The CBS is the institution that gathers, researches and publishes statistical information about the Netherlands on behalf of the Dutch government. It also supplies statistical information of the Netherlands to the European statistics institution Eurostat (CBS, 2020). It functions as an independent institution, free from interference by public or private actors and has been peer reviewed in 2015 (CBS, 2020). The dataset I use is the '*Kerncijfers wijken en buurten'* (KWB) dataset*,* which translates as 'district and neighborhood statistics'. The neighborhood level is the lowest spatial scale that the CBS uses, which is assumed to capture the local living environment of the people. A neighborhood is determined by a homogenous social-economic structure or homogenous architecture. A neighbourhood's

primary function can be residential, industrial or recreation, but mixed uses also occur (CBS, 2019).

The KWB dataset is available for every year from 2003 onwards, prior to 2003, it was issued bi-annually. Therefore, we've chosen the timeframe of 2003-2018, because it includes the most possible years without reliability concerns. The KWB datasets contain observations for every neighborhood, district and municipality in the Netherlands. For consistency, we've selected all neighborhoods that belonged to a municipality of the province of Groningen in 2018 and trimmed the datasets of all years to only contain these observations. A neighborhood is a term used to identify a geographical area and doesn't necessarily imply a neighborhood in a population center as a reader might expect. Some 2018 'neighborhoods' are geographical areas that consist only of water. While these areas technically belong to the province of Groningen, it would not make any sense to include them in the dataset. I therefor excluded neighborhoods that consisted only of water. This gives us 601 observations in 2018.

By combining the CBS datasets with the LISA dataset, I have a panel dataset at my disposal. A panel dataset contains information across both space and time, it combines cross-sectional data with the elements of time-series data. I removed observations with missing values for either the independent or the dependent variable. I also removed observations that had value of zero for population size or amount of job. As 2003 serves as my base year from which I could calculate the population growth rate (PGR) for all the following years, I removed 2003 itself from the data as the PGR cannot be calculated for this year. Having done this, I have observations for 601 neighborhoods, of which 560 have observations for every year between 2004 and 2018. The reason for this is that either the CBS or a municipality has adjusted the codes of some areas in some years. For those neighborhoods that were simply assigned a new identification number, which happened to neighborhoods in municipalities that were merged into a new municipality, I could backtrack these changes and assign these neighborhoods a uniform code over my study period. However, for a fraction of my observations, the actual area of the neighborhood changed in certain years. This was mostly because a municipality made the administrative choice to either merge neighborhoods together or split them up. This is unfortunately technically impossible to undo in my data, but as this only applies to 7% of my observations, I expect no major problems from this. I winsorized my variables at the 1% and 99% levels to eliminate outliers.

3.3 Operationalization of variables

To test the effect of demographic changes on the development of jobs in the area of observation, a regression model is set-up.

3.3.1 Dependent variable

The dependent variable is economic development in terms of the log of the number of jobs (log_WPFT) per unit of observation in a given year. The dependent variable is not directly available from my LISA dataset, but has to be calculated manually. The LISA dataset is set up as a company data register. Observations in the dataset are unique companies in a given year, with variables on zipcode (PC6), SBI classification, full-time jobs, parttime jobs, total number of jobs, name of the location and COROP region. As I want to analyze the job development per neighborhood, district and municipality, I have to create a new variable in the CBS *Kerncijfers wijken en buurten* dataset, which contains this information. This new variable contains the total jobs sum of all observations for a neighborhood from the LISA dataset. To be able to do this, I first had to add a variable to the LISA dataset containing the code of the neighborhood for every observation. This could be easily done as the CBS provides a zip code to neighborhood and district pairing dataset for every year (CBS, 2018). I merged this dataset with the LISA dataset through the zip code variable and dropped the observations coming from the pairing dataset that didn't have any company data as those were neighborhoods or districts outside of my study area.

I use the general SBI industry classification code to distinguish between job developments in different sectors. While the LISA data contains 4-digit SBI classification codes, which allows for very specific subsector identification, such specificness is beyond the scope of this research. Jobs fall within the general sectors as displayed in the table to the right.
In my analysis, I will use the A – S sector identification letter when I refer to the sectors.
The sectors belonging to the nurturing economy, as explained in my conceptual framework, are: F, G, I, O and Q. The sectors belonging to the value-adding economy are: C, H, J and M. The other sectors don't specifically belong to either category. In table …, an overview is provided of all sectors and their identifying letter.

Sector identifier	*Full name*
A	Agriculture and related service activities
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage, waste management and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial Institutions
L	Renting, buying and selling of real estate
M	Consultancy, research and other specialized business services
N	Renting and leasing of tangible goods and other business support services
O	Public administration, public services and compulsory social security
P	Education
Q	Human health and social work activities
R	Culture, sports and recreation
S	Other service activities

Table 1: Overview of sectors

3.3.2 Independent variables

The independent variables I will test in my model are population size, population growth rate, ageing and urbanization. Population size (log_PS) is the log of the absolute number of people registered in a neighborhood in a given year. Population Growth Rate (PGR) is not directly available from the CBS dataset, but it can be calculated. PGR in year *t* is calculated as $((PS_{i,t} - PS_{i,t-1})/ PS_{i,t-1})$. Ageing (AGEING) is measured as the share of the population that is over the age of 65, a variable that is available from the CBS dataset. The level of urbanization (URB) is measured by the urbanization category assigned to the neighborhood by the CBS, which is also directly available from the dataset.

The CBS District and Neighborhood dataset provides information on the level of urbanization. Neighborhoods are classified according to their level of urbanization on a scale of 1 to 5. This level is determined based on the *Omgevingsadressendichtheid*, the density of registered addresses per neighborhood. This density aims to measure the level of concentration of human activity (living, working, education, shopping, recreation, etc.) of a certain area. The density of a neighborhood is calculated as the average registered addresses per square kilometer. The level

of urbanization is determined based on the density and are categorized into the following five categories:

1. Very strongly urbanized: ≥ 2500 addresses per km^2
2. Strongly urbanized: 1500 – 2500 addresses per km^2
3. Somewhat urbanized: 1000 – 1500 addresses per km^2
4. Barely urbanized: 500 – 1000 addresses per km^2
5. Not urbanized: < 500 addresses per km^2

To incorporate the five urbanization categories into our regression model, we create dummy variables for every category. These are called URB1, URB2, URB3, URB4 and URB5 for the respective category number. These dummies take the value of 1 if a neighborhood falls in that urbanization category and take a value of 0 if otherwise.

3.4 methodology

I conduct my analysis using a mixed methods approach. First, I will conduct a geographic information software analysis to identify spatial patterns in my data and better understand the complexity of my research question. Then, I will compare the performance of the different sectors within the labor market using a sector analysis. Finally, I will empirically test my hypotheses for statistical significance and correlation using an econometric panel data model. Econometrically, my panel data model would be the following:

$$y_{it} = \alpha + \beta x_{it} + u_{it}$$

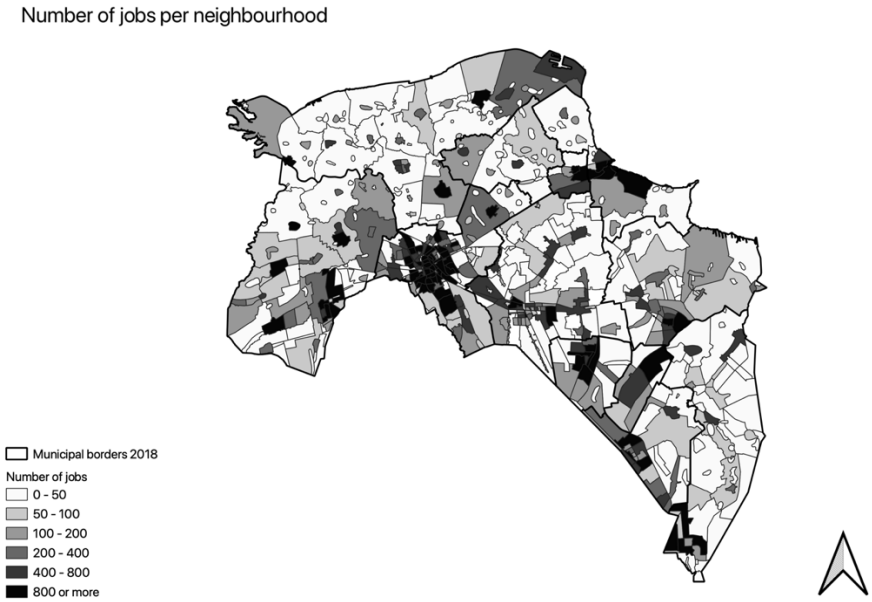
In which y_{it} is the dependent variable, α is the intercept term, β is a k*1 vector of parameters to be estimated on the explanatory variables, and x_{it} is a 1*k vector of observations on the explanatory variables, t = 1, …,T; i =1, …, N (Brooks, 2014). u_{it} is the disturbance term.

Chapter 4: Empirical Results & Discussion

4.1 GIS analysis

The first part of my analysis is done using Geographic Information Software (GIS). With it, it is possible to spot spatial patterns by mapping my panel data on a map of the province of Groningen. The goal is to identify the spatial aspect and structure of my dependent and independent variables. First, I will look into the spatial pattern of jobs in the Province of Groningen.

4.1.1 Jobs per neighborhood



Map 1: Number of jobs per neighborhood in the province of Groningen in 2018.

In map 1, I present an overview of the number of jobs per neighborhood in the province of Groningen. I observe that there is a large cluster of jobs around the city of Groningen, especially since the neighborhoods in the city of Groningen have a smaller surface area than rural neighborhoods. Non-agricultural employment in the province of Groningen is very strongly centered around the city of Groningen. In 2018, the municipality of Groningen had 150.529 jobs, which made up 57,21% of the total amount of non-agricultural jobs in the entire province (LISA, 2019). There are also large clusters of jobs around Delfzijl and its harbour. Also, most local population centres have more jobs than the surrounding area. The north of the province appears, which is a shrinking area, to be the least job dense. For the south east of the province, which is also a shrinking area, this appears to be less the case.

4.1.2 Population size per neighborhood

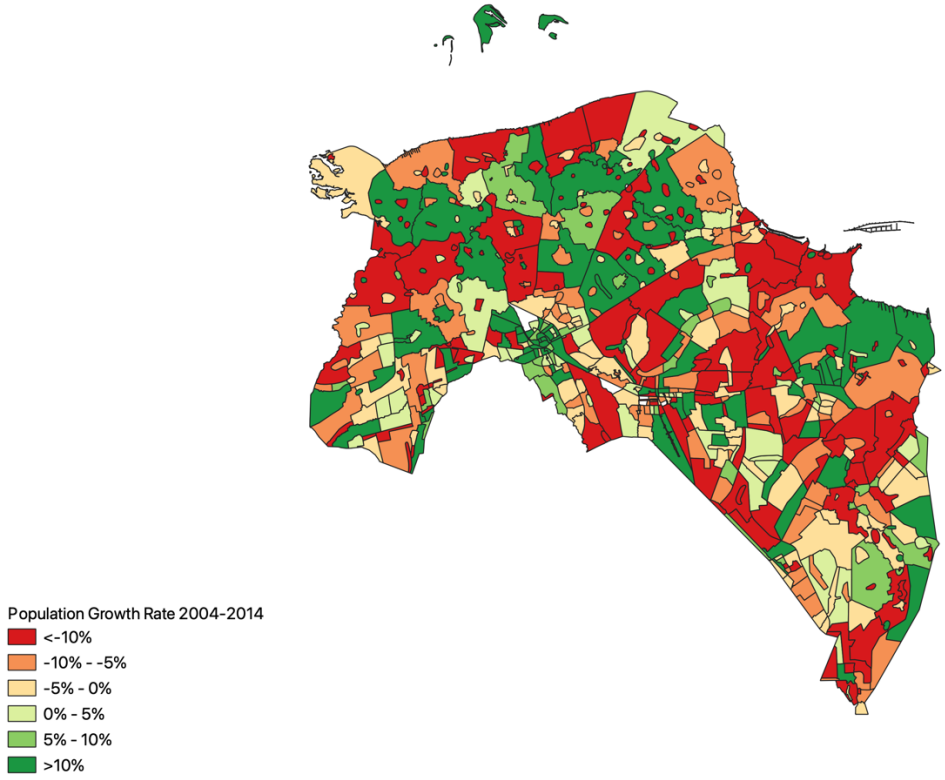
Population size in 2018 in the province of Groningen

Map 2: Population size per neighborhood in 2018 measured as the number of registered residents.

In map 2, I present the population size per neighborhood in 2018. To emphasize the large differences in sizes, I created 6 color codes, each of which has a population size of two times the size of the upper limit of the code below it. The darkest, black, neighborhoods therefor have an almost twenty times larger population than the white areas. I observe that the city of Groningen is the largest population cluster in the province and that there are some smaller population centers distributed around the province. Comparing this map with map … in section 4.1.1, I observe large similarities between the distribution of jobs and the distribution of people. Except for the industrial seaport area of Eemshaven, living and working appears to go hand in hand.

4.1.3 Population Growth Rate per neighborhood

Population Growth Rate in the province of Groningen between 2004 and 2014



Map 3: Long-term Population Growth Rate in the province of Groningen (between 2004 and 2014). We took 2014 instead of 2018 as measurement year because administrative changes to neighborhood codes would have made the visual comparison of 2018 to 2004 incomplete.

In map 3, I present the long-term population growth rate in the province of Groningen. I compared the population size of a neighborhood in 2014 to that of 2004. This is a slightly different period than that of the rest of my analysis, but this is for visualization purposes only. Municipalities sometimes change codes of neighborhoods, which I can work around by assigning the same code to the same neighborhood over my study period. However, in some cases, municipalities split up, combine or change the borders of neighborhoods, which makes it technically impossible to re-adjust the neighborhoods. As this has only happened to a small fraction (7%) of the neighborhoods and only during the 2014-2018 period, I expect no problems from this for the rest of my analysis. For GIS visualization, this would however leave some blank spots on the map if I picked 2018 as measurement year, so therefor I took 2014, which is the most recent year for which this issue is not present. I observe that once again, there is a lot of heterogeneity across the province considering the PGR. However, I also observe some patterns. All neighborhoods of the city of Groningen have grown by more than 10% during the period. Most rural neighborhoods in the east of the province have declined, with many by more than -5%. A minority there has also grown. Those that have grown appear to have mostly grown

by more than 10%. One reason for why the growth or decline percentages for rural areas are quite large is because they've mostly got a small population (as shown in map 2), which makes that a small nominal in or decrease can cause a large percentage change. In the north of the province, I observe that the local population centers or villages (the smaller neighborhoods in area size) have mostly declined, while the surrounding rural area has grown. This pattern is less visible in the east of the province, but also visible. This might be because on the one hand, villages are less attractive to live in, while the countryside is perceived as more attractive and is better able to attract and retain population. An example of such a situation might be that people who move away from the city in search of more space and tranquility find that in the actual countryside, more than in rural villages. Overall, I observe that the majority of the rural neighborhoods have declined in population size, regardless of whether they are located in an area that has been branded as shrinking.

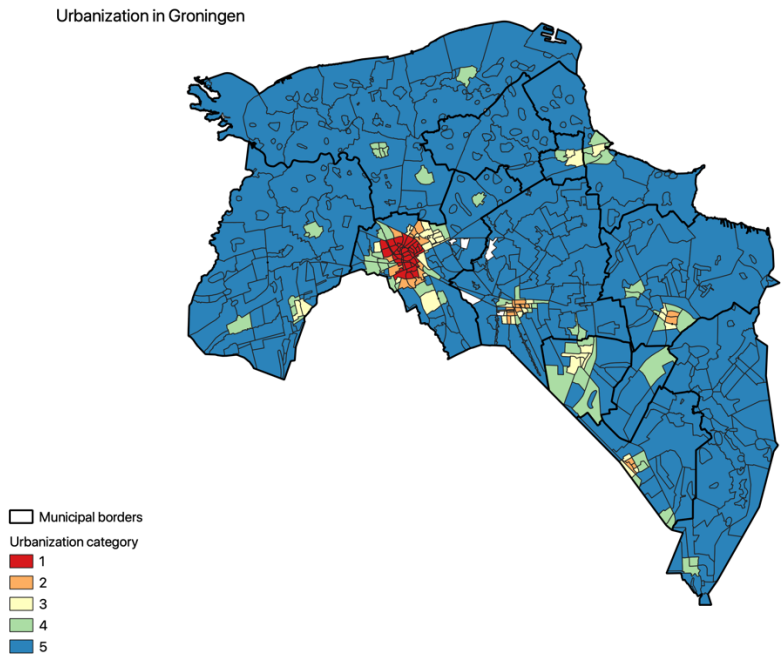
4.1.4 Ageing per neighborhood

Ageing in 2018 in the province of Groningen

Map 4: Ageing in the province of Groningen in 2018

In map 4, I present an overview of ageing in the province of Groningen. Ageing is defined as the share of the population that is older than 65. In 2018, this share was 18% for the total Dutch population (Volksgezondheidenzorg.info, 2021), while it was 20.18% for the province of Groningen. The population of Groningen is therefore already more aged than the rest of the country, but there are is a lot of heterogeneity within the province. The city of Groningen is very young compared to both the national average as well as the provincial average, with less than 12.6%. The rural parts of the province are more aged, but here as well, it differs per region to what extent. The neighborhoods in the north of the province are mostly between 12.6% and 16.9%, with some, specifically village neighborhoods, being more aged. The east and south east of the province are very aged with most neighborhoods having a share higher than 21.2% and a substantial number of neighborhoods having a share of 25% or higher. What also stands out is the area just south of the city of Groningen, which is also very strongly aged.

4.1.5 Urbanization per neighborhood



Map 5: Urbanization category per neighborhood in the province of Groningen.

In map 5, I present an overview of the urbanization categories per neighborhood in the province of Groningen. Spatially, it is visible that all very strongly urbanized neighborhoods are within the city of Groningen and that the rest of the province is mostly not urbanized. Strongly urbanized neighborhoods can also be found in the population centers of Hoogezand, Winschoten and Stadskanaal. Somewhat urbanized neighborhoods can also be found in Appingedam, Delfzijl, Haren, Veendam and Leek. Barely urbanized neighborhoods can be furthermore be found in Marum, Zuidhorn, Winsum, Bedum, Ten Boer, Uithuizen, Scheemda, Oude Pekela, Musselkanaal and Ter Apel. In the appendix, a similar map for the entire Netherlands is included as reference.

4.2 Sector analysis

4.2.1 Sector overview

In table 1, I present an overview of the number of full-time jobs per sector in the province of Groningen in 2018 and the change compared to 2004. There is a total number of jobs of 226,637 divided over 19 sectors in 2018. It is clear that there is a large heterogeneity between the number of jobs per sector. This originates from either the historical development of a sector in the region, or because some sectors are more labor intensive than others. In the province, the human health sector (Q) employs the most people with 46,684 full-time jobs, followed by wholesale and retail trade (G), education (P), business services (M) and public administration (O). On the other end of the spectrum, I find that the least people work in water supply (E), followed by the electricity (D), renting & buying of real estate (L), information & communication (J) and financial institutions (K) sectors. Looking at the development of the different sectors over my study period, I observe that here also there is a lot of heterogeneity. Overall, there has been a growth of 12%. The sector that has seen the most growth is culture, sports & recreation (Q), followed by water supply (E) and business services (M). The sectors that have seen the strongest decreases are financial institutions (K), agriculture and related service activities (A) and manufacturing (C).

Sector	*2004*	*2018*	*Change*
A - Agriculture and related service activities	15447	12311	-20%
B - Mining and quarrying	11826	13068	11%
C - Manufacturing	16902	14353	-15%
D - Electricity, gas, steam and air conditioning supply	1529	1882	23%
E - Water supply; sewerage, waste management and remediation activities	1015	1717	69%
F - Construction	12747	12928	1%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	25578	28596	12%
H - Transportation and storage	9447	8256	-13%
I - Accommodation and food service activities	5006	7342	47%
J - Information and communication	1518	2172	43%
K - Financial Institutions	5005	3158	-37%
L - Renting, buying and selling of real estate	1982	2149	8%
M - Consultancy, research and other specialized business services	11164	16524	48%
N - Renting and leasing of tangible goods and other business support services	7871	9122	16%
O - Public administration, public services and compulsory social security	16512	17040	3%
P - Education	18415	20444	11%
Q - Human health and social work activities	34257	46684	36%
R - Culture, sports and recreation	2463	4311	75%
S - Other service activities	4348	4580	5%
Total	203032	226637	12%

Table 2: Number of full-time jobs per sector in 2004 and 2018 in my sample of the province of Groningen. The change column captures the relative increase or decrease.

It is important to note that my focus is the number of jobs and not productivity or external importance and these are not always correlated. The European Commission (2020) namely reported that in terms of production, the major sectors in Groningen are manufacturing (C), business services (M), mining and quarrying (B) and information & communication (J).

4.2.2 Sectors per urbanization category

In table 2 I present an overview of the number of jobs per sector, per urbanization category. I observe that first and foremost, most jobs are in category 1, which is the city of Groningen, but that there is an almost equal number of jobs in category 5, which are all the rural parts of the province combined. There is a lot of heterogeneity in how sectors are distributed across urbanization categories. What stands out is that I observe a fairly traditional distribution of sectors. The manufacturing and agricultural sector, sectors that traditionally require a lot of land per unit of output for their operations, are very dominantly located in the rural areas of the province. Interesting to note is that there are more agricultural jobs in urbanization category 4 than 5. This can be because farms are usually family-owned businesses that are run by members of the family with only a few employees and that these are mainly located in category 5 areas, while agricultural service and support businesses that employ many people per location are located in and around villages in category 4. One example is Avebe, an international potato starch manufacturer that employs over 1300 people with locations in Foxhol and Veendam (Avebe.nl, 2021), which are both category 4 areas. There are also some sectors that appear to be much more bound to very strongly urbanized areas, such as health & social work, public administration and accommodation & food services. As I've seen in section 4.1, the job distribution is much denser in urban areas, however I can now add to this observation that it does not necessarily apply that there is a lack of jobs in the other areas. In table 4 I present an overview of the growth of different sectors per urbanization category. Splitting my data up in this way allows me to observe whether there are differences in the job development between urban and rural areas in the province of Groningen. As investigating whether there is a pattern of jobs leaving rural areas and moving to urban areas is vital to my understanding of the changes in the spatial structure. I observe very clearly that this is not the case. The number of jobs has grown the most in the most rural category, with 35%, compared to 'only' 7% growth in category 1.

Sector	*1*	*2*	*3*	*4*	*5*	*Total*
A - Agriculture and related service activities	529	164	1791	5869	3958	12311
B - Mining and quarrying	4599	738	1325	1465	4941	13068
C - Manufacturing	280	303	1649	5074	7047	14353
D - Electricity, gas, steam and air conditioning supply	498	952	8	8	416	1882
E - Water supply; sewerage, waste management and remediation activities	257	41	137	652	630	1717
F - Construction	731	457	1087	3070	7583	12928
G - Wholesale and retail trade; repair of motor vehicles and motor cycles	5372	2658	4737	5850	9979	28596
H - Transportation and storage	746	164	766	3229	3351	8256
I - Accommodation and food service activities	3578	647	619	748	1750	7342
J - Information and communication	936	367	338	130	401	2172
K - Financial Institutions	1404	260	571	577	346	3158
L - Renting, buying and selling of real estate	976	150	430	355	238	2149
M - Consultancy, research and other specialized business services	4692	1976	2765	2595	4496	16524
N - Renting and leasing of tangible goods and other business support services	1590	650	872	1716	4294	9122
O - Public administration, public services and compulsory social security	9383	1772	3078	1461	1346	17040
P - Education	7254	1904	2626	6555	2105	20444
Q - Human health and social work activities	19258	4863	9412	7033	6118	46684
R - Culture, sports and recreation	1499	551	554	603	1104	4311
S - Other service activities	1367	368	578	844	1423	4580
Total	64949	18985	33343	47834	61526	226637

Table 3: Overview of number of full-time jobs per sector per urbanization category in 2018.

There are seven sectors that have declined in category 1 areas and grown in category 5. Examples are mining and quarrying (B), construction (F) and transportation and storage (H). Most noteworthy is the renting of tangible goods sector (N), which grew in category 5 by 569% from 642 jobs in 2004 to 4294 jobs in 2018. For these sectors, this suggests an opposite movement, that businesses are actually moving out of the city instead of towards it. The increase in the health sector in category 5 areas might be a sign of increased demand for health services due to the relatively older rural population.

Sector	*1*	*2*	*3*	*4*	*5*	*Total*
A - Agriculture and related service activities	-34%	59%	-45%	-20%	1%	-20%
B - Mining and quarrying	-26%	5%	184%	5%	62%	11%
C - Manufacturing	-54%	-56%	-25%	0%	-15%	-15%
D - Electricity, gas, steam and air conditioning supply	-11%	17%	N/A	N/A	170%	23%
E - Water supply; sewerage, waste management and remediation activities	93%	-49%	140%	23%	197%	69%
F - Construction	-24%	-49%	3%	-16%	23%	1%
G - Wholesale and retail trade; repair of motor vehicles and motor cycles	0%	-4%	10%	4%	32%	12%
H - Transportation and storage	-31%	-73%	-52%	-9%	28%	-13%
I - Accommodation and food service activities	71%	26%	18%	27%	36%	47%
J - Information and communication	93%	12%	-36%	43%	366%	43%
K - Financial Institutions	-34%	-43%	-36%	-34%	-48%	-37%
L - Renting, buying and selling of real estate	19%	-37%	68%	-16%	-2%	8%
M - Consultancy, research and other specialized business services	19%	36%	47%	22%	156%	48%
N - Renting and leasing of tangible goods and other business support services	-43%	26%	-67%	35%	569%	16%
O - Public administration, public services and compulsory social security	5%	84%	-1%	-18%	-20%	3%
P - Education	2%	6%	0%	35%	3%	11%
Q - Human health and social work activities	45%	-11%	55%	26%	59%	36%
R - Culture, sports and recreation	9%	283%	76%	142%	189%	75%
S - Other service activities	-31%	-13%	39%	37%	56%	5%
Total	7%	0%	3%	5%	35%	12%

Table 4: Overview of the percentage increase or decrease of the number of jobs in 2018 relative to 2004. N/A means Not Available, which results from an absence of the sector in those urbanization categories in 2004.

4.2.3 Sectors in shrinking and non-shrinking areas

In table 5, I've presented an overview of the development of the 18 different sectors in either the parts of the province that have been branded as "krimpgebieden" or shrinking areas and those parts of the province that have not (Rijksoverheid, 2018). I observe that there is no indication that jobs are leaving shrinking areas as there is an overall job growth of 4% during my study period. Some sectors have even seen substantially more growth in shrinking areas than in non-shrinking areas, for example the information and communication sector and the culture, sports & recreation sector. Overall, I observe that the total growth of jobs is 11% higher, more than three times larger, in non-shrinking areas than in shrinking areas, which does provide

an indication that there may be an effect of shrinking on economic development measured by the number of jobs.

	Non-shrinking areas			Shrinking areas		
Sector	*2004*	*2018*	*%*	*2004*	*2018*	*%*
A - Agriculture and related service activities	7765	6330	-18%	7682	5981	-22%
B - Mining and quarrying	9594	10951	14%	2232	2117	-5%
C - Manufacturing	9041	7556	-16%	7861	6797	-14%
D - Electricity, gas, steam and air conditioning supply	1375	1644	20%	154	238	55%
E - Water supply; sewerage, waste management and remediation activities	723	1166	61%	292	551	89%
F - Construction	8150	7800	-4%	4597	5128	12%
G - Wholesale and retail trade; repair of motor vehicles and motor cycles	16103	18587	15%	9475	10009	6%
H - Transportation and storage	4658	3976	-15%	4789	4280	-11%
I - Accommodation and food service activities	3392	5573	64%	1614	1769	10%
J - Information and communication	1376	1835	33%	142	337	137%
K - Financial Institutions	3562	2207	-38%	1443	951	-34%
L - Renting, buying and selling of real estate	1433	1448	1%	549	701	28%
M - Consultancy, research and other specialized business services	8730	12741	46%	2434	3783	55%
N - Renting and leasing of tangible goods and other business support services	6464	7721	19%	1407	1401	0%
O - Public administration, public services and compulsory social security	12894	13273	3%	3618	3767	4%
P - Education	14293	16391	15%	4122	4053	-2%
Q - Human health and social work activities	23938	34087	42%	10319	12597	22%
R - Culture, sports and recreation	2004	3185	59%	459	1126	145%
S - Other service activities	3001	2895	-4%	1347	1685	25%
Total	138496	159366	15%	64536	67271	4%

Table 5: Growth of each sector during my study period (2004-2018) in the parts of the province that have been branded as shrinking areas and those that have not.

4.3 Statistical analysis

4.3.1 Descriptive statistics

The descriptive statistics of my variables in table 6 show that my sample has a mean log of jobs of 4.25. The mean log of population size is 6.13 and the mean population growth rate for the entire province is 0.01%. The mean of ageing is 7.78% for the province and the mean value for the urbanization category is 4.36. Table 7 provides an overview of the number of observations and the mean values of my dependent and independent variables per municipality. The municipalities are those existing as of 1 january 2018 in the province of Groningen. In the years prior to 2018, several smaller municipalities have been merged into a few larger municipalities, namely Oldambt, Midden-Groningen and Westerwolde. To create uniformity in my sample, I've merged those smaller municipalities into their 2018 combination municipality for the years prior to their merger. The number of neighborhood-year combinations differs a lot per municipality, with (the city of) Groningen having the most with more than 900 observations, followed by the merger municipalities of Westerwolde (814), Midden-Groningen (783) and Oldambt (678). Pekela and Appingedam have the least observations with 70 and 84 respectively. This difference originates primarily from administrative choices of municipalities that determine the number of neighborhoods in a municipality. I observe that Groningen has the most jobs per neighborhood with a mean log of 5.93, followed by Appingedam with a mean log of 5.62. Eemsmond has the lowest mean log of jobs of 3.18, followed by Westerwolde with a mean log of 3.31. Groningen also has the largest mean log of population size per neighborhood with 7.17, followed by Pekela with 6.83. The unweighted mean population growth rate is the largest for Leek, with 10.27%, followed by Groningen with 7.45%. The municipalities with the lowest unweighted mean PGR's are Delfzijl (-0.92%) and Loppersum (-0.76%). The municipality with the largest unweighted mean of ageing is Haren with 12.42%, followed by De Marne with 11.16%. The lowest unweighted means of ageing are found in Groningen (3.98%) and Pekela (4.79%). I knew from my GIS analysis that most of the province is not or barely urbanized except for the city of Groningen and this shows from the mean values for Urbanization. Groningen has the lowest (which implies more urbanized) mean value with 2.22, which stands out from the rest of the municipalities. The municipality with the second lowest mean value is Midden-Groningen with 3.98. There are three municipalities which have the maximum value (5) as mean value for urbanization: De Marne, Grootegast and Loppersum. Looking at the mean values, it appears as if more jobs and a larger population size go hand in hand, but this relationship is less clear for the population growth rate, ageing and urbanization.

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
log_WPFT	7,139	4.254148	1.831717	0	8.325548
log_PS	7,139	6.125703	1.36248	2.995732	8.836374
PGR	7,139	.001045	.0695068	-.25	.3870968
AGEING	7,139	.077832	.0863888	0	.3846154
URB1	7,139	.0683569	.2523751	0	1
URB2	7,139	.0465051	.2105911	0	1
URB3	7,139	.0617734	.2407603	0	1
URB4	7,139	.1022552	.3030049	0	1
URB5	7,139	.7211094	.448485	0	1

Table 6: This table reports the number of observations, mean, standard deviation and minimum and maximum values of variables. The sample period is from 2004 to 2018. Definitions of variables are reported in chapter 3.

Municipality	*N*	*log_WPFT*	*log_PS*	*PGR*	*AGEING*	*URB*
Appingedam	84	5.619887	6.640612	0.0111859	0.079718	4.166667
Bedum	112	3.866106	5.964783	0.0008408	0.0753598	4.875
De Marne	381	3.403624	5.379996	0.0007326	0.111616	5
Delfzijl	340	4.244087	6.063328	-0.0092207	0.0799622	4.711765
Eemsmond	351	3.184995	5.497358	-0.0031701	0.0822823	4.960114
Groningen	905	5.933881	7.168125	0.0745454	0.0398337	2.223204
Grootegast	224	4.348786	6.314251	0.0000652	0.0547697	5
Haren	196	4.755294	5.934044	-0.0001249	0.1242168	4.714286
Leek	342	3.996171	5.719387	0.1027969	0.0825893	4.71345
Loppersum	306	3.41438	5.665945	-0.007651	0.0807782	5
Marum	210	3.592547	5.877075	-0.0009109	0.0683804	4.933333
Midden-Groningen	783	4.606179	6.365282	0.0133604	0.0805971	3.983397
Oldambt	678	3.99552	5.998974	0.0006359	0.0923726	4.641593
Pekela	70	4.867041	6.834087	0.0221046	0.0479347	4.8
Stadskanaal	378	4.835253	6.734416	-0.0022473	0.0684664	4.259259
Ten Boer	168	3.436183	5.540633	-0.0033126	0.0809052	4.916667
Veendam	238	5.315976	6.764803	-0.0032019	0.0630267	4.117647
Westerwolde	814	3.30709	5.46409	0.0134944	0.109291	4.965602
Winsum	279	3.941999	6.006589	-0.0019951	0.0777424	4.749104
Zuidhorn	280	3.805257	6.064425	0.0131095	0.0667707	4.9
Total	7139	4.25673	6.12035	0.017021	0.0793713	4.361255

Table 7: This table reports the number of observations and the mean values of log_WPFT, log_PS, PGR, AGEING and URB per country.

4.3.2 Regression results

Using a linear regression approach, I find a significant correlation for all of my main independent variables. The results are presented in table 8. I first regress my independent variables on the (log of the) total number of jobs in model 1. Population size is positively correlated with a coefficient of 0.041, which is significant at the 1% level. This implies that for

every 1% increase in the population size, the number of jobs increases by 0.041%. I can therefor accept hypothesis 1a: population size has a positive effect on job development. Population growth rate is negatively correlated with a coefficient of -0.154, which is significant at the 5% level. This implies that for every 1-point increase in the PGR, the log of jobs decreases by 15.4%. A 1-point increase in the PGR implies a 100% increase, which is a very abnormal situation, so I could also assume that a 1% increase in the PGR implies a decrease of log of jobs of 0.154%. I therefore must reject hypothesis 2a, the population growth rate does not positively influence the development of jobs and accept hypothesis 2b. This might either be because of the negative aspects of growth, like congestion and criminality, but this would not make much sense in my study area. Looking at this coefficient from the inverse perspective however, a negative coefficient also implies that when the local population growth rate is negative, the number of jobs goes up. Perhaps this is because an area with a faster declining population has lower land prices than an area with a less fast declining population, therefor making it cheaper to expand operations there (Feng et al., 2018). Ageing is positively correlated with a coefficient of 0.484, which is significant at the 1% level. This implies that for every 1-point (or 100%) increase in the share of the population older than 65, the log of jobs increases by 48.4%, or for every 1% increase in ageing, the log of jobs increases by 0.484%. I therefore have to reject hypothesis 3a and accept hypothesis 3b as ageing has a positive effect on job development.

The urbanization dummies are all positively and significantly correlated with the number of jobs. For the first urbanization dummy, which captures the effect of very strong urbanization on the development of jobs, we observe a strong coefficient of 2.695, which is significant at the 1% level. For the second urbanization dummy, which captures the effect of strong urbanization on the development of jobs, we observe an also strong coefficient of 2.164, which is also significant at the 1% level. The first and second urbanization categories are almost exclusively located in the city of Groningen and could therefor also be interpreted as a dummy for the city of Groningen. For the third urbanization dummy, capturing the effect of moderate urbanization, the coefficient is 1.909 which is also significant at the 1% level. The fourth urbanization dummy, which captures the effect of being barely urbanized, the coefficient is 2.070, which is equally significant at the 1% level. Third and fourth urbanization category neighborhoods are mostly local centers, and can therefore be also interpreted as a dummy for such places. The fifth urbanization dummy is used as reference category and therefore has a coefficient of zero. These results indicate that the higher the level of urbanization is, the higher the number of jobs, with especially the highest level of urbanization being correlated very

strongly with job development. I can therefor accept hypothesis 4a and reject hypothesis 4b: urbanization has a positive effect on job development.

In model 2 and 3, I test the effect of my independent variables on the (log of the) number of jobs in the 'nurturing economy' and 'value-adding economy' respectively to see whether a difference exists between these two groups of sectors. While the significance and direction of the correlations is the same as in model 1 for both groups, the strength of the correlations does differ slightly. The coefficients of population size are stronger for the two groups than that for the total number of jobs, with the value-adding economy having the strongest coefficient. This suggests that jobs of both these groups of sectors are more influenced by a larger population than the total amount of jobs. As the effect of population size on the value-adding economy is stronger than on the nurturing economy, I must reject hypothesis 5. An explanation might be that the positive effects of labor supply for the value-adding economy are stronger than the local demand factors for the nurturing economy. I also observe that the coefficient of PGR is less strong in model 2 than in model 1, while it is larger in model 3. Following my earlier explaining of the negative PGR coefficient, I could argue that the value-adding economy sectors are more focused on physical production, an activity that is more land intensive than average. Therefore, these sectors might react stronger to lower land prices than average. Activities of the nurturing economy sectors are on the other hand generally less land intensive than average, therefore explaining their smaller than average coefficient.

I furthermore observe that the effect of ageing is stronger in model 2 than in model 1, while it is less strong in model 3. This implies that the nurturing economy benefits more from an older population, which might be due to, for example, the larger demand for health care that an older population causes. I finally observe that the coefficient for my urbanization variable in model 2 doesn't diverge much from that in model 1, but the coefficient in model 3 is 20% less strong. This can probably be explained due to the nature of activities in the value-added economy sector group. Especially the manufacturing sector requires a lot of space for its production, which are therefore automatically located away from more urbanized areas in order to save costs on the price of land.

	1	*2*	*3*
log_PS	0.041***	0.065***	0.085***
	[0.015]	[0.017]	[0.021]
PGR	-0.154**	-0.137*	-0.164
	[0.068]	[0.082]	[0.103]
AGEING	0.484***	0.540***	0.429***
	[0.063]	[0.074]	[0.089]
URB1	2.695***	2.654***	2.056***
	[0.228]	[0.221]	[0.240]
URB2	2.164***	2.007***	1.283***
	[0.267]	[0.259]	[0.281]
URB3	1.909***	1.745***	1.512***
	[0.225]	[0.218]	[0.237]
URB4	2.070***	1.958***	1.898***
	[0.193]	[0.188]	[0.206]
URB5	0.000	0.000	0.000
	[.]	[.]	[.]
Constant	3.328***	2.389***	1.507***
	[0.110]	[0.119]	[0.141]
Observations	7139	6917	6365

Table 8: This table presents the results of the linear panel data regression. The log of the number of jobs is used as dependent variable. Column (1) reports the results of the regression with the total number of jobs as dependent variable. Column (2) and (3) report the results of the regressions with the log of number of jobs in the 'nurturing economy' and 'value-adding economy' as dependent variables respectively. The number of observations in model 2 and 3 differs from that in model 1 as neighborhoods that do not have any employment in the nurturing or value-adding economy are omitted in the respective models. Standard errors are provided in parentheses, ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

Chapter 5: Conclusion

This research investigated whether the characteristics of shrinking areas influence the development of the local labor market within them. I also wanted to discover whether negative stereotypes about these areas were true. Are jobs disappearing in these areas and will we see the emergence of second-class citizens there?

After my analysis, I can conclude that this is not the case. While there is a difference between the shrinking areas and non-shrinking areas, this is a difference in by how much jobs have grown during my study period and not a difference between negative and positive development. The number of jobs increased by 4% in shrinking areas, compared to 15% in non-shrinking areas. Some sectors (the information & communication sector and the culture, sports & recreation sector) even grew more in the shrinking areas than in the non-shrinking areas. The difference in the strength of the growth between shrinking and non-shrinking areas can however be linked to characteristics of shrinking areas. I found that population size is positively correlated with the number of jobs in a neighborhood, so the number of jobs is lower in areas with a lower population size. As the shrinking areas have generally more neighborhoods that have declined in population size than non-shrinking areas, this might have reduced the growth of the number of jobs there. I can also connect my finding that economic activity is not disappearing in shrinking areas with the evolutionary approach to location choice theory, which prescribes that the older a firm is, the more embedded it will be in its environment. This increases relocation costs and thus, the stronger the push and pull factors need to be in order to make firm relocate (Brouwer et al., 2004). As the relationship between population size and number of jobs was significant, but had a quite small coefficient, I could argue that the effect is not large enough to form a push factor that makes firms leave the shrinking area *en masse*.

One finding that was opposite of what I expected was the coefficient for the population growth rate, which was negative. While I did formulate a line of reasoning in my hypothesis building for a negative PGR coefficient, I expected that if I found this to be true, the coefficient for population size would also be negative. In my line of reasoning, a stronger PGR would accelerate the effects of a larger population size, so therefor, I would expect both coefficients to have the same direction. The negative coefficient for PGR could be caused by the anticipating effect that PGR has on land prices (Feng et al., 2018), but as land prices itself were not part of my research, this deserves to be investigated in future research. One characteristic of shrinking areas that actually has a positive influence on the number of jobs is ageing. The strong coefficient of 0.484 for the total number of jobs and even stronger coefficient for the nurturing sector confirm my hypotheses that an older population positively influences the job market

through, possibly, the higher demand for health care and leisure services like restaurants and hotels. Finally, I find that the level of urbanization also strongly influences the number of jobs in a neighborhood. I therefor confirm that theories of agglomeration that predict the clustering of economic activity and growth of the economy of cities through the upward spiral of benefits that this agglomeration brings (McCann, 2013). My suggestions for future research would be to focus on the influence of shrinking areas on the relocation movements of firms, which I had no data on. Research could also focus on diving deeper into the relationships between specific demands associated with an ageing population and the effect this has on a regional economy.

Finally, I would like to conclude with the notion that regional labor markets appear to be more resilient to the characteristics of shrinking than what one would expect based on the prevailing sentiment towards these regions in media coverages. My research gives no indication that these areas are soon-to-be economical cold spots. So, maybe it's time to reconsider these stereotypes?

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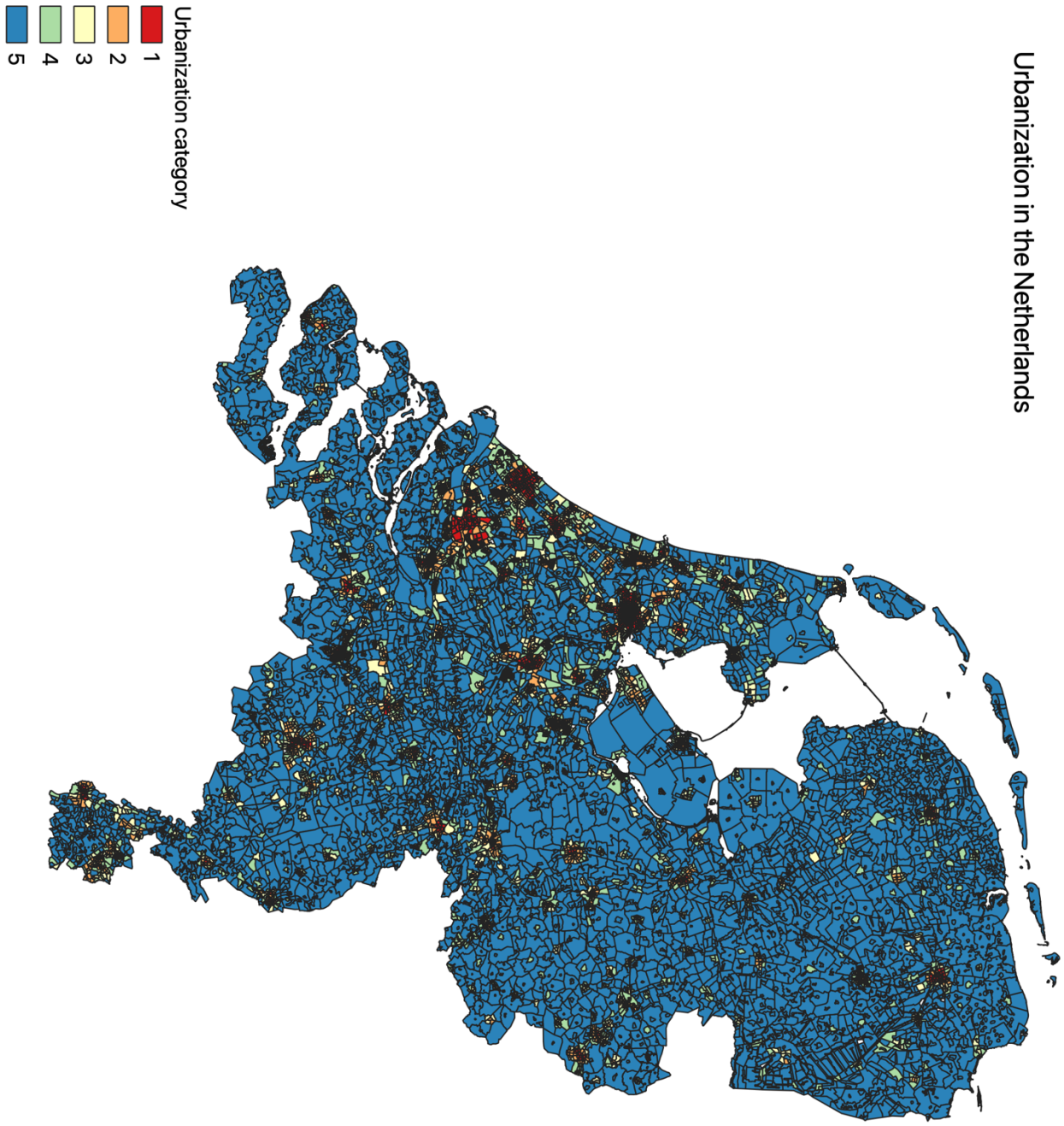
Appendix


Urbanization in the Netherlands
Urbanization category
1
2
3
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