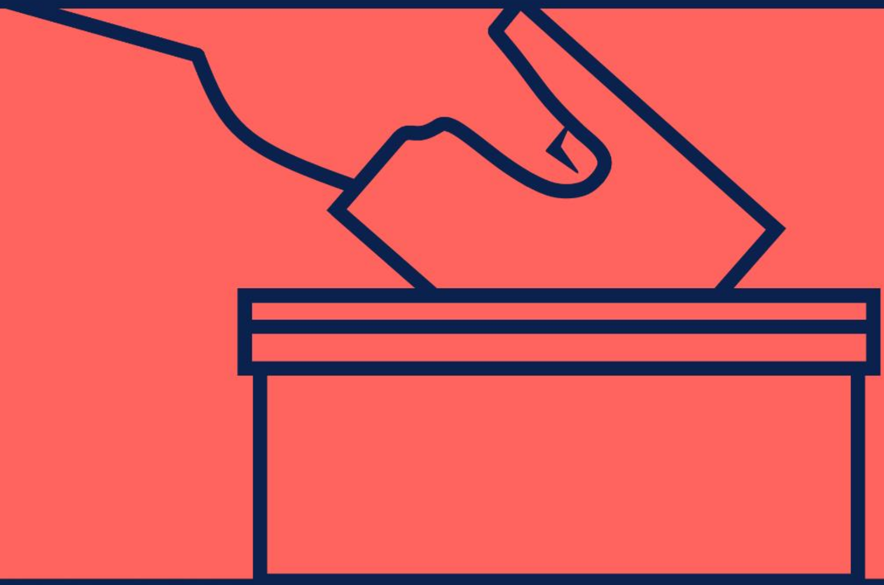

A STUDY ABOUT THE GRONINGEN COUNTRYSIDE

BEYOND THE BALLOT BOX

HOW POPULATION DECLINE IMPACTS VOTING BEHAVIOUR

MASTER THESIS BY XANDER MEIJER

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Master Program: Population Studies

Course: Master thesis

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Handed in: June 19th 2024

Words: 19937

Abstract

Rural municipalities in the province of Groningen are currently experiencing population decline, primarily due to migration towards the city of Groningen and low levels of natural increase within the province. This population decline can negatively impact economic stability, reduce the availability of amenities, and weaken social networks. These adverse effects can foster feelings of abandonment by national or local governments. Lack of trust can lead to rising levels of right-wing, left-wing and localist voting behaviour. Previous research has found no correlation between population decline and populist voting behaviour. This thesis investigates whether this findings is true for Groningen's countryside using a quantitative study. The results indicate that population decline does not significantly correlate with populist or localist voting behaviour, aligning with findings of previous research. However, the effects of population decline on the demographic structure, economic situation, and social networks can influence voting behaviour.

Keywords*: Population decline, Groningen, Electoral analysis, Urbanisation*

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1 Introduction

In 2022, a report published by CBS revealed that 54 municipalities in the Netherlands are expected to experience a decline in population from 2022 to 2035 (see Figure 1). Despite an overall projected population growth of 8%, De Jong et al. (2022) still anticipated a decline during the same period. Groningen Province is one of the regions where most municipalities are projected to face population decline in the next fifteen years. The only municipality in this region projected to have population growth between 2022 and 2035 is Groningen Municipality (see Figure 1). The COROP spatial level shows that the two COROP regions projected to face the most population decline between 2022 and 2035 are located in Groningen province (De Jong et al., 2022). Therefore the Groningen countryside presents an intriguing case study concerning population decline.

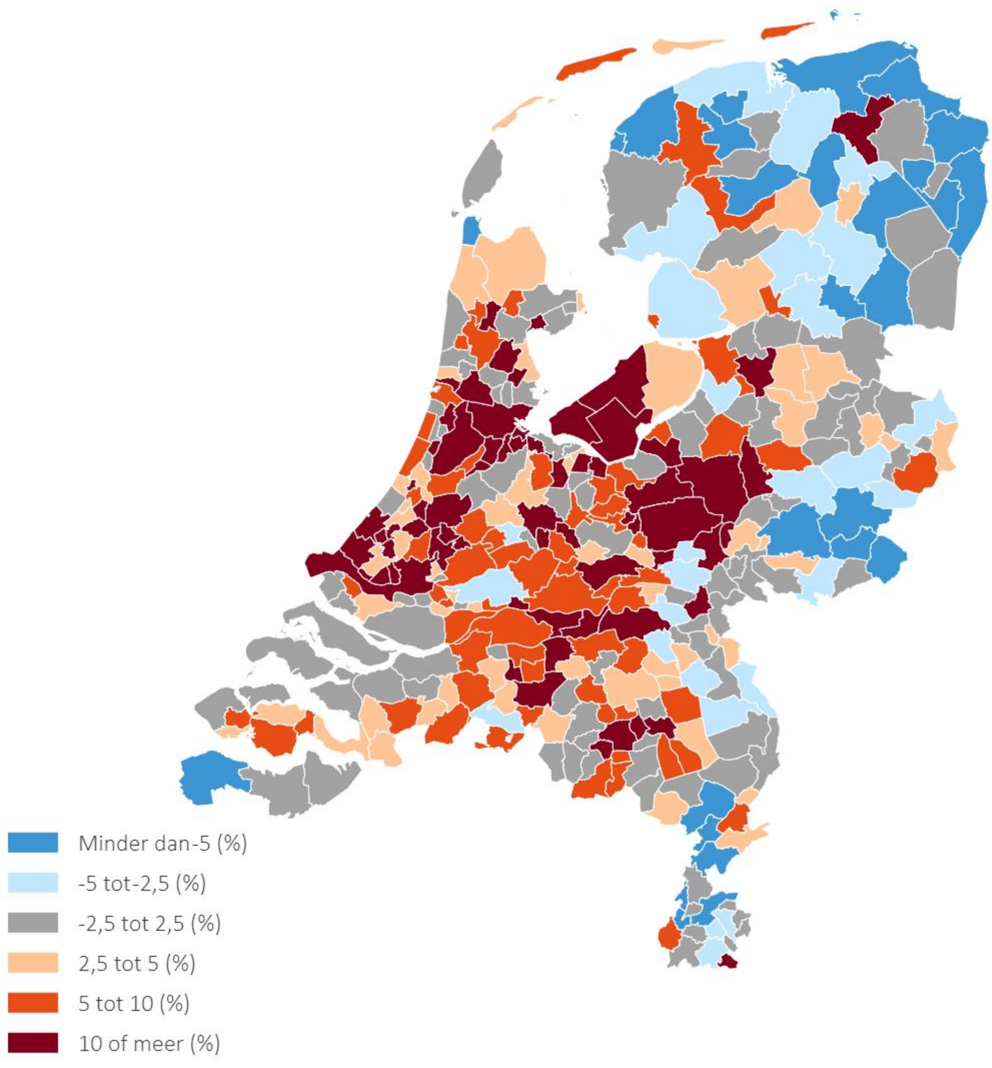

Figure 1: Projected population change per municipality in the Netherlands between 2022 and 2035 (De Jong et al., 2022).

The population decline in Groningen Province that took place from 2002 until 2022 mirrors this pattern (see Figure 2). Over this period, most municipalities experienced population decline, except for Westerkwartier, Westerwolde and Groningen. Notably, Groningen Municipality saw relatively large population growth compared to the other municipalities (CBS, 2024a). On the contrary, population decline was particularly pronounced in Northern and Eastern Groningen (CBS, 2024a).

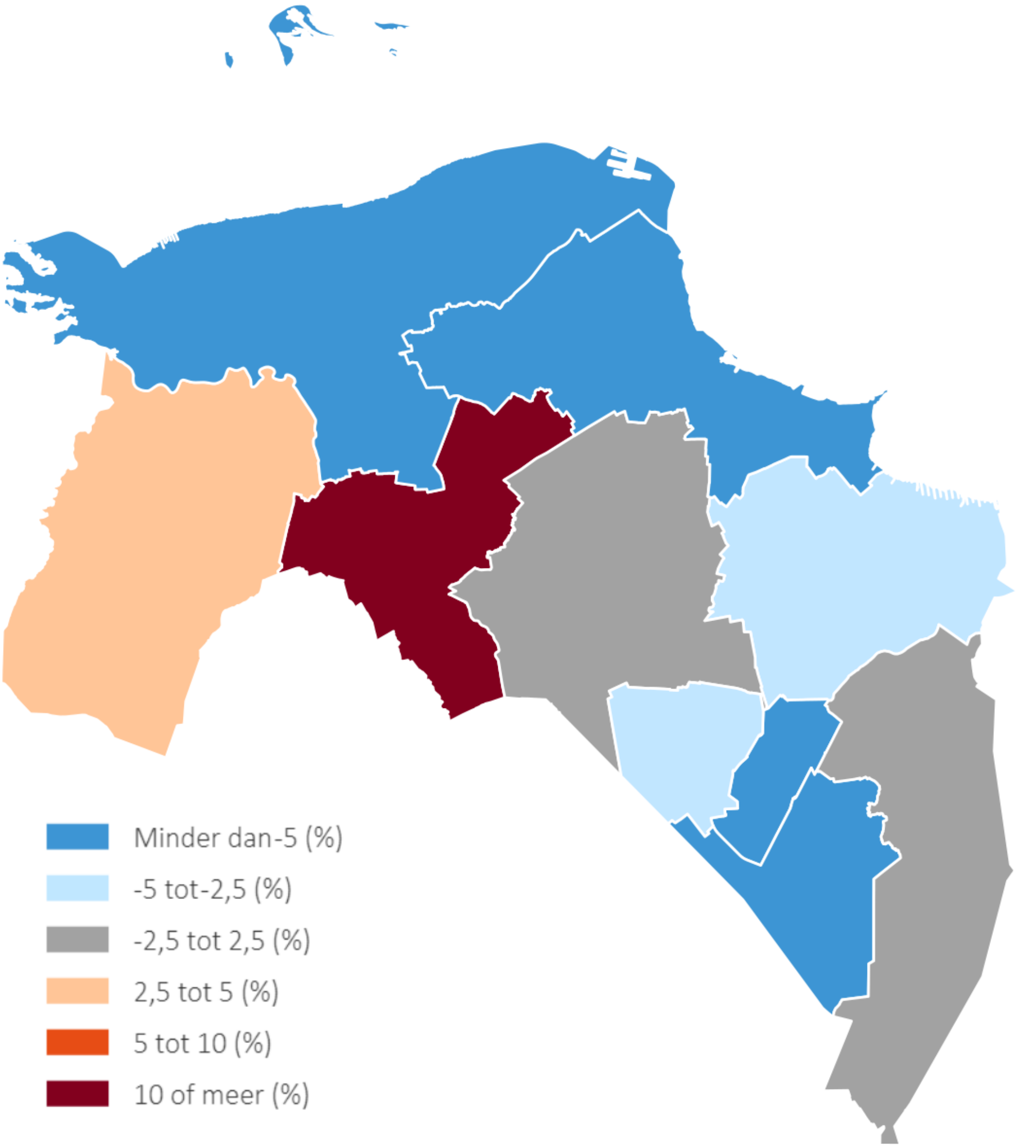

Figure 2: Population decline per municipality in Groningen Province between 2002 and 2022. (Constructed by author, using data from CBS, 2024a)

Research by Bulder (2018), shows that population decline appears in two ways: decline due to natural factors and decline due to migration. Both forms of decline have different effects on the demographic composition of a region. Migratory population decline mostly concerns the loss of younger individuals (Serow, 1996), whereas natural population decline, mostly concerns the loss of seniors (CBS, 2024b). Therefore, it is important to consider these different forms of population decline. In Groningen province, natural population decline mostly occurs in the COROP regions of Eastern Groningen and Delfzijl and Surroundings, while migratory population decline primarily affects Rest of Groningen (excluding Groningen Municipality) and Delfzijl and Surroundings (see Table 1).

	Natural population change	Net migration	Total population change
Groningen Municipality	7,2%	18,2%	25,9%
Rest of Groningen (Excluding Groningen Municipality	2,0%	-0,5%	1,5%
Delfzijl and Suroundings	-1,8%	-3,4%	-5,2%
Eastern-Groningen	-5,9%	2,0%	-3,5%

Table 1: Population decline over the past twenty years per COROP (2002-2022) (Groningen municipality subtracted from Rest of Groningen due to contrast between the two) (CBS, 2024b).

Thus, the Groningen countryside presents an intriguing case study of population decline. Population decline can lead to economic problems (Martinez-Fernandez et al., 2012), issues within one's social circle (Bulder, 2018), and limitations in the availability of amenities (Elshof et al., 2014). It can also bring demographic transformations, as those who emigrate tend to be younger individuals (Bulder, 2018). The effects of population decline can lead to feelings of inequality, making people in these areas feel abandoned by the national government (Ubarevičienė et al., 2016).

In recent years, Groningen Province has witnessed the rise of newer political parties, which are often classified as populist (De Voogd & Cuperus, 2021). These parties gain support from rural areas, particularly Northern and Eastern Groningen (De Voogd & Cuperus, 2021). These regions align with those that experienced population decline in Groningen Province (CBS, 2024a). On the other hand, the growing Groningen City favours green and progressive parties (De Voogd & Cuperus, 2021). The 2023 provincial elections illustrate this urban-rural divide, with the 'Boer Burger Beweging' (A ruralist party) securing the largest vote share in rural municipalities but only obtaining 11% of the vote in the urban Groningen Municipality (Kiesraad, n.d.). This suggests a potential correlation between demographic trends and voting behaviour.

Van Leeuwen et al. (2020) researched the correlation between population decline and populism in the Netherlands. They found that areas experiencing population decline did not exhibit a significant increase in support for populist parties. They drew this conclusion from the fact that the Netherlands has comparatively lower levels of population decline than other European countries. Given the higher levels of population decline in Groningen's countryside compared to other regions in the Netherlands, it is possible that population decline could correlate significantly with voting behaviour in this area. Thus the main research question of this thesis is:

To what extent is there a relationship between local population decline and voting behaviour in the Groningen countryside?

The sub-questions of this thesis are:

1. *How are voting patterns spatially distributed in the countryside of the province of Groningen?*
2. *How is population decline spatially distributed in the countryside of the province of Groningen?*
3. *To what extent do the demographic effects of population decline correlate with voting behaviour?*
4. *To what extent do the economic effects of population decline correlate with voting behaviour?*
5. *To what extent do the social effects of population decline correlate with voting behaviour?*

6. *To what extent do the effects of population decline on the availability of amenities correlate with voting behaviour?*

Firstly, this thesis discusses the theoretical framework. This section starts by explaining the relevant theories concerning the concept of population decline and its drivers. Subsequently, a literature review delves into the theories and concepts related to the effects of population decline and voting behaviour. Secondly, a conceptual model is presented, based on the previously discussed literature review. Next, the research design of the thesis is outlined. Following this, the results of the analysis are presented and subsequently discussed. Lastly, the thesis concludes with a summary and reflection, including recommendations for future research.

2 Theoretical Framework

This chapter outlines the theoretical underpinnings of this research. It begins with an exploration of the causes of population decline in Groningen Province, drawing on relevant theories and concepts. Following this, the effects of population decline are examined. These effects are then linked to potential voting behaviours that may arise as a result. The ideologies associated with these behaviours are subsequently defined. The theoretical framework concludes with the presentation of a conceptual model and the hypotheses of this thesis.

2.1 Theories of population decline

Population decline is a complex phenomenon characterised by a diverse range of causes, varying considerably across different regions (Hoekstra et al., 2020). This decline is influenced by both natural and migratory population change (Bulder, 2018). In the context of Groningen, both factors contribute to the population decline observed in rural areas. Different theories help to understand natural and migratory population change.

Natural change refers to the difference between the number of births and deaths in a population. A prominent theory explaining natural population change is the demographic transition model (Bulder, 2018). This theory describes the shift from high birth and death rates to low rates, ultimately resulting in low or negative natural population change (Thompson & Roberge, 2015; Bulder, 2018). In Groningen's countryside, natural population growth has either stagnated or turned into decline, indicating that the Groningen countryside has entered the final phase of this transition (CBS 2024b; Thompson & Roberge, 2015). The predominant factor contributing to natural population decline is the relatively older population compared to Groningen City, due to the relocation of younger individuals to the city (Bulder, 2018). Therefore natural population decline cannot be viewed separately from migration.

Migration, the other main component of population change, aligns with migration patterns described by Ravenstein (1885). Ravenstein observed that individuals tend to move from rural areas to urban centres, known as centres of absorption. This phenomenon, termed urbanization, is explained by various theories (Geyer et al., 1996; Rees et al., 2017). Geyer et al. (1996) propose that once cities reach an advanced level of urbanisation, counter-urbanisation occurs, leading people to move from urban to rural areas. Rees et al. (2017) modify this theory by introducing additional possibilities for highly urbanised countries, including continued urbanisation, re-urbanisation, and dynamic equilibrium. Groningen Province is still undergoing the process of urbanisation, as people continue to leave the countryside for Groningen City (Latten et al., 2008; Van Wissen, 2009; Bulder, 2018).

Education plays a crucial role in the urbanisation of Groningen Province (Latten et al., 2008; Van Wissen, 2009). Groningen's status as an educational hub, home to the largest university in the north of the Netherlands, attracts individuals with high levels of education (Latten et al., 2008). These individuals do not only come from Groningen Province but also from neighbouring provinces such as Drenthe and Friesland (Latten et al., 2008). After completing their education, most of these individuals move to the Randstad, positioning Groningen City as an "escalator city" (Latten et al., 2008). An escalator city is best defined as a place where individuals come to acquire intellectual capital before moving elsewhere (Latten et al., 2008). Consequently, there is a noticeable concentration of individuals aged eighteen to twenty-five in Groningen City, emphasising the disparity between the city and the countryside.

2.2 Effects of population decline on the local population

Regional population decline poses significant challenges for the affected regions, impacting their inhabitants in various ways. These challenges can be economic, social, or related to the availability of amenities. This segment explores these different challenges in detail.

2.2.1 The economic side of population decline

Areas undergoing population decline are often seen as the "losing side" of economic globalisation (Martinez-Fernandez et al., 2012). This phenomenon arises from the concentration of production and consumption in well-connected and desirable locations, leading to the growth of urban centres as hubs of economic activity (Martinez-Fernandez et al., 2012). Conversely, rural regions that do not partake in this economic transition face population decline, and subsequent economic challenges (Martinez-Fernandez et al., 2012). Economic decline due to population decline is particularly difficult to counter in economically liberal countries such as the Netherlands, where market forces dominate the economy (Kirkpatrick & Smith, 2011; Hoekstra et al., 2020).

One of the sectors of the economy most affected by population decline is the housing market (Hoekstra, 2020). In regions with declining populations, low demand for housing drives prices down, potentially leading to the demolition of vacant or unwanted homes (Vermeulen & Rouwendal, 2007; Haartsen & Venhorst, 2009). These demolitions can constrain the housing opportunities for low-income residents (Schilling & Logan, 2008). Current policies in the Netherlands that aim to combat population decline, demolish these dwellings for low-income groups, while constructing new dwellings for more affluent individuals (Hoekstra, 2020). Therefore, population decline can exacerbate (spatial) inequality. Disparities in population change between regions, one experiencing decline while another grows, further contribute to this inequality (Dax & Fischer, 2018).

Employment opportunities diminish in regions facing population decline, often accompanied by shifts in the economic importance of various sectors (Aldrian, Fließer & Egger, 2022). The agricultural sector, for example, continues to lose its significance, along with industrial sectors, such as mining (Martinez-Fernandez et al., 2012; Aldrian, Fließer & Egger, 2022). The loss of these sectors, results in a significant reduction in employment opportunities in regions facing population decline, which is often coupled with the decline of essential services such as food retailers, doctors' practices, and primary schools (Wiesinger, 2003). This leads to increased poverty for those left behind (Wiesinger, 2003).

2.2.2 The impact of population decline on the availability of amenities

Amenities are features of a community that provide benefits or utility to residents (Kolodinsky, et al., 2013). They are crucial for quality of life, and their availability affects the spatial distribution of households and businesses, as well as welfare (Luger, 1996). Amenities include grocery stores, education and employment opportunities, healthcare providers, childcare services, retail services, entertainment, and natural surroundings and recreation (Kolodinsky, et al., 2013). The availability of amenities plays a crucial role in providing a sense of liveability (Allen, Haarhoff & Beattie, 2018). They also play an important role in revenue generation (VanderLeeuw & Sides, 2016), housing prices (McCord et al., 2018), employment (Carlino & Saiz, 2019), and wages (Hong, 2011). Beyond their economic impact, the availability of amenities also influences one's social circle. They function as social spaces (Reezigt, Rekers, Spithoff, 2019), and greater availability of amenities is associated with lower levels of loneliness (Choi & Ailshire, 2022).

Different age groups utilise different types of amenities. Seniors are a key demographic group in regions facing population decline, as younger individuals are often the ones who leave (Latten et al., 2008; Van

Wissen, 2009; Bulder, 2018). Seniors have distinct needs, making them particularly reliant on amenities (Bulder, 2018). Public transport, health care and leisure amenities are especially important for seniors (Machon et al., 2020; Zhang, Loo & Wang, 2021). Proximity to green spaces and leisure facilities is crucial for the physical activity and social lives of seniors (Machon et al., 2020). Due to the importance of amenities, seniors often cluster around them (Bulder, 2018). Since seniors require more care than younger age groups, there is an increased need for care facilities, due to the ageing population (Verwest & Van Dam, 2010).

Population decline is problematic for this demographic group, as it can lead to the disappearance of facilities and services, thereby decreasing the liveability in the area (Haartsen & Venhorst, 2009). An ageing population negatively impacts the labour force (Krueger, 2017). These labour shortages can eventually lead to the closing or merging of hospitals, further affecting the availability of these crucial facilities (Zorgvisie, 2008; Verwest & Van Dam, 2010).

Besides seniors, it is also important to consider other age groups. For parents, amenities related to their children are crucial (Hoover-Dempsey & Sandler, 1997). Parents value recreational, public transport, shopping, banking, educational, social and cultural, and childcare facilities amenities (Cryer & Burchinal, 1997; Witten, Exeter & Field, 2003). Population decline can cause educational facilities such as schools to have difficulty sustaining themselves due to declining student numbers (Rekers-Mombarg & Hulshof, 2017). While this does not affect their academic achievements, it does impact students' social lives (Rekers-Mombarg & Hulshof, 2017; Aldrian et al., 2022). This is especially problematic since schools also function as social spaces (Allan & Catts, 2014). Children in areas experiencing population decline often fear switching schools and complain about having fewer classmates, which limits their potential for friendships (Rekers-Mombarg & Hulshof, 2017).

The disappearance of childcare facilities due to population decline is also concerning. Childcare facilities promote children's physical, cognitive, and social development (Park & Lee, 2019). The availability of childcare supports healthy behaviour, reducing the risk of childhood obesity (Swyden et al., 2017). Childcare can also help close the academic achievement gap between disadvantaged and advantaged children (Geoffroy et al, 2010). High levels of childcare availability are linked to higher labour force participation for mothers (Givord & Marbot, 2015). Thus, the lower availability of Childcare facilities negatively impacts both parents and children.

For adolescents, key amenities include public transport (Glendinning et al., 2003), cultural, consumption, and educational facilities (Jacob, McCall & Strange, 2017). Consumption spaces and cultural facilities are considered leisure facilities (Edington, 2006; Karsten, Kamphuis & Remeijnse, 2015). Leisure facilities contribute to happiness, community liveability, and environmental protection (Edington, 2006). Due to population decline, these leisure facilities often have fewer guests, which can eventually lead to their closure (Government of the Netherlands, n.d.), negatively affecting the quality of life for nearby residents.

Public transport facilities are particularly important for adolescents, as most do not own a car (Elshof et al., 2014). Public transport is their main method of travel for longer distances, such as commuting to school or work (Glendinning et al., 2003). In areas experiencing population decline, public transport facilities often deteriorate, making it increasingly difficult for residents without a car to travel longer distances (Elshof et al., 2014).

2.2.3 The social side of population decline

Social connections are crucial for both psychological (Kawachi & Berkman, 2001) and physical well-being (Wilkinson et al., 2019). Population decline can shrink these social circles as friends, family, and neighbours move away (Bulder, 2018). The deterioration of social networks is linked to loneliness (Stokes, 1985), which in turn is linked to depression and anxiety (Lim et al., 2016). Therefore, the strain on social connections due to population decline is a concern.

Seniors are particularly susceptible to loneliness, as their children often have moved out, and some have lost their partners (Verwest & Van Dam, 2010). In Groningen's countryside, 29% of seniors live in single-person households, a percentage that increases with age (CBS, 2024a). A case study in Finsterwolde (Eastern Groningen) shows that 30% of seniors have no (grand)children living nearby, and 20% do not have frequent contact with them (Bulder, 2018). Parents without contact with their children experience more loneliness (Pinquart, 2003).

In the Netherlands, much of the care for seniors relies on their social networks (Thissen, 2011), often provided by children and grandchildren who assist with practical and emotional issues (Bulder, 2018). Professionals are often called upon to address practical issues, making seniors somewhat resilient to problems with these types of problems (Bulder, 2018). The lack of emotional support, however, can deteriorate one's mental health (Strine et al., 2008). Low contact with children is associated with increased depressive symptoms for older parents (Buber & Engelhardt, 2008), making loneliness a concern for seniors in areas facing population decline.

The disappearance of amenities can also increase loneliness (Rekers-Mombarg & Hulshof, 2017; Reezigt, Rekers, Spithoff, 2019). Some amenities function as social spaces and their disappearance can lead to deteriorating social networks (Choi & Ailshire, 2022). For primary school students, having fewer potential friends due to population decline can result in smaller social networks, increasing feelings of loneliness (Rekers-Mombarg & Hulshof, 2017).

2.2.4 Differences between natural and migratory population decline

The two different forms of population decline, natural and migratory, have distinct effects on the demographic composition of the population. Natural population decline primarily involves the loss of seniors (CBS, 2024b), while migratory decline primarily involves the departure of younger individuals (Serow, 1996).

These two forms of population decline, therefore have different impacts on the areas where they occur. Since seniors are often retired, natural population decline does not significantly affect the job market (CBS, 2023a). In contrast, migratory decline, which mostly involves the departure of working-age individuals strains the labour force. As most businesses are run by working-aged individuals (Kamer van Koophandel, 2023), their departure can result in fewer potential entrepreneurs combined with a reduced workforce, which in turn can impact the availability of amenities in a region (Krueger, 2017).

Seniors are relatively more reliant on amenities than younger age groups, creating a greater imbalance between the supply and demand of amenities' services (Bulder, 2018). Therefore, it is reasonable to assume that migratory population decline has a greater impact on the economic situation and the availability of amenities in a region compared to natural population decline.

However, younger age groups are more likely to experience loneliness than older age groups (CBS, 2022). Consequently, migratory decline, which results in the departure of younger people, can therefore decrease the total level of loneliness. Conversely, migratory population decline can exacerbate feelings of loneliness among seniors, as members of their social circle might move away (Bulder, 2018). Therefore it is difficult to determine which form of population decline affects loneliness more.

Taking all this into account, it can be assumed that migratory population decline plays a larger role than natural population decline in the negative effects experienced by individuals due to population decline.

2.2.5 Population decline as self-reinforcing effect

Elshof et al. (2014) describe population decline as a self-reinforcing process, based on two key assumptions. The first is that population changes lead to transformations within the affected areas. The second is that these transformations cause further migration away from these areas, creating a downward spiral of population decline (Elshof et al., 2014).

This downward spiral is evident in the three previously identified effects of population decline. Firstly, economic disparities between regions tend to attract labourers from poorer areas to wealthier ones, thereby boosting the economies of the richer regions, while worsening the economic decline in poorer regions (Puga, 2010). Secondly, the availability of amenities is a crucial factor motivating people to move to regions where there are more amenities (Carlino & Saiz, 2019). As population decline reduces the availability of amenities, this also creates a downward spiral (Haartsen & Venhorst, 2009). Lastly, to combat social isolation, some individuals choose to relocate (Boyd et al., 2021). However, this can further increase loneliness as population decline increases social isolation (Bulder, 2018).

2.3 Political landscape of the Netherlands

Population decline has many effects, such as those identified in the previous segment. It is therefore important to examine how these different effects can influence voting behaviour. These effects potentially lead to three different voting patterns, right-wing populism, left-wing populism, and localism (Van Leeuwen et al., 2020; De Voogd & Cuperus, 2021). These three voting patterns are discussed in this segment, in combination with the different effects influencing them.

The Dutch political landscape is one of the most diverse landscapes in the European Union, with 15 different parties that are represented in the House of Representatives (Parlement, n.d.). Besides these parties, there are also regional parties that are represented in the different provinces (De Voogd & Cuperus, 2021). These different parties often target specific groups, which causes spatial voting patterns to emerge.

2.3.1 Right-wing and left-wing populism

The first two ideologies identified as potential outcomes of population decline are right-wing and left-wing populism. The concept of populism is defined by Canovan (1999) as an appeal to "the people" against the established power structures and the prevailing ideas and values of society. Vossen (2012) notes that populists often criticise the elite, accusing them of prioritising their interests over those of the people. This anti-elitism is a key component of populism (Belanger & Aarts, 2006). Additionally, populist parties often have strong and personalistic leaders (Mudde, 2007). Schumacher and Rooduijn (2013) identify two distinct strands of populism active in the Netherlands: right-wing populism and left-wing populism.

While both right- and left-wing populism share a common opposition to the elite and established power structures, they are distinct ideologies. Right-wing populist parties focus on the perceived threat of immigration, while left-wing populist parties primarily oppose the capitalist system and bureaucracy (Van Leeuwen et al., 2020).

In the Netherlands, right-wing populist parties include the Party for Freedom (PVV), Forum for Democracy (FVD), JA21, and the Farmers Citizens Movement (BBB) (De Voogd & Cuperus, 2021). Conversely, left-wing populist parties include the Socialist Party (SP), the Party for the Animals (PvdD), DENK, and Bij1 (De Voogd & Cuperus, 2021).

Populist parties attract diverse communities with varying characteristics. Several effects of population decline identified in the prior segment influence the number of votes for populist parties. Three main effects of population decline, economic, social and the availability of amenities, each impact populist voting behaviour.

Firstly, the economic impact of population decline serves as an indicator of populist voting behaviour (Van Leeuwen et al., 2020). Regions with low employment levels tend to vote more for populist parties than areas with higher employment levels (De Voogd & Cuperus, 2021). This suggests, that worsening employment due to population decline can influence populist voting behaviour. Regions with relatively more low-income households are also more likely to vote for populist parties (De Voogd & Cuperus, 2021). Economic decline due to population decline can thus influence populist voting behaviour. Economic aspects of population decline can also foster distrust towards the government.

For example, low housing demand can leave people unable to sell their homes, making them feel “locked in” (Van Leeuwen et al., 2020). This distrust is further reinforced by increased spatial inequality (Lynch et al., 2022). Those affected by economic issues may be drawn to populist parties on both the left and the right (Ellinas, 2008). However, factors linked to economic decline are more likely to increase support for right-wing populist parties than left-wing populist parties (Lynch et al., 2022).

Secondly, the availability of amenities influences populist voting behaviour. De Voogd & Cuperus (2021) state that the loss of amenities can cause feelings of despair and democratic abandonment, feeling abandoned by their leaders. The perceived liveability of an area is also impacted by the disappearance of amenities (Allen, Haarhoff & Beattie, 2018), which is linked to feelings of discontent and distrust in the government (De Voogd & Cuperus, 2021). This societal discontent is linked to increased populist and Eurosceptic voting behaviour (Van Leeuwen et al., 2020).

Lastly, the social effect of population decline, particularly loneliness, influences populist voting. Loneliness is associated with greater political disengagement (Alexander Langenkamp, 2021). It can foster anger towards traditional politicians and parties, boosting support for populist parties (Lynch et al., 2022).

Lynch et al. (2022) propose the social identity theory, to explain the connection between loneliness and populism, suggesting that humans have a desire to belong to groups, This desire is exploited by populist parties, who convince individuals that they are part of “the people” fighting against “the elites”, indicating that people who do not have strong social networks are more susceptible to populist messaging (Lynch et al., 2022).

Lynch et al. (2022) found that loneliness has a greater impact on populist voting behaviour than economic and cultural factors. He stated that social and economic factors are not mutually exclusive, but interconnected. Loneliness can stem from economic hardship (Lempers, Clark-Lempers & Simons, 1989), or the loss of social spaces (Bolet, 2021). Right-wing populist parties are expected to benefit more from loneliness, as those who feel their social status is threatened are more likely to develop hostility towards outgroups, such as immigrants (Lubbers & Scheepers, 2000).

Demographic changes resulting from population decline also influence populist voting behaviour. The ageing, a consequence of this demographic shift, tends to lead to fewer votes for populist parties since seniors generally prefer traditional parties (De Voogd & Cuperus, 2021). Therefore, the demographic changes associated with population decline could potentially reduce the number of votes for populist parties.

2.3.2 Localism

Besides populism, localism is another voting response linked to feelings of government neglect (De Voogd & Cuperus, 2021). This suggests that the identified aspects of population decline also influence the number of votes for localist parties. This can be seen during regional elections since populist parties perform worse in regions with strong regional parties such as Groningen (De Voogd & Cuperus, 2021).

Localist parties can be characterised as parties that focus on regional concerns. In Groningen Province, there are two active local parties, Groninger Interests (GB) and the Party of the North (PvhN) (De Voogd & Cuperus).

2.3.3 Difference between regional and national elections

In the Netherlands, there are five distinct administrative levels, each with its own elections: provincial, national, water authority, municipal, and European (Overheid, 2010). The two elections with the highest turnout are the national and provincial elections, which are the focus of this thesis (De Voogd & Cuperus, 2021). Both national and provincial elections occur every four years, although the interval between national elections can vary if a snap election is called (Overheid, 2010).

During national elections, voters elect the House of Representatives (Overheid, 2010). Provincial elections, on the other hand, elect the provincial councils, which in turn elect the Senate (Overheid, 2010). Therefore, the provincial councils and the Senate's composition influence voters' decisions on which party to support.

In the most recent provincial election, three key voting motivations were identified. About one-third of voters indicated their vote was driven solely by national political issues (NOS, 2023). Conversely, only one-fifth of voters cited provincial factors as their primary motivation (NOS, 2023). This highlights the dominance of national issues during provincial elections, as reflected in the similar voting patterns observed between the national and provincial elections (De Voogd & Cuperus, 2021).

Additionally, provincial elections typically have a lower voter turnout (De Voogd & Cuperus, 2021), which benefits parties with loyal voters. The Christian parties, namely the Reformed Party (SGP) and the Christian Union (CU), tend to perform well in these lower-turnout elections, including provincial elections (De Voogd & Cuperus, 2021). Furthermore, regional parties, which are present during provincial elections, tend to perform well in Groningen Province (De Voogd & Cuperus, 2021). The presence of these local parties and the lower turnout negatively impact populist parties during regional elections (De Voogd & Cuperus, 2021). Consequently, the populist vote share can be smaller in provincial elections compared to national elections.

2.4 Conceptual model

Using the theoretical framework, a conceptual model has been constructed to explain how the relevant concepts interact to address the main research question: To what extent is there a relationship between local population decline and voting behaviour in the Groningen countryside? The conceptual model serves as a guide through the remainder of the thesis. The constructed model is presented in Figure 3.

The conceptual model is framed within a box that represents the regional context of Groningen Province, taking into account its unique political and social circumstances. The human-induced earthquakes are one of the most notable examples of the Groningen context (De Voogd & Cuperus, 2021).

At the top of the model are concepts related to population decline. The two components of population decline are the migratory component (Ravenstein, 1885) and the natural component (Bulder, 2018). Together, these components create the total population decline.

The literature review identifies three primary impacts of population decline.

1. Economic implications: These include financial problems individuals face due to population decline (Martines-Fernandez et al., 2012).
2. Availability of amenities: Population decline can lead to the disappearance of amenities (Bulder, 2012). The disappearance of amenities can impact both the economic situation (Hong, 2011; VanderLeeuw & Sides, 2016; McCord et al., 2018; Carlino & Saiz, 2019) and social circles (Choi & Ailshire, 2022).
3. Social impact: This refers to the challenges within social networks resulting from population decline, particularly focusing on population decline (Rekers-Mombarg & Hulshof, 2017).

Additionally, there is a demographic transformation associated with population decline, primarily the ageing of the population (Bulder, 2018). This demographic shift also affects voting behaviour (De Voogd & Cuperus, 2021).

Three distinct voting patterns can be affected by the impacts of population decline: right-wing populism, left-wing populism (Van Leeuwen et al., 2020), and localism (De Voogd & Cuperus, 2021). Changes in demographic composition can further influence the support for these parties (De Voogd & Cuperus, 2021).

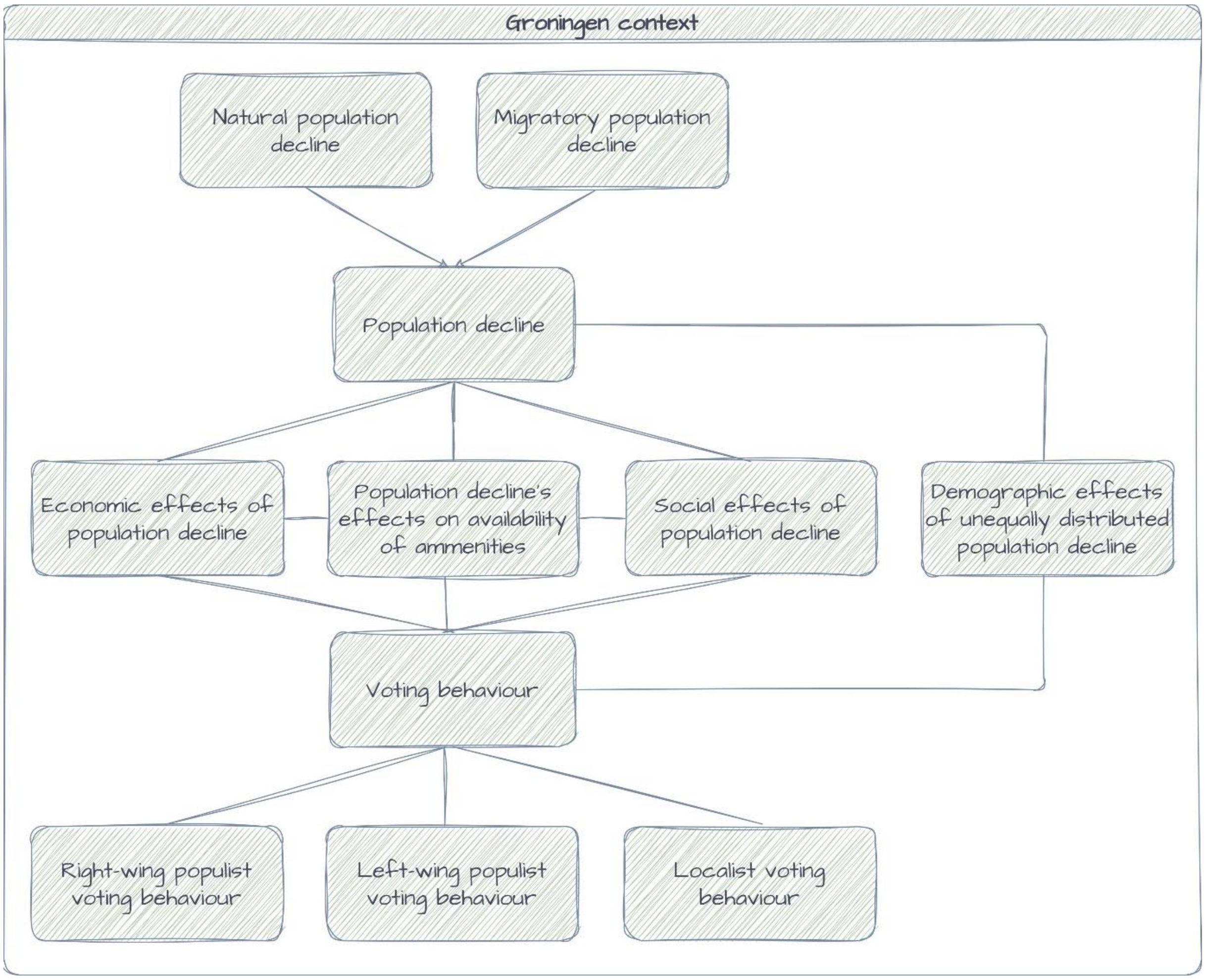

Figure 3: Conceptual model (Constructed by author)

2.5 Hypotheses

In this thesis, the following hypotheses are tested:

Hypothesis 1: High levels of total population decline correlate significantly with the percentage of votes for right-wing populist parties.

Hypothesis 2: High levels of total population decline correlate significantly with the percentage of votes for left-wing populist parties.

Hypothesis 3: High levels of natural population decline do not correlate significantly with the percentage of votes for right-wing, left-wing or localist parties.

Hypothesis 4: High levels of migratory population decline correlate significantly with the percentage of votes for right-wing populist parties.

Hypothesis 5: High levels of migratory population decline correlate significantly with the percentage of votes for left-wing populist parties.

3 Research Design

3.1 Research Area

To answer the research question a case study is conducted. The case study focuses on the countryside of the province of Groningen situated in the north of the Netherlands (See Figure 4). The province of Groningen has approximately 600.000 inhabitants (CBS, 2024a). Therefore Groningen is one of the country's most sparsely populated provinces (CBS, 2024a). The population of the province is predominantly centred in the municipality of Groningen, which is home to approximately 200.000 inhabitants (CBS, 2024a). As previously noted, the demographic distribution within Groningen exhibits significant disparities. The rural areas of the province have an average senior citizen population of approximately 25% (CBS, 2024a), in contrast to Groningen City, where the corresponding figure averages around 15% (CBS, 2024a). Conversely, a contrasting pattern emerges when looking at the junior population. Roughly 35% of Groningen city's populace falls below the age of 25, compared to approximately 25% within the countryside (CBS, 2024a). This demographic divergence, as delineated in the literature framework, is anticipated to persist. Within the rural regions of Groningen, the demographic composition predominantly consists of individuals of European origin, with the proportion of individuals originating from outside Europe ranging between 5% and 12% (VZinfo, 2024). In stark contrast, within Groningen city, the percentage of individuals either born or possessing a parent born outside of Europe stands at 17% (VZinfo, 2024). In the province of Groningen, a discernible distinction in the sex ratio does not appear to exist, given that the number of males is approximately equivalent to that of females (CBS, 2024a).

Figure 4: Case study area located on a map of the Netherlands (Constructed by Author)

The interplay of demographic disparities coupled with the prevailing cultural climate has significantly shaped the political landscape of the province. This difference within the province especially manifests itself between the urban and rural parts of the province (De Voogd & Cuperus, 2021). The city of

Groningen wields substantial influence within the province because they have roughly one-third of the provincial population (CBS, 2024a). This influence is visible in the electoral outcomes of recent elections. In the ten most recent regional and national elections the prevailing party of the city has also emerged victorious in the province (Kiesraad, n.d.). Although in many of the older elections the countryside and city aligned with their results, more recent elections show that the victors solely emerged from Groningen City (Kiesraad, n.d.).

The political landscape in the city is dominated by progressive and left-wing parties, together with poor performances for right-wing populist parties (Kiesraad, n.d.). Within the countryside, there are divisions present as well. In the western parts of the province, predominantly Christian parties tend to garner support, indicating a notable religious demographic (Kiesraad, n.d.). In contrast, the eastern part of Groningen province favours populist parties, backing both right and left-wing populist parties (Kiesraad, n.d.). Over the past half-decade, the schism between urban and rural areas has widened, propelled by mounting support for populist parties in Eastern Groningen while concurrently witnessing an increase in support for progressive parties in the city of Groningen (Kiesraad, n.d.).

In the province of Groningen, earthquakes play a significant role in the political process (De Voogd & Cuperus, 2021). Earthquakes take place around the municipality of Eemsdelta (See Figure 5). These earthquakes can severely impact one’s mental health (van der Voort & Vanclay, 2014), economic situation (Stroebe et al., 2019) or damage buildings (Postmes et al., 2020). Therefore these effects could also possibly influence voting behaviour. As can be seen on the map, the Earthquakes have less effect in the city than in the countryside.

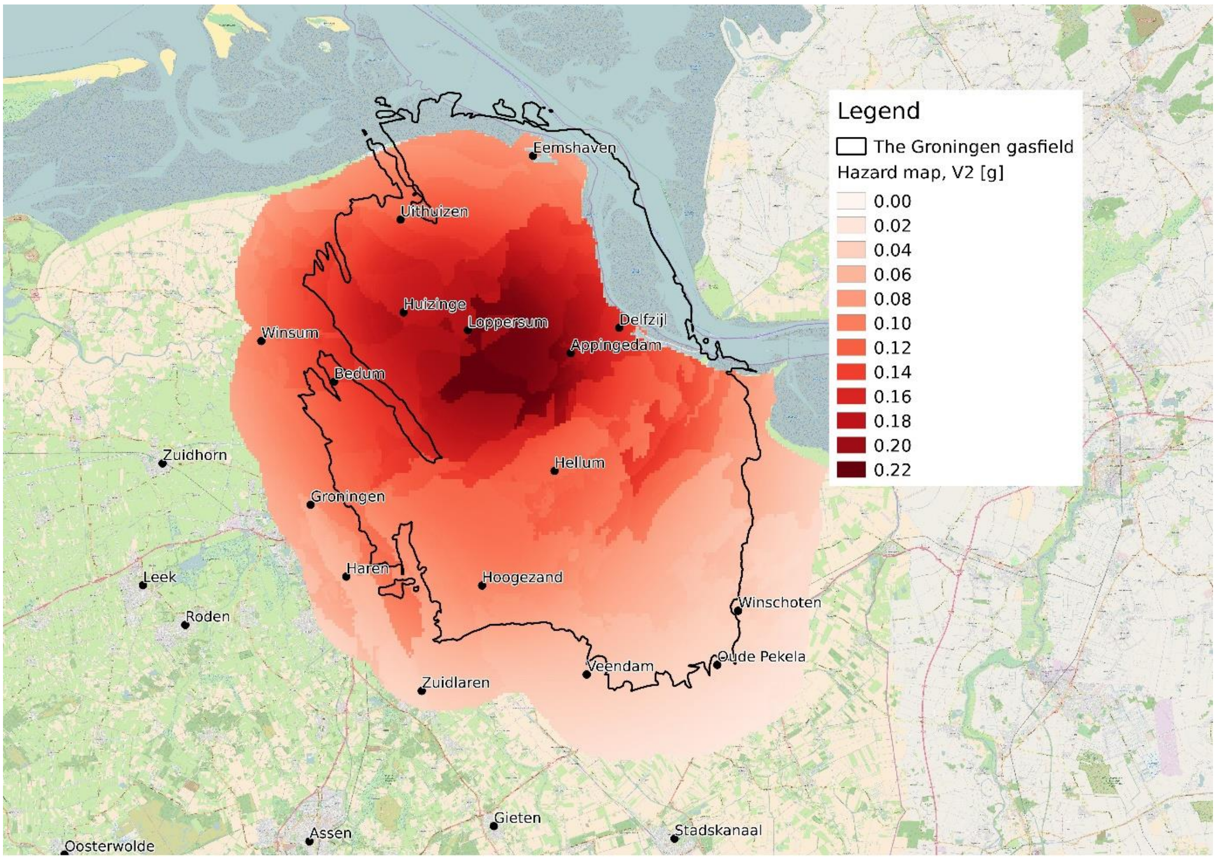

Figure 5: Earthquake risk in Groningen (KNMI, 2016)

This difference can be seen in the amount of damage claims per inhabitant (See Figure 6). This map shows that the earthquake problems are specifically present in similar areas to the high-risk areas in Figure 5.

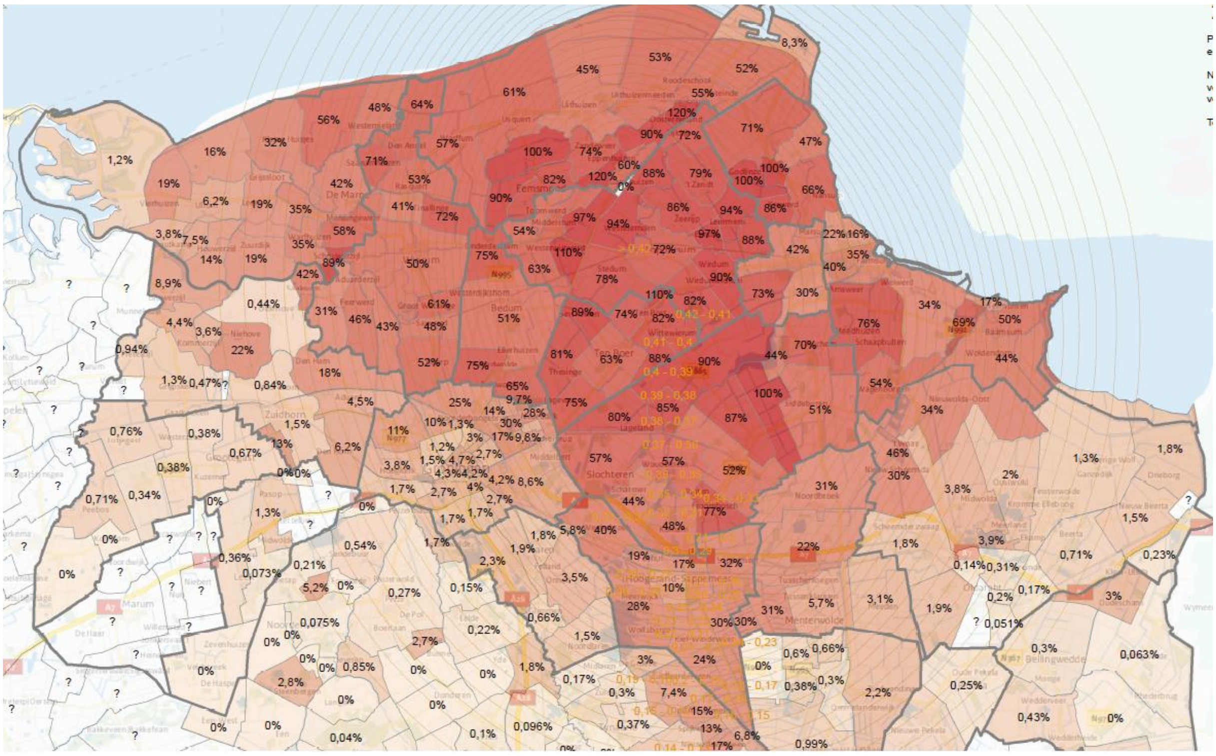

Figure 6: Amount of damage claims per inhabitant due to earthquakes (De Kam, 2016)

Because of these stark differences between the city and the countryside, this thesis solely focuses on the countryside of Groningen.

3.2 Type of Research

To address the primary research question along with its corresponding sub-questions, this thesis uses a quantitative research approach. The data used for this research is collected from population registers. The choice for register-based data means that the population of the case study and the sample are the same. Using register-based data offers several advantages. The information is both accurate and reliable, given it is collected by the government. The coverage of the dataset is complete, making the dataset representative of the region. Additionally, register-based data is consistent, thanks to the standardised processes of the government.

Besides register-based data, this thesis incorporates election results. Election results offer similar advantages to register-based data, as both use population-level data. However, a key distinction is that not everyone participates in elections and that individuals could cast their votes in locations different from their residences.

Hence the study has a quantitative approach. This approach has several advantages. The use of quantitative methods entails the use of objective and measurable data, allowing for statistical testing. Statistic methods facilitate identifying patterns, trends, and relationships. Moreover, a quantitative study allows for replicability. This enables other researchers to validate the study's results by following the methodology of this thesis.

3.3 Dataset design

As stated in the previous chapter, this thesis relies on register-based data. This data is collected from two sources. Demographic, economic, health, and facility availability data are obtained from CBS Statline while voting behaviour data is sourced from the Kiesraad. The chosen elections for this analysis include the national elections of 2015 and 2019, as well as the provincial elections of 2017 and 2021. All CBS Statline data in this dataset is as of January 1st. The specific dataset citations can be found in Table 2 (See chapter 3.4).

The variables for the statistical analysis are derived from the aforementioned datasets. These distinct variables have been organised and categorised according to the literature framework. The designated categories encompass voting behaviour, population change, the Groningen context, demographic effects, economic effects, social effects, and effects on the availability of amenities. To create these variables, Microsoft Excel was used.

3.3.1 Voting behaviour

Voting behaviour is subdivided into three voting patterns derived from the theoretical framework. These voting patterns cover right-wing populism, left-wing populism, and localism. These subdivisions of voting behaviour have been derived from data provided by the Kiesraad. The dataset from the Kiesraad includes raw votes per party per voting booth in Groningen province. To render this data suitable for statistical analysis, it has undergone a transformation process. Initially, the total number of votes per voting booth is determined. Following this, the identification of parties aligning with the aforementioned ideologies is conducted. This categorisation is guided by the literature framework. Parties classified as right-wing populists include the Party of Freedom (PVV), Forum for Democracy (FVD), JA21 and the Farmers Citizens Movement (BBB). Those classified as left-wing populists comprise the Socialist Party (SP), the Party for the Animals (PvdD), DENK and Bij1. Finally, parties characterised as localists encompass the Party of the North (PvhN) and Groninger Interests (GB). Following this categorisation, the raw votes for parties associated with these ideologies are aggregated. This yields the total raw votes per ideology per voting booth.

Given the varied spatial levels in the data used in this thesis, the standardisation of spatial units is necessary. The chosen standard spatial level for this thesis is the four-digit postcode district level. Following this decision, the first four digits of the postcodes for the voting booths were identified. In most cases, the postcode data is incorporated into the voting booth names. In instances where postcode data is not available, online resources such as Google Maps and various news sites that publish election results by precinct have been used. Subsequently, the raw votes for the various ideologies and the total votes within the identified postcode districts were aggregated using the Excel pivot table. This process yielded a dataset displaying the raw votes for each ideology per postcode area. Given the focus on the Groningen countryside of this thesis, postcodes within Groningen City were excluded. The postcode districts featured in this dataset are illustrated in Figure 7. It is important to note that not every postcode district is represented in the dataset. This is the case as not every postcode contains a voting booth for the selected elections. For inclusion in the dataset, a postcode district must have a voting booth for the two selected national elections or the two selected provincial elections. Finally, the raw votes for each ideology were divided by the total votes, transforming the raw counts into percentages. This normalisation levels the playing field across postcode areas, by eliminating the impact of varying population sizes.

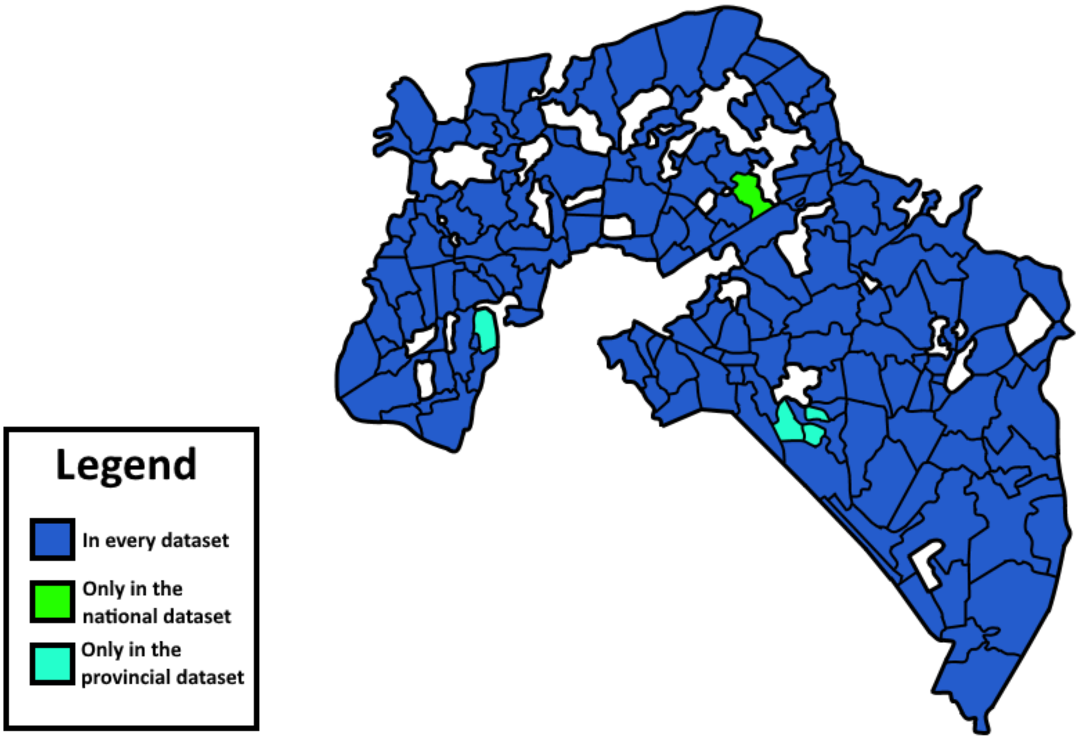

Figure 7: Postcodes included in the dataset (Constructed by author)

3.3.2 Population change

Population change comprises three distinct variables: natural change, migratory change, and overall population change. The data used to create these variables is sourced from various datasets obtained from CBS Statline.

Initially, the population change per postcode district needed to be established. To accomplish this, a dataset containing the total population figures for each postcode in the Netherlands was used. This dataset spans back to 1998. Given that the earliest election occurred in 2015, the timeframe of population change over the past fifteen years is selected. This choice ensures a consistent timeframe for population change across all selected elections. This entails that the population data from the years 2000, 2002, 2004, 2006, 2015, 2017, 2019, and 2021 are used. In the case of the election year 2015, the population data from 2000 serves as the initial population. Similarly, for the 2017 election year, the population data from 2002 is considered the initial population, and so forth. The calculation of population change within the timeframe between these two points involves subtracting the initial population from the final population. This yielded the total population change over the past fifteen years for the selected election years. Ultimately to normalise the data and mitigate the impact of varying population sizes, the population change was divided by the initial population. This process transformed the numerical data into percentages, thereby establishing the variable of population change.

To formulate the variable for natural population change, it is essential to establish the annual births and deaths. To determine the number of individuals born in the past fifteen years, several datasets have been employed. Among these datasets is the core statistics per postcode district dataset. This dataset provides information on the total number of births in postcode districts from 2015 to 2021. However, this dataset is incomplete, with some postcodes having missing data.

To cover the missing information, calculations have been employed. To determine the annual number of individuals born in postcode districts, age-specific birth rates have to be multiplied by age-specific population numbers. The birth rates are utilised, given there are no gender-specific age groups for the age-specific population numbers per postcode district. As there is no available data for age-specific birth rates per postcode district, it becomes necessary to use rates per COROP region. The selection of the COROP region is based on the substantial variations in birth rates among the different COROP regions (CBS, 2024c). The dataset from CBS Statline provides this information, containing the number of births per age group per year for the years 2000 to 2021. The categorised age groups in the dataset are: "Younger than 20, 20 to 25, 25 to 30, 30 to 35, 35 to 40, 40 to 45, and older than 45". In the province of Groningen, the COROP regions consist of Eastern Groningen, Delfzijl and Omgeving, and the Rest of Groningen. Since Groningen City is not included in the dataset, the births in Groningen Municipality are subtracted from the COROP region Rest of Groningen. The figures for Groningen municipality are used, as specific birth numbers for Groningen City are unavailable. This process yields the total number of births per age group annually within the newly established Western Groningen region. Considering that the former Haren and Ten Boer municipalities merged with Groningen Municipality in 2019, their annual births since 2019 are not included in Western Groningen.

To convert the annual births per age group per COROP region into birth rates, it is essential to have population numbers per COROP region. The data from CBS Statline provides the number of inhabitants per COROP region yearly for each life-year spanning from 2000 to 2001. These COROP regions align with those employed for the annual birth statistics. To ensure compatibility between these two datasets, the life-years must be grouped into categories. These age groups mirror those used for the annual birth counts, with the exception that "Younger than 20" is replaced with "15-20" and "Older than 45" is replaced with "45-50". This adjustment has been made due to the majority of these births occurring within these two age groups. Similar to the annual birth statistics, the population of Groningen Municipality has been deducted from the COROP region Rest of Groningen. Consequently, the annual population figures for the former municipalities Haren and Ten Boer after 2019 are not encompassed in the population figures of Western Groningen. This process yields the annual population numbers per COROP region from 2000 to 2021. By dividing the annual births per age group by the corresponding annual population per age group, the annual birth rates for each age group are obtained.

To determine the annual birth numbers per postcode district, the annual age-specific population numbers are required. The dataset from CBS Statline to create the variable population change is also employed here. Identifying the COROP region to which each postcode belongs is achieved using the website "Alle Cijfers". This website provides information on the location of postcode districts and their corresponding municipalities. These municipalities can in turn be connected with specific COROP regions. Utilising this information, the annual age-specific population data is organised into the three selected COROP regions. Subsequently, the annual age-specific population figures per postcode district are multiplied by the corresponding COROP regions' annual age-specific birth rates. This calculation yields the annual birth numbers per age group per postcode district. Finally, to obtain the annual total births per postcode, the figures for the different age groups are summed. These calculated values are assigned to the postcode districts for which birth numbers are not available. This process results in one of the main components of the variable natural population change.

The other main element of this variable is the annual total number of deaths per postcode district. However, there are no mortality statistics available per postcode district available. Similar to the missing annual total birth numbers, calculations are necessary. The methods used to calculate the annual total deaths per postcode district are akin to those employed for calculating the annual total births per postcode district.

To determine the annual total number of deaths per postcode district, the death rate per COROP region is needed. The data collected from CBS Statline is categorised into different age groups, each spanning a time frame of five years. Notable exceptions include the age groups, 0 years old, 1 to 5 years old, and older than 95 years. For compatibility with the annual population per COROP region data, the deaths in age groups 0 years old and 1 to 5 years old are combined. The COROP regions used, align with those employed for the birth rate statistics. This includes deducting Groningen Municipality from the COROP region "Rest of Groningen". As a result, the annual mortality figures for the former municipalities of Haren and Ten Boer after 2019 are not accounted for in the newly created Western Groningen region. This results in the annual death numbers per age group per COROP region. To transform the annual death figures per age group per COROP region into death rates, it is necessary to have the annual population figures per age group per COROP region. To align the age groups, the life years in the annual population figures per life-year were grouped into age groups that correspond to those of the annual death figures per age group per COROP. Subsequently, the annual age-specific death figures were divided by the annual age-specific population figures. This results in the annual age-specific death rates by COROP region.

To convert the spatial level of the annual age-specific death rates by COROP region into postcode districts, the CBS Statline dataset on annual population by age group per postcode district is utilised. The previously established identification of postcode districts and their respective COROP regions is used to align the postcode districts with the annual age-specific death rates of the corresponding COROP regions. Subsequently, the annual age-specific population figures per postcode district were multiplied by the corresponding annual age-specific death rates of the COROP regions. This calculation produces the annual age-specific death figures per postcode district. Finally, to determine the total annual deaths per postcode district, the figures for the various age groups are aggregated.

The creation of these two datasets allows for the establishment of the variable natural population change. As natural population change represents the difference between the number of births and deaths, the total annual deaths per postcode district are subtracted from the total annual births per postcode district. This yields the total annual natural population change per postcode district.

To convert the total annual natural population change per postcode district into natural population change over the past fifteen years per postcode district for the selected election years, it is necessary to define fifteen-year time intervals. These intervals align with the time frames used to construct the variable total population change. This means that, for the election year 2015, the starting point for this time frame is the year 2000. To compute the natural population change over the past fifteen years per postcode district for the selected election years, the annual natural population change per postcode district was aggregated for the specified fifteen-year time intervals. This process produced the total natural population change over the past fifteen years per postcode district for the four selected election years. Finally, to standardise the data and mitigate the impact of varying population sises, the total natural population change was divided by the population at the start of the different fifteen-year periods. This yields the variable "Natural population change over the past fifteen years".

For the final variable of the category population change, net migration over the past fifteen years, no specific data is available. To calculate net migration, two previously generated datasets are necessary. As population change encompasses both natural population change and net migration, the required datasets are the total natural population decline over the past fifteen years per postcode district, and the total population decline over the past fifteen years per postcode district. To derive net migration over the past fifteen years per postcode district for the four selected elections, the total natural population decline over the past fifteen years per postcode district must be subtracted from the total population decline over the same period. To normalise this newly created dataset, the respective datasets are divided by the population at the start of their respective fifteen-year periods. This yields the variable "Net migration over the past fifteen years"

3.3.3 Groningen context

The category Groningen context compromises a single variable: "The number of earthquake damage claims per capita". This variable was selected because earthquakes are a significant aspect of the Groningen context. This variable is derived from the dataset provided by De Kam (2016), which includes the count of earthquake damage claims per person per postcode district. Since this dataset contains the precise data needed, no further transformations are necessary.

3.3.4 Demographic effects

The demographic effects category encompasses the variable “Seniors”, representing the percentage of individuals aged 65 and above per postcode district. Seniors were chosen as a variable of interest due to their importance in the literature framework in discussions about ageing. To construct this variable, the CBS Statline dataset for annual population by age group per postcode district is employed. This dataset provides annual population figures with five-year age groups for the four selected election years per postcode district. In transforming this dataset, the age groups above 65 are aggregated, yielding the total number of seniors per postcode district for the selected election years. To convert the total number of seniors into the percentage of seniors of the total population, the total population for the selected election years is required. Obtaining the total population per postcode district involves summing the corresponding age-specific population data. Finally, the number of seniors per postcode district was divided by the total population per postcode district. This resulted in the variable “Seniors”.

3.3.5 Social effects

Within the social effects category is the variable “Loneliness”, denoting the percentage of individuals who report feeling lonely in a given postcode district. The choice of loneliness as the main independent variable for the social effects aligns with the literature framework, which identifies increased loneliness as the main social impact of population decline. To create the loneliness variable, the dataset from RIVM Statline focusing on health per neighbourhood is necessary. This spatial level is selected due to the unavailability of data on the postcode district level. The loneliness data within this dataset is about the percentage of individuals experiencing loneliness per neighbourhood. As the variable is already expressed in percentages, no further adjustments here are necessary. Notably, the available loneliness data from RIVM Statline pertains only to the years 2012, 2016, 2020, and 2022, which do not align with the selected election years. Consequently, estimations have been created to solve this problem.

For this estimation, linearity for the difference in loneliness between two measuring points in the dataset is assumed. Using this linearity, the loneliness per neighbourhood for the election years 2015, 2017, 2019, and 2021 is estimated. This process involves calculating the difference in loneliness between two of the measuring points of the RIVM Statline dataset. Subsequently, this difference in loneliness is divided by the number of years between the two selected measurement years. This calculation yields the annual increase between two measurement points. This annual increase is used to calculate the percentage of people feeling lonely per neighbourhood for the selected election years. To achieve this, the measurement year that occurred before the election is determined. This is measuring point 2012 for the election in 2015, measuring point 2016 for the elections in 2017 and 2019, and 2020 for the election in 2021. Subsequently, the difference between the selected measuring points and election years is determined. The calculated annual increase corresponding to the measuring points is multiplied by the year difference between the election and the starting point. This value is added to the loneliness percentage at the starting point for the respective elections. This yields the estimations of the percentages of people feeling lonely per neighbourhood per election year.

To convert the dataset from neighbourhood to postcode district level, the population figures for both neighbourhood and postcode districts are required. This data is sourced from two CBS Statline datasets, one providing total population numbers for postcode districts in 2022, and the other providing the same data for neighbourhoods in 2022. Since most postcode districts comprise multiple neighbourhoods, it is essential to have neighbourhood and postcode district population data to determine each neighbourhood’s proportion of the total population within a postcode district. This calculation involves dividing the population of each neighbourhood by the population of the corresponding postcode district. Subsequently, these derived population proportions are multiplied by the loneliness percentages for the four selected election years. The outcomes of these calculations for the neighbourhoods within a specific postcode district are then aggregated, yielding the percentage of individuals experiencing loneliness within that postcode district for the four selected election years.

Before conducting these calculations, it was necessary to match neighbourhoods with their respective postcode districts. This task is facilitated using the website “Alle Cijfers” (n.d.). While most neighbourhoods belong to a single postcode district, some neighbourhoods span multiple postcode districts. These postcode districts particularly concern rural outskirts (“Buitengebieden”), that have relatively few inhabitants. Rural outskirts are not problematic, since they are often the sole neighbourhood within a postcode district, that is present in multiple postcode districts. This implies that the population in the rural outskirts of a postcode district can be determined by deducting the population totals of the remaining neighbourhoods within the same postcode district from the overall postcode of the postcode district. The calculation for the loneliness rates for most postcode districts is therefore relatively certain. However, certain postcode districts cannot be calculated certainly, particularly in the towns of Haren Ter Apel and Ter Apelkanaal. Nonetheless, these issues are relatively minor as the loneliness rates are comparable, and the undetermined population in question for these cases is less than 50. After matching the neighbourhoods with their respective postcode districts and determining their population sizes, the calculations described in the previous paragraph were carried out. This resulted in the variable “Loneliness”.

3.3.6 Economic effects

The economic effects category includes the variables “Low-income” and “Social Security”. “Low-income” represents the percentage of individuals in a postcode district belonging to the 20% of lowest-income households in the Netherlands. “Social security” represents the percentage of individuals in a postcode district who receive social benefits, excluding AOW. These variables are chosen because they are identified in the theoretical framework as effects of population decline. Additionally, employment, vacancy rates, and rent prices are also found to be affected by population decline. However, data for these three variables are not available at the postcode district level.

Both variables are derived from the CBS Statline dataset on core statistics per postcode district. For “Low-income”, the dataset includes the percentage of individuals in a postcode district belonging to the 20% of lowest-income households in the Netherlands. Since this data aligns with the desired format, no transformations of the dataset are required.

For the variable “Social security”, the dataset includes the number of people receiving social benefits (excluding AOW) in a postcode district. To align this data with the desired format, the numbers are converted into percentages by dividing them by the total population numbers in a postcode district. This results in the percentage of individuals that receive social benefits (excluding AOW) in a postcode district.

3.3.7 Effects on the availability of amenities

The category addressing the effects on the availability of amenities includes the variable “Proximity to Amenities” This variable represents an average of the proximities to seven different types of facilities: commercial, public transportation, educational, medical, cultural, culinary, and childcare. These facility types are selected based on the literature framework, which identifies them as being affected by population decline. The variables are merged into one due to concerns about multicollinearity. The data on the average proximity to these different amenities are extracted from the CBS Statline dataset on core statistics per postcode district, which provides information on the proximity of the average resident in a postcode district to various facilities. To construct the “Proximity to facilities” variable, the proximity to each facility type is determined, ensuring equal weighting for each type.

For commercial facilities, the proximity to supermarkets, speciality food stores, and department stores is used from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

For public transport facilities, the proximity to train stations is used from the CBS Statline dataset. Although public transportation includes more facilities than just trains, data for bus stops and other public transportation facilities is not available. Therefore, no transportation is required for this data type.

For educational facilities, the proximity to primary schools, VMBO middle schools, Havo/VWO middle schools, and tertiary educational facilities is utilised from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

For medical facilities, the proximity to general practitioners, central general practitioners, hospitals (excluding policlinics), hospitals (including policlinics), and pharmacies is used from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

For cultural facilities, the proximity to amusement parks, cinemas museums, performing art venues, libraries, skating rinks, music venues, saunas, tanning salons, and swimming pools is used from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

For culinary facilities, the proximity to cafes, cafeterias, hotels, and restaurants is used from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

For childcare facilities, the proximity to daycare centres and school care facilities is used from the CBS Statline dataset. The average distance to each of these facilities is then averaged together.

Finally, the average proximities of these seven facility types are averaged together to yield the main variable "Proximity to Amenities".

3.4 Creation of the shapefile

After constructing variables in the final category of effects on the availability of amenities, the next step involves combining the created variables into a single dataset. This merger is achieved by linking the postcode districts associated with voting behaviour to those linked with the other variables. Microsoft Excel's crosstab function facilitates this process, merging the various variables into one dataset. Postcode districts without voting behaviour are excluded from the final dataset, given that voting behaviour serves as the dependent variable. As a result, four Microsoft Excel datasets are generated, each corresponding to the election years 2015, 2017, 2019, and 2021.

The necessary file format for the spatial analysis is the shapefile. A shapefile is a type of spatial dataset that comprises two main components: locational data and attribute data. Locational data provides details about the geographic positioning of the various cases within the dataset, while attribute data includes information regarding their district characteristics (Anselin, 2020a). In the context of this thesis, the locational data are the postcode districts depicted in Figure 7, while the attribute data encompasses the various variables constructed in this chapter.

To convert the Microsoft Excel datasets into shapefiles, the software ArcGIS Pro is utilised. This program facilitates the linkage between locational data and attribute data. The locational data used in this thesis is extracted from the CBS Statline dataset on core statistics per postcode district in 2021, which includes a shapefile with the outlines of the various postcode districts in the Netherlands with corresponding attribute data. The year 2021 was chosen to standardise the different maps. The borders of postcode districts have remained largely unchanged over the past 20 years, with any alterations primarily affecting uninhabited areas. Therefore utilising the 2021 map for the other election years poses no concerns. Amid the given attribute data, only the four-digit postcode numbers are relevant to this analysis. Therefore only this variable is retained, while the remaining data is removed. This process yields a shapefile with only the different four-digit postcodes as the attribute data. The additional attribute data used in the analysis consists of the Microsoft Excel files that were created.

To construct the required dataset, initially, the various Microsoft Excel datasets were imported using the "add data" function. This function converts the Microsoft Excel datasets into attribute tables. To merge these attribute tables with the base shapefile, the "add join" function is applied. The "add join" function needs a shared identifier between the two datasets, which for these two datasets are the four-digit postcode numbers. Utilising the four-digit postcode numbers as the common identifier, results in the shapefiles of postcode districts in the Netherlands, containing the various variables necessary to address the main research question for the four selected election years.

The newly generated shapefile includes several postcode districts without the required attribute data. Since these postcode districts are not relevant for the analysis, they are removed. This results in a shapefile of postcode districts in the Groningen countryside, encompassing the various variables necessary to address the main research question for the four selected election years. The variables in this newly created dataset can be found in Table 2.

Variable category	Variable name	Description	Datatype	Source
Voting behaviour	Left-wing Populism (%)	Percentage of left-wing populist votes	Ratio	(Kiesraad, 2020a; Kiesraad, 2020b; Kiesraad, 2022; Kiesraad 2023)
Voting behaviour	Right-wing Populism (%)	Percentage of right-wing populist votes	Ratio	(Kiesraad, 2020a; Kiesraad, 2020b; Kiesraad, 2022; Kiesraad 2023)
Voting behaviour	Localism (%)	Percentage of localist votes	Ratio	(Kiesraad, 2020a; Kiesraad, 2020b; Kiesraad, 2022; Kiesraad 2023)
Population change	Population change (%)	Percentage of population change in the past fifteen years	Ratio	(CBS, 2023b)
Population change	Natural population change (%)	Percentage of natural population change in the past fifteen years	Ratio	(CBS; 2023b; CBS, 2024a; CBS, 2024c; CBS, 2024d; CBS, 2024e)
Population change	Net Migration (%)	Percentage of Migratory population change	Ratio	(CBS; 2023b; CBS, 2024a; CBS, 2024c;

		in the past fifteen years		CBS, 2024d; CBS, 2024e)
Groningen context	Earthquake damage claims	Number of earthquake damage claims per capita	Ratio	(De Kam, 2016)
Demographic effects	Seniors (%)	Percentage of seniors in the local population.	Ratio	(CBS, 2023b)
Social effects	Loneliness (%)	Percentage of people that feel lonely in the local population	Ratio	(RIVM, 2023)
Economic effects	Low-income (%)	Percentage of low-income households (Lowest 20%) in the local population	Ratio	(CBS, 2024e)
Economic effects	Social Security (%)	Percentage of people receiving social benefits (excluding AOW) in the local population.	Ratio	(CBS, 2024e)
Effects on the availability of amenities	Proximity to amenities (Km)	Average distance to amenities for the local population.	Ratio	(CBS, 2024e)

Table 2: Variable list

3.5 Limitations of the dataset

In the process of constructing any dataset, certain limitations are inevitably encountered. Some of these constraints have already been discussed in the dataset design section. One of the primary limitations is the availability of data. As previously highlighted, substantial data is lacking at the spatial level of four-digit postcode districts. This limitation applies to various variables, including the different voting behaviour variables, natural and migratory population change, loneliness, economic effects, and the availability of amenities.

Voting behaviour is measured at the level of individual voting booths, meaning that the spatial level is small. Since these voting booths only belong to one postcode district, converting their spatial level into postcode districts is not an issue. However, determining the other variables requires making some assumptions.

For instance, estimating natural population change involved estimating the total birth and mortality figures based on general trends observed in various COROP regions. It is important to note that these estimates may deviate from the actual figures, affecting the variables of natural population change and net migration, which rely on these estimations. Another issue arises with the utilised COROP regions. Specifically, data for the former municipalities Haren and Ten Boer are not integrated into the Western Groningen region after 2019. Consequently, the birth and mortality rates within this region do not fully represent these two areas post-2019.

Due to the lack of data on the different impacts of population decline, the total values of these variables are used. Therefore, these variables do not necessarily reflect the effects of population decline, and significant correlations with these variables do not indicate a relationship with population decline.

Although estimations were not required for the loneliness data, precise data on loneliness rates for certain postcode districts could not be calculated. This occurred due to some neighbourhoods not aligning perfectly with specific postcode district boundaries. The affected postcode districts include Haren (9751, 9752, 9755), Ter Apel (9561), and Ter Apelkanaal (9563). In these districts there exist populations that cannot be assigned to either of the adjacent postcode districts. However, the undetermined populations are relatively small, each comprising fewer than fifty inhabitants.

For the economic effects of population decline, some identified economic effects in the theoretical framework, such as unemployment, vacancy rates, and rent prices are not available at the postcode district level. Regarding the effect on the availability of amenities due to population decline, data is unavailable at the postcode district level for public transportation methods other than trains such as bus stops. Due to difficulties estimating this data, it is not included in the dataset.

Furthermore, some variables face challenges with data availability for specific years. Data derived from the CBS Statline dataset on core statistics per postcode district is provided with a three-year delay, impacting variables within the economic effects and the

effects on the availability of amenities categories. Consequently, data from 2020 has been used instead of 2021 for the variables “Low-income households” and “Proximity to amenities”.

Time-based availability issues also affect the loneliness variable. The datasets for this variable are from 2012, 2016, 2020, and 2022, which do not coincide with the selected election years. Since the selected election tears fall within the range of 2012 to 2022, estimations can be made for the loneliness rates of the selected election years by assuming linearity between the various measurement dates. However, this means that the utilised loneliness rates do not perfectly align with the actual figures.

Apart from data availability issues, the primary limitation of the dataset pertains to the key dependent variables of this study, which are the various types of voting behaviour. The dataset focuses on votes cast within postcode districts rather than votes from the residents of those districts. This choice is made because data on votes from residents per postcode district is unavailable, as voting in the Netherlands is conducted anonymously. This presents a challenge because individuals are not required to vote in their residential postcode district.

One issue with the dependent variables is that not every postcode district in the case study area is represented within the dataset. Out of the total 240 postcode districts in the case study area, only 159 postcode districts have voting booths for the provincial elections, and only 156 postcode districts have voting booths for the national elections. This means that for every five postcode districts in the case study area, two postcode districts are not included in the dataset. The absence of these postcode districts is also evident in Figure 7. Although the populations of the excluded postcode districts are relatively small, the number of postcode districts unaccounted for results in a total of 32.107 inhabitants unaccounted for in 2021 (CBS, 2023b). The excluded 2021 population constitutes 8% of the total population of the case study area (CBS, 2023b). In addition to individuals without voting booths in their postcode districts, those with voting booths in their postcode district could also vote in a postcode district they do not reside in. This suggests that at least 8%, and likely more, of the population have not cast their votes in their residential postcode district.

Since individuals are required to vote in their municipality of residence, the votes of those residing in postcode districts without voting booths are incorporated into the dataset. However, the issue arises when these votes are attributed to postcode districts where these individuals do not reside. Given that the statistical analysis in this thesis associates voting behaviour with the population characteristics of the various postcode districts, this poses potential bias.

Another issue arises with the chosen dependent variables concerning the former municipalities of Haren and Ten Boer. Since 2019, these two municipalities have been incorporated into the municipality of Groningen. Consequently, residents of these areas included in the dataset have the option to vote within Groningen City, and vice versa. The exact number of these crossover votes cannot be determined.

Due to the anonymity of the ballots, it is impossible to determine the turnout levels for the different postcode districts. This is because a sizable number of individuals are unaccounted for, leading to inflated turnout rates for postcode districts adjacent to those without voting booths. The discrepancies are substantial enough that utilising turnout as a variable at this spatial level is not feasible.

3.6 Characteristics of the dataset

To answer the research sub-questions one and two, it is necessary to visualise the characteristics of the main variables in the dataset. Given that the dataset is spatial, the most effective method to accomplish this is through mapping. The software ArcGIS Pro is utilised to map out the characteristics of the dataset. For the first sub question, “How are voting patterns spatially distributed in the countryside of the province of Groningen?” the variables related to voting behaviour are mapped. To address the second research question, “How is population decline spatially distributed in the countryside of the province of Groningen?” the variables related to population decline are mapped. For each variable, four maps are created, one for every selected election year. This approach enables the observation of the variable’s evolution over time and facilitates comparisons between national and provincial elections.

To map out the various variables, the ArcGIS Pro tab symbology is utilised. In this tab, the primary symbology of the shapefile can be set. To show the different values of the dataset the primary symbology “graduate colours” is selected. To create a map showing the values of the different variables, classes have to be defined. Classes are the different categories of value sizes of the different variables. These classes have different labels, indicating which values belong to which class. In this thesis, it has been determined to employ five distinct categories to ensure clarity and ease of understanding in the maps.

The definitions of the classes must remain consistent across the chosen election years. Therefore, it is crucial to consider years with both high and low values for a variable. Across the selected election years, the minimum value of a variable is selected as the lower limit of the categories, while the maximum value of a variable serves as the upper limit. Between these limits, four breakpoints are established based on recommendations from the ArcGIS Pro software. These breakpoints, divide the dataset into five different groups. To pinpoint the exact location of these breakpoints, the recommended values of the four selected election years are averaged, resulting in average breakpoints. These averages are then rounded to the nearest multiple of five. While this approach yields suitable categories for most variables such as population decline and localism, variables such as right-wing populism and left-wing populism show sizable disparities across different election years. Consequently, the classes for these variables are broad across various election years, affecting the clarity of the maps.

Once classes are defined, a layout is generated to enhance the comprehensibility of the map by incorporating attributes. This is achieved through the insertion of elements such as the scale bar, a north arrow, and a legend, using the insert function. Following this, the legend is converted into graphics to improve readability. The conversion enables editing of various aspects of the legend. Next, the labels are rounded up and the titles are changed. Finally, the background colour is altered to ensure the legend stands out from the map. With the maps finalised, they are exported into PNG files. These maps can be found in Figures 8-29.

3.7 Data analysis

After visualising the dataset's characteristics, it is crucial to explore potential correlations among the variables using statistical analysis. This analysis is instrumental in answering research sub-questions three, four, five, and six. In this thesis, the standard level of statistical significance is set at 95%. Additionally, significance levels of 90% and 99% are included in the tables with the results of the analysis, to provide a broader understanding of the significance levels across the different correlations.

In this thesis, the focus is on correlation rather than causation. While correlation and causation can coexist, correlation does not imply causation. Correlation indicates that two variables are related, whereas causation means that changes in one variable directly cause changes in another. Although statistical analysis can identify a correlation between two variables, it is not sufficient to confirm a causal relationship. Establishing causation requires additional steps, such as conducting controlled experiments, to demonstrate that one variable influences the other. Due to the complexity of establishing causality, this thesis concentrates on exploring correlations.

To address the research sub-questions, multiple models have been created. In these models, the dependent variables are the various strands of voting behaviour. For each type of voting behaviour in each election year, four distinct models have been constructed. This implies that there are thirty-two models for the provincial elections and twenty-four models for the national elections.

The initial model examines the correlation between the overall population change and the different strands of voting behaviour for the corresponding election years. Subsequently, the second model subdivides the overall population change into two categories: natural population change and net migration. These initial two models solely explore the correlation between population change and voting behaviour, without considering the broader context of the situation. Models three and four expand on this model, where additional variables related to the effects of population decline are incorporated. These variables encompass aspects specific to the Groningen context, demographic factors, social factors, economic factors, and factors to do with the availability of amenities. Model Three integrates these variables into Model One, whereas Model Four does the same for Model Two. Therefore, model three examines the correlation between overall population change and voting behaviour, while model four assesses the correlation between the two types of population decline and voting behaviour.

Given that the dataset uses postcode districts for cases, there is a possibility that a spatial autocorrelation is present among the variables. Regular statistical tests do not adequately capture this spatial component when testing for correlations. Instead, a spatial regression is necessary when dealing with spatially correlated variables. To assess the presence of spatial correlation within a dataset, and to perform the aforementioned spatial regressions the software GeoDa is utilised. This tool facilitates the examination of correlations among various spatial datasets, including shapefiles.

First, one of the created shapefiles is imported into the GeoDa Software. Once uploaded, a spatial weight is generated for the specific dataset. Spatial weights determine the degree to which different cases influence one another. There are two types of weights: contiguity-based and distance-based. Contiguity-based weights connect cases that share a border (Anselin, 2020b), while distance-based weights link cases that fall within a specified distance from the centre of a case (Anselin, 2020c). Given that the shapefile (See Figure 7) has several missing cases, a distance-based weight is preferred. This approach connects cases with missing data between them, provided they are within the specified distance. The Distance-based weight has several methods, and for this thesis, the "distance band" method was chosen. This function connects cases whose centroids fall within a specified radius (Anselin, 2020c).

To create a spatial weight for the shapefile, the weight creator tool in GeoDa was utilised. Since a distance-based weight was chosen, this option was selected in the menu. Subsequently, the "distance band" method was selected. To establish a specific radius, the "specify bandwidth" function was used to input a manually specified radius. Given that a spatial weight must solely contain cases with connections to other cases, the chosen distance should ensure that every case has at least one neighbour. The minimum distance needed for each election year is approximately 5,6 km. This number is rounded up to 6 km, establishing the radius of the circumference for the distance-based weight.

After creating the spatial weight, regression diagnostics were computed to assess the statistical assumptions necessary for conducting a spatial regression. Regression diagnostics are provided when conducting Ordinary Least Squares (OLS) by selecting the spatial weight in the regression function of GeoDa.

The two main tests that deal with spatial autocorrelation are the spatial error and the spatial lag models. The spatial error model addresses the correlation between error terms across different spatial units (Brown University, n.d). In contrast, the spatial lag model assumes that the dependent variable is influenced by the independent variables of neighbouring units (Brown University, n.d). Since this study is not interested in how the independent variables of one unit affect the dependent variables of neighbouring units, the spatial lag model is irrelevant. Instead, the spatial error model is more appropriate for the dataset.

Since the spatial error test is a form of Ordinary Least Squares (OLS), the assumptions of OLS form the basis for the assumptions of the spatial error test. The distinction between the assumptions of OLS and the spatial error test lies in the assumption that cases must be independent of each other. For the spatial error test, this assumption does not hold, as the presence of spatial autocorrelation implies interconnectedness among cases (Brown University, n.d; Steenbeek & Ruiter, 2021). Therefore, this assumption is replaced with the assumption that the error terms of the dataset are spatially correlated, as this is required for the spatial error test. The assumptions of the spatial error tests and the methods for assessing if these assumptions hold for the dataset are as follows:

Assumption 1: The regression has linearity in its error term and coefficients

Assumption 2: The error term has a mean of zero

Assumption 2, is inherently met by the program due to the inclusion of a constant. This constant ensures the mean is zero, so no additional steps are necessary to satisfy this assumption.

Assumption 3: The error term is spatially autocorrelated

To verify assumption 3, the Moran's I test is necessary. Moran's I is one of the regression diagnostics provided by the GeoDa program when conducting an OLS. For models with an insignificant Moran's I test, a regular OLS is utilised.

Assumption 4: Large outliers are unlikely

Assumption 4 has been met for all the models during the dataset creation process. There are no outliers present in the dataset. This is also evident in Figures 8-29, where the various variables are depicted on maps.

Assumption 5: The error term has a constant variance

Assumption 5 pertains to the presence of heteroskedasticity in the model. This can be evaluated through the Breusch-Pagan and Koenker-Bassett tests. These two tests are part of the regression diagnostics provided by the GeoDa Program. If these two tests yield significant results, it suggests the likely presence of heteroskedasticity in the model. In cases where the two heteroskedasticity tests provide conflicting results, the assumption is made that heteroskedasticity is present, to err on the side of caution.

The presence of spatial autocorrelation can impact the measured levels of heteroskedasticity. Consequently, the heteroskedasticity tests need to be re-evaluated following the spatial regression. GeoDa facilitates this by providing a new Breusch-Pagan test. The results of these tests take precedence for the spatial error models. A violation of assumption 5 leads to problems with efficiency.

To solve problems with heteroskedasticity, several different solutions are possible, such as transforming the data, using robust errors or using alternative analysis techniques. However, since most of the tests contain spatial autocorrelation, these solutions are not viable. Therefore resolving any remaining multicollinearity issue is not feasible.

Assumption 6: The error term has a normal distribution

To evaluate assumption 6, the Jarque-Bera test is utilised. This test is included in the regression diagnostics provided with the OLS. A significant result from the Jarque-Bera test indicates that the error term lacks a normal distribution. The presence of a normal distribution in the error term can affect the outcomes of the tests used for assumptions 3 and 5 (Brown University, n.d). This is the case as violations of assumption 6 lead to problems with efficiency.

Assumption 7: There should be no high dependence between two or more independent variables

Assumption 7 addresses the presence of multicollinearity within the model. This is evaluated using Variance Inflation Factor (VIF) numbers in the STATA software, as the GeoDa program does not provide VIF numbers. Since the multicollinearity test is unaffected by spatial autocorrelation, this does not pose an issue.

To conduct this analysis, the Excel datasets for the different election years are imported into STATA. An OLS regression is then performed using the same model specifications as previously described, followed by the VIF command to obtain the VIF numbers. If any VIF number exceeds 4, it indicates the presence of multicollinearity in the dataset, necessitating corrective measures. Multicollinearity within the dataset leads to issues with efficiency and consistency.

Addressing multicollinearity typically involves removing or adjusting variables in the dataset. Therefore, if any VIF number exceeds 4, corrective measures are taken. Correlation matrices created with STATA are used to identify which independent variables exhibit high interdependence, A decision is then made regarding which variable to retain based on the model's context.

The regression diagnostics calculated for assumptions 2, 5, and 6 can be found in Tables 3-6, and the VIF numbers can be found in Tables 7-10.

After conducting the regression diagnostics, the statistical regressions were performed. The statistical regressions were executed using the regression function. Models with a nonsignificant Moran's I employ the classic model, whereas those with a significant Moran's require the spatial error model. This yields different coefficients and p values, for the correlations between the different independent variables and voting behaviour. Subsequently, the numbers obtained from these tests, have been arranged in tables. One asterisk indicates significance at the 90% level, two asterisks at the 95% level, and three asterisks at the 99% level.

Additionally, the number of cases (N), the constant and for OLS models the R-squared are included. The R-squared is only provided for the OLS. It indicates the proportion of variance in the dependent variable that is explained by the independent variables. While an R-squared-like value is also calculated for the spatial error models, it differs from the traditional R-squared. The R-squared in spatial error models is not considered useful (Anselin & Rey, 2014), so it is omitted from the table. The created tables can be found in Tables 11-14.

4. Results

4.1 Characteristics of the dataset

This chapter presents several maps based on the datasets from 2015, 2017, 2019, and 2021. These maps, align with the sub-questions and illustrate the selected voting patterns and the types of population decline. They visualise the dataset and show how the values of different variables are distributed across the various cases, answering research questions 1 and 2.

The dataset for the provincial elections has 159 cases, while the dataset for the national elections comprises 161 cases. To answer the main research question, it is crucial to map the primary independent variable, population decline.

4.1.1 Population decline

Several patterns emerge when examining the maps concerning population decline (Figures 8-11). While most areas experience population decline, it is particularly pronounced in North Eastern Groningen. Despite the general trend of decline, some regions, notably the town of Haren and certain postcode districts in the municipality Westerkwartier, have population growth

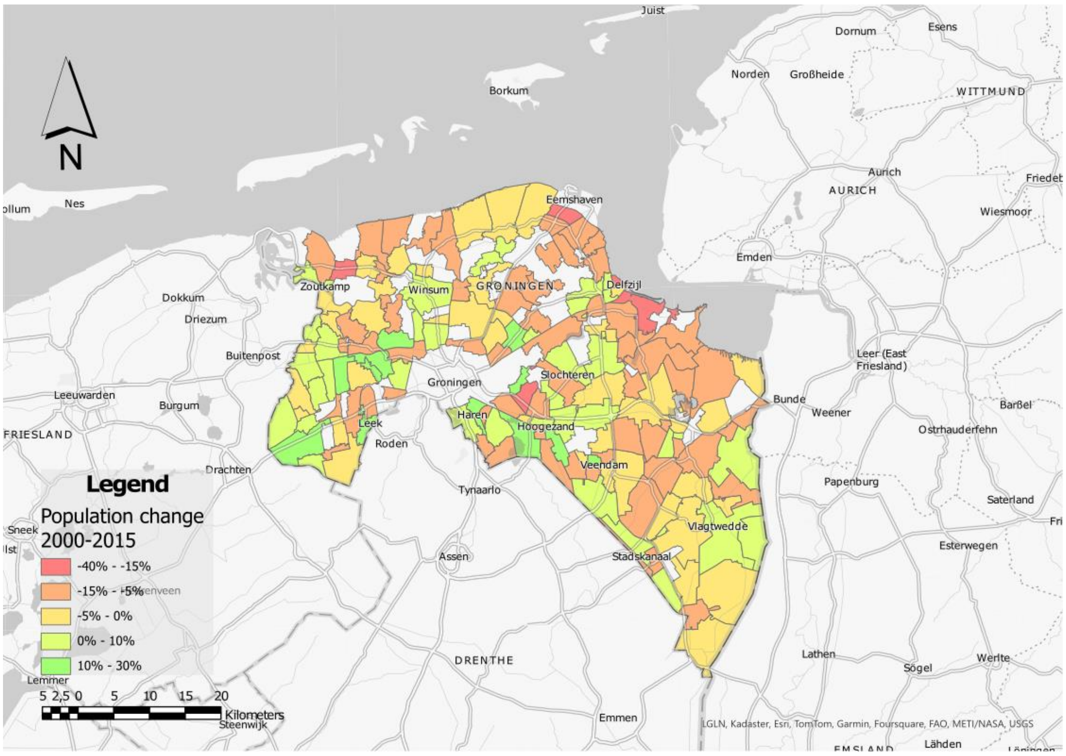

Figure 8: Population change between 2000 and 2015

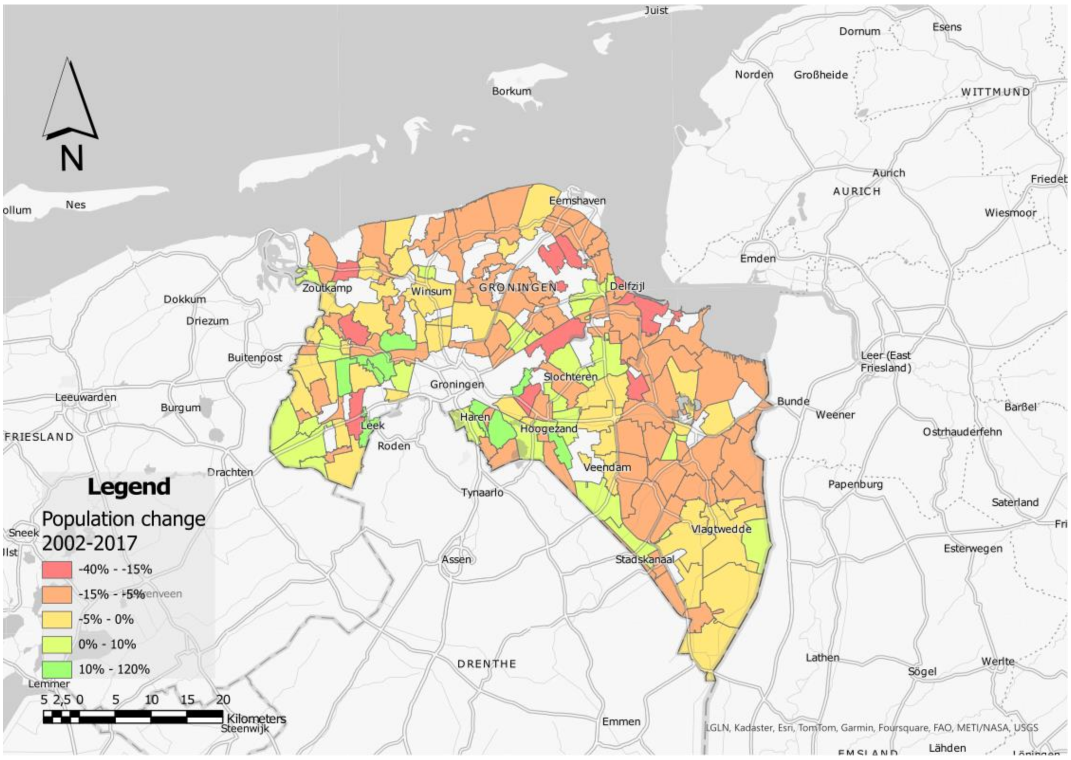

Figure 9: Population change between 2002 and 2017

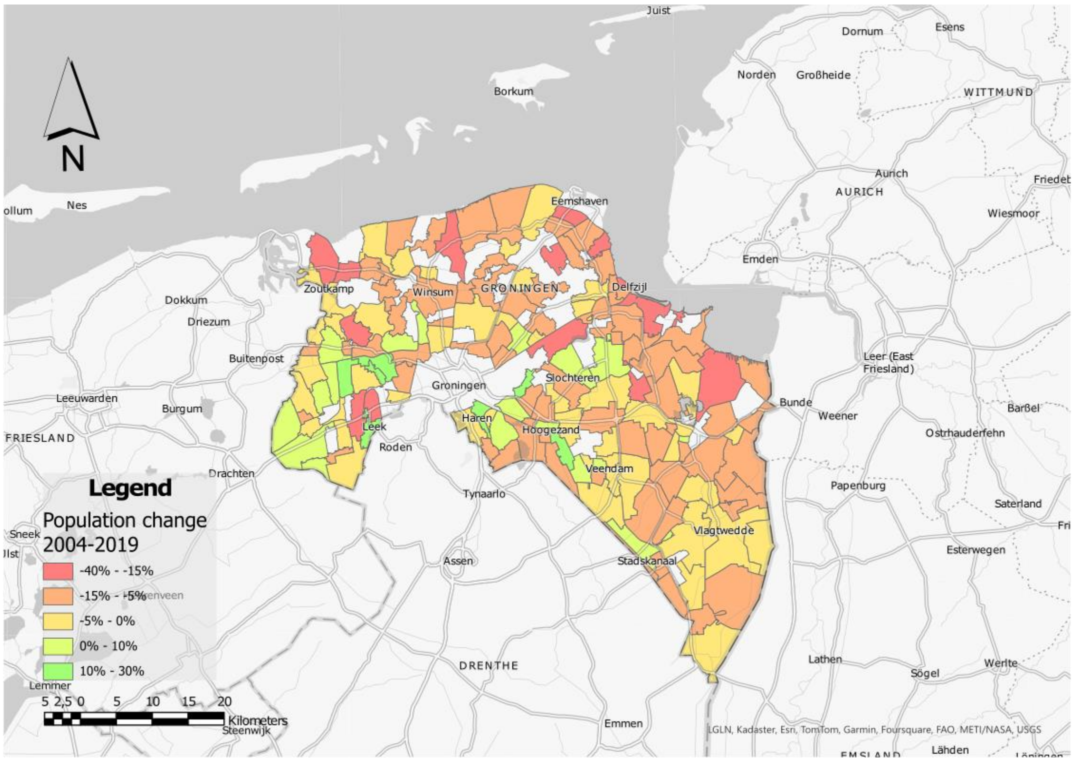

Figure 10: Population change between 2004 and 2019

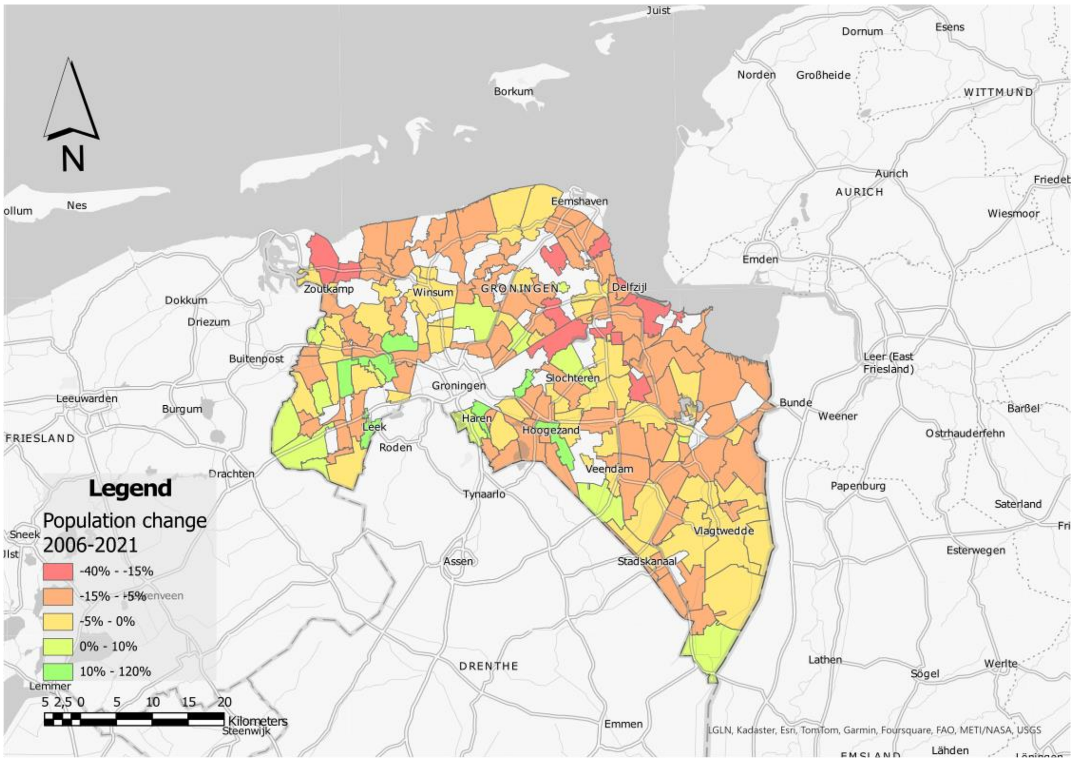

Figure 11: Population change between 2006 and 2021

As discussed in the literature framework, these levels of population decline are influenced by natural population change and migration. To explain these patterns in the case study, these variables are mapped across the study area. Natural population decline is especially prominent in North Eastern and Eastern Groningen (See Figure 12-15).In contrast, Western Groningen shows more mixed results, with some areas experiencing relatively high natural growth rates, while others are experiencing relatively strong decline. These findings are consistent with Table 1 in the introduction.

Over time, there is an observable increase in natural population decline. The 2021 map shows that many areas which experienced natural population growth in 2015 are now facing stagnation or decline.

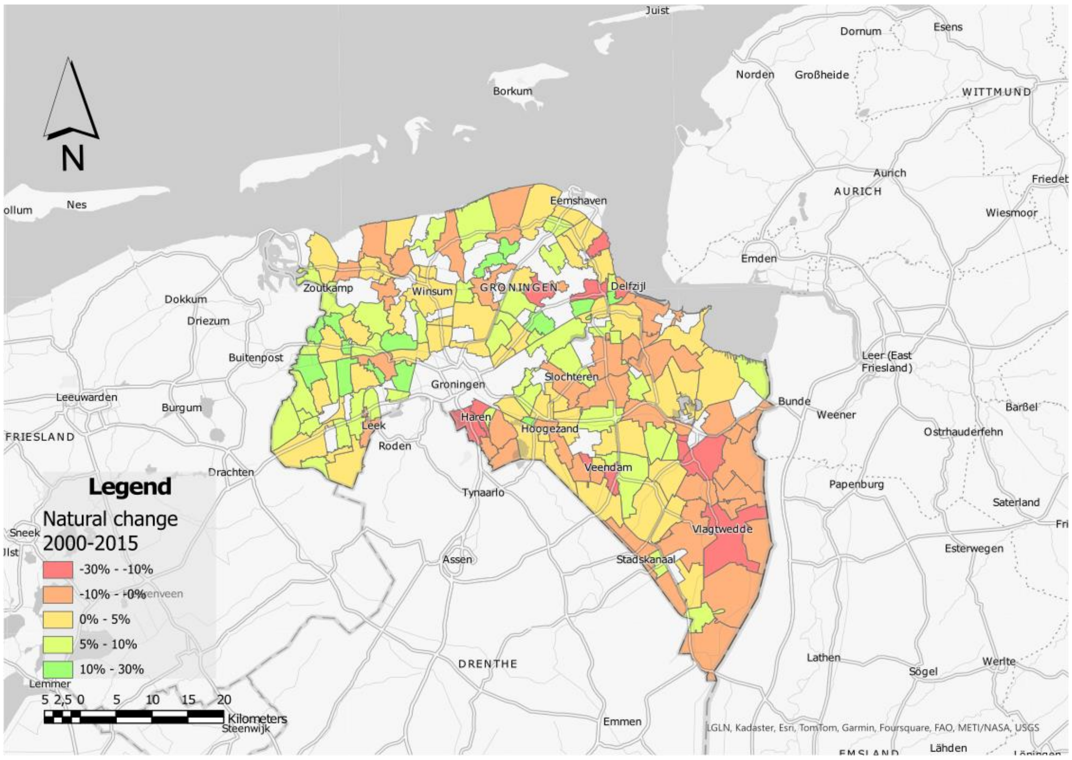

Figure 12: Natural population change between 2000 and 2015

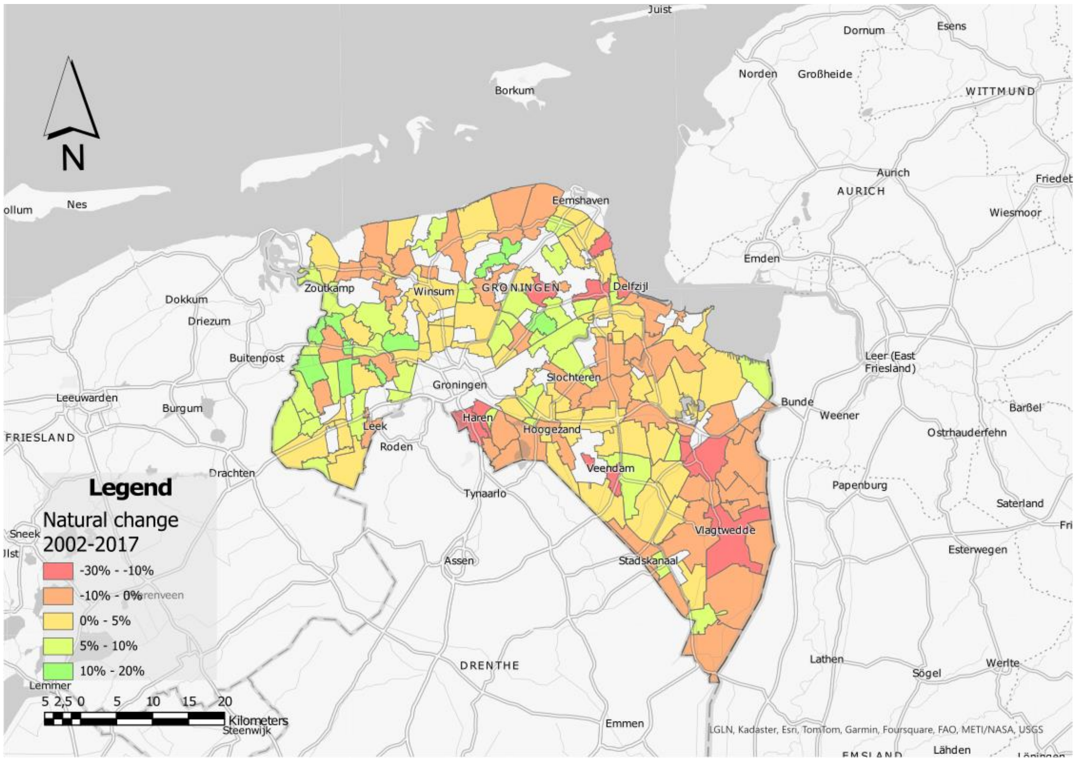

Figure 13: Natural population change between 2002 and 2017

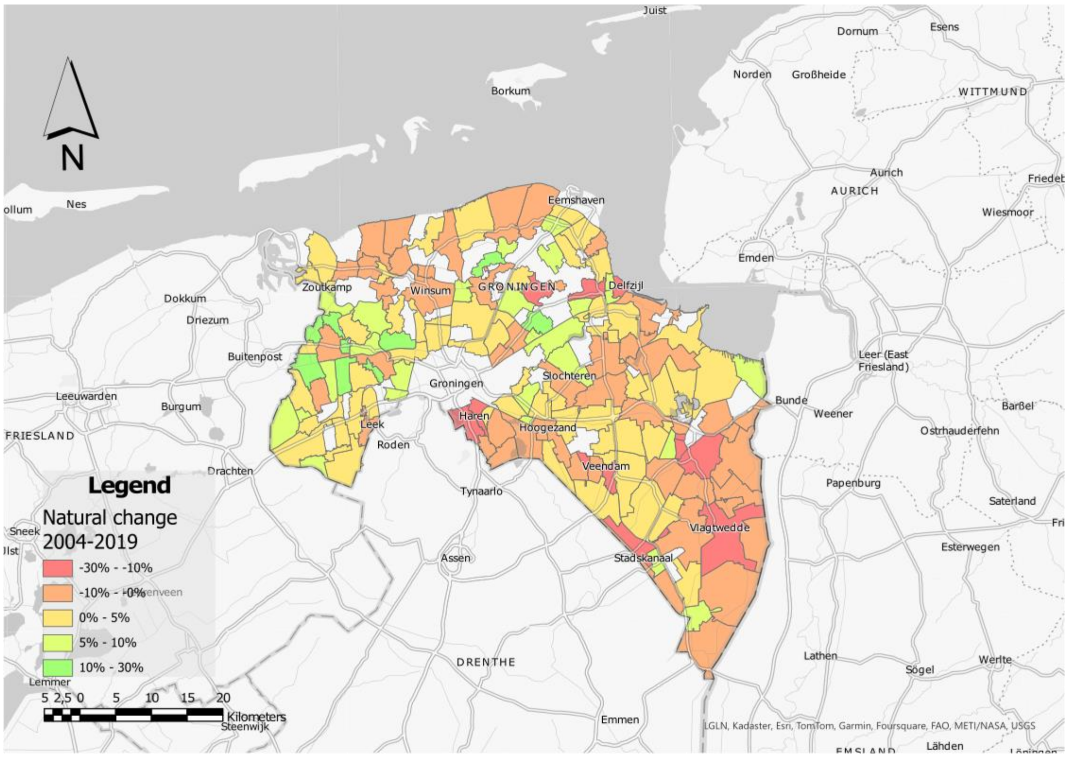

Figure 14: Natural population change between 2004 and 2019

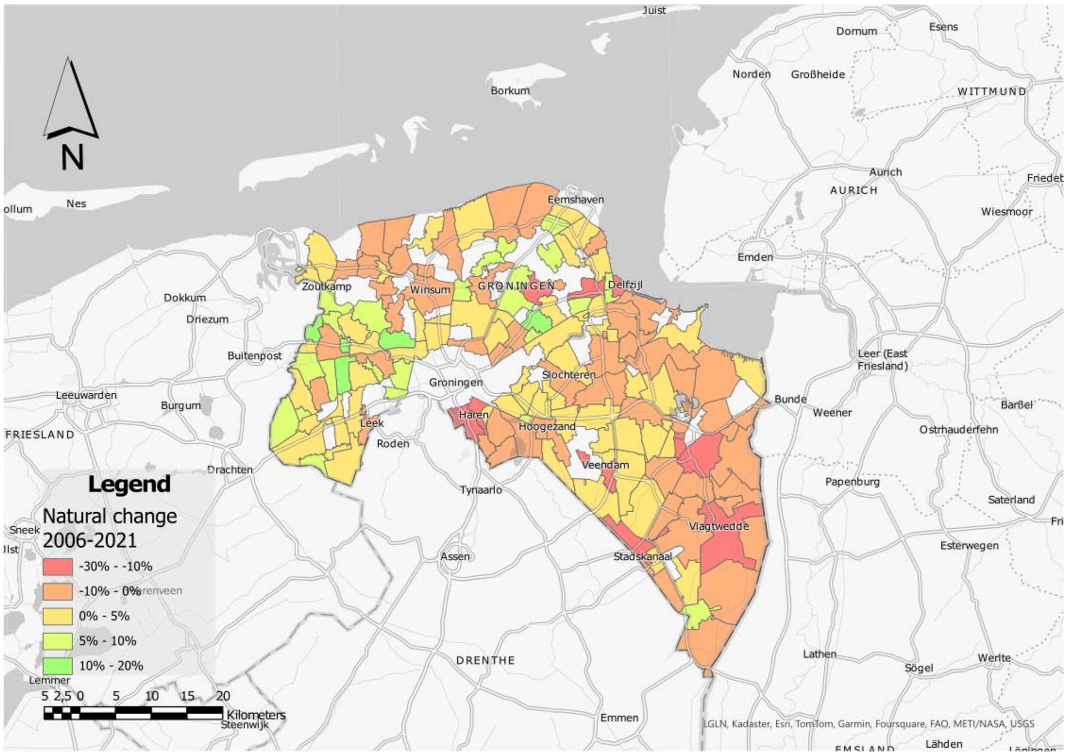

Figure 15: Natural population change between 2006 and 2021

The results of net migration differ from those of natural population change. Migratory population decline predominantly occurs in Western Groningen and North Eastern Groningen, while Migratory population growth is mostly experienced in Eastern Groningen and the Haren region (See Figures 16-19). These findings are consistent with Table 1 in the introduction. The patterns of net migration remain relatively stable over the years, showing no major differences between the selected election years.

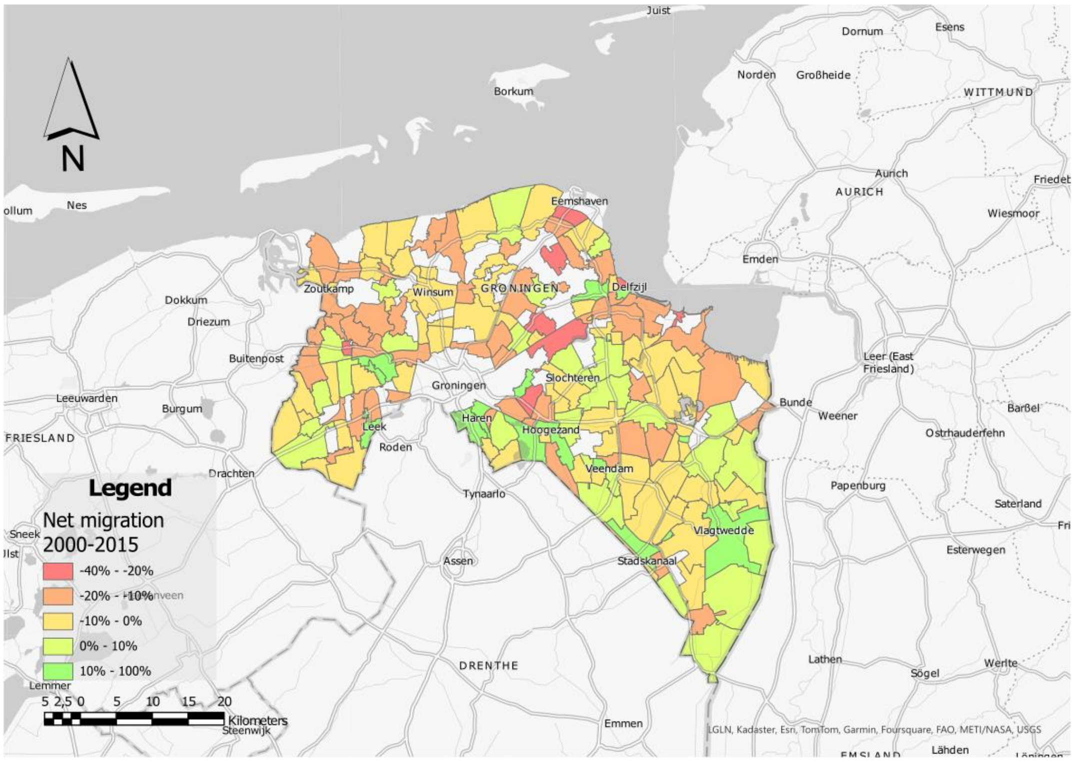

Figure 16: Net migration between 2000 and 2015

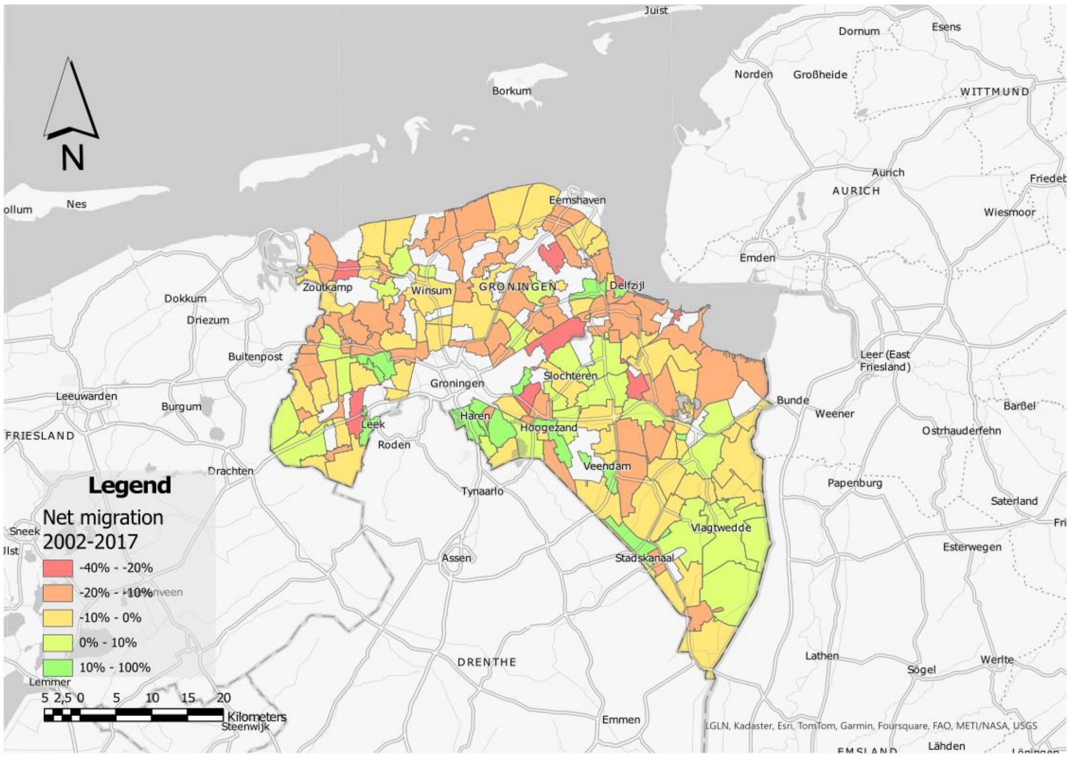

Figure 17: Net migration between 2002 and 2017

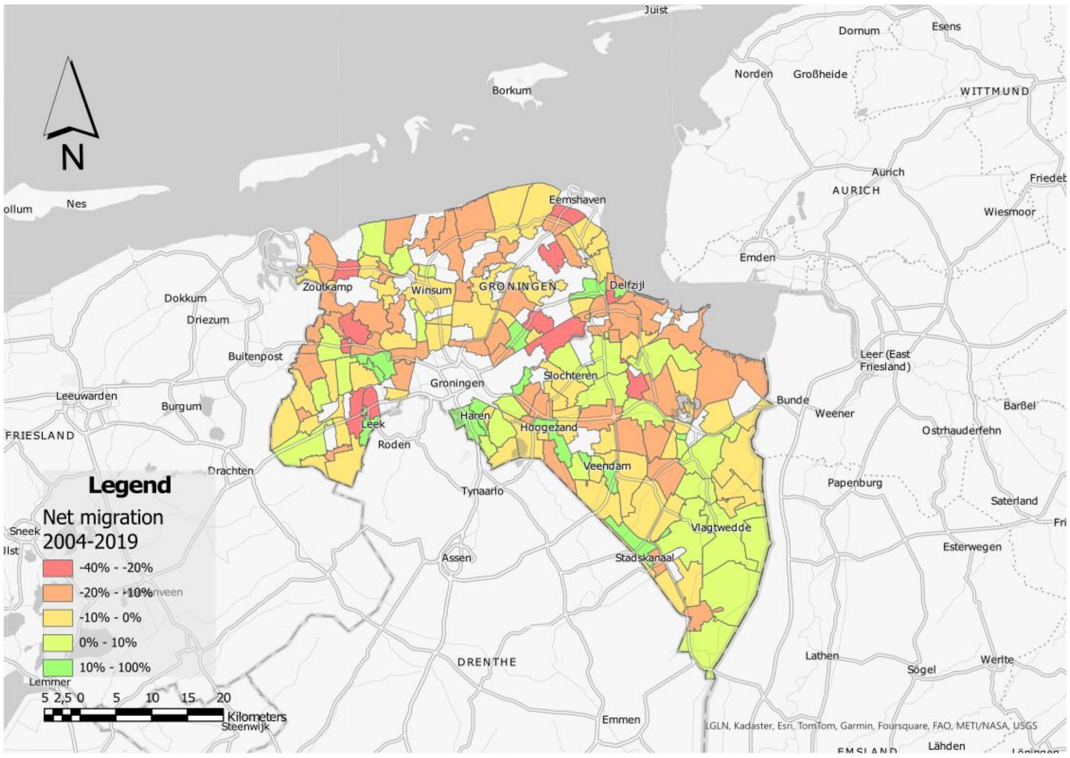

Figure 18: Net migration between 2004-2019

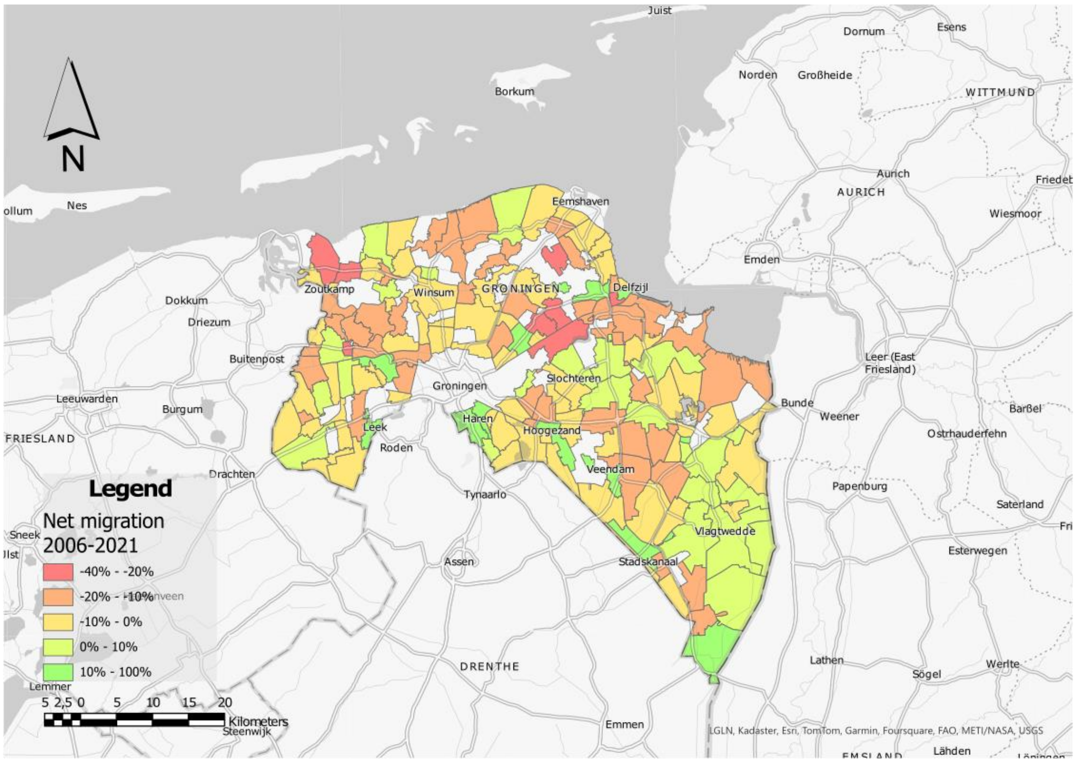

Figure 19: Net migration between 2006 and 2021

4.1.2 Voting patterns

The dependent variable concerns voting behaviour. This thesis focuses on three patterns of voting behaviour: right-wing populism, left-wing populism, and localism. To gain a better understanding of these patterns, it is essential to map them.

Right-wing populism in Groningen performs well in eastern Groningen, with its stronghold around the town of Ter Apel (See Figures 20-23). Conversely, it underperforms in Central Groningen. Right-wing populist parties have increased their vote share significantly from 2015 to 2021.

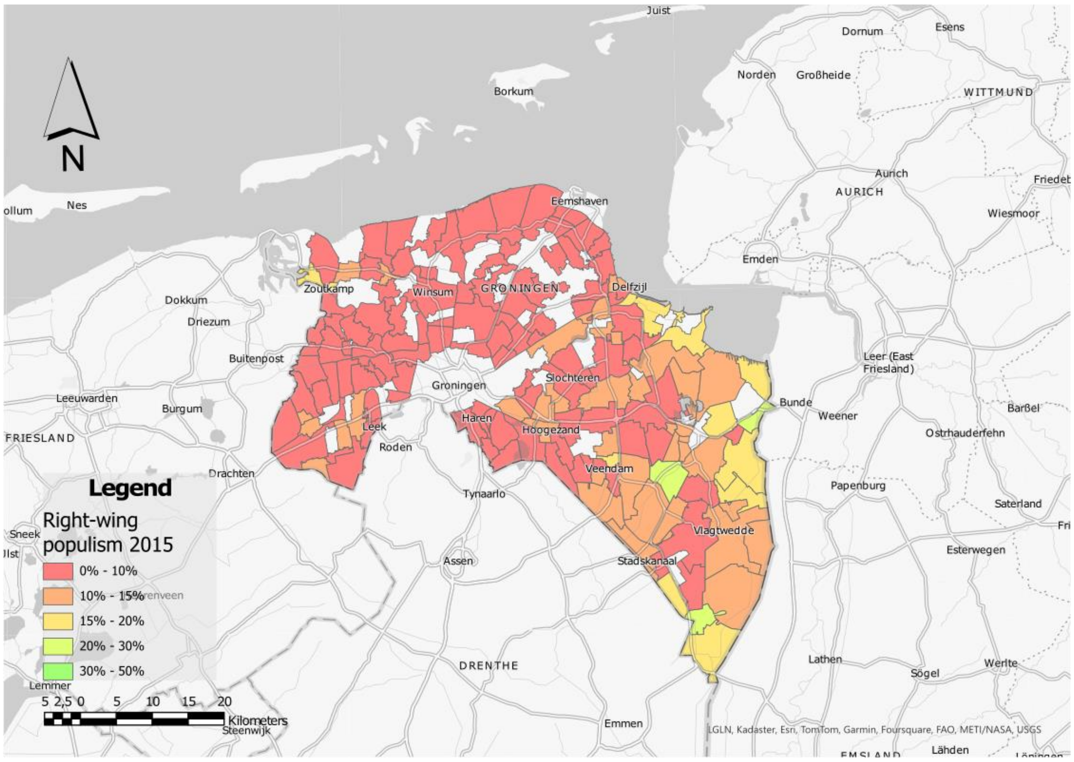

Figure 20: Right-wing populism in the regional election of 2015

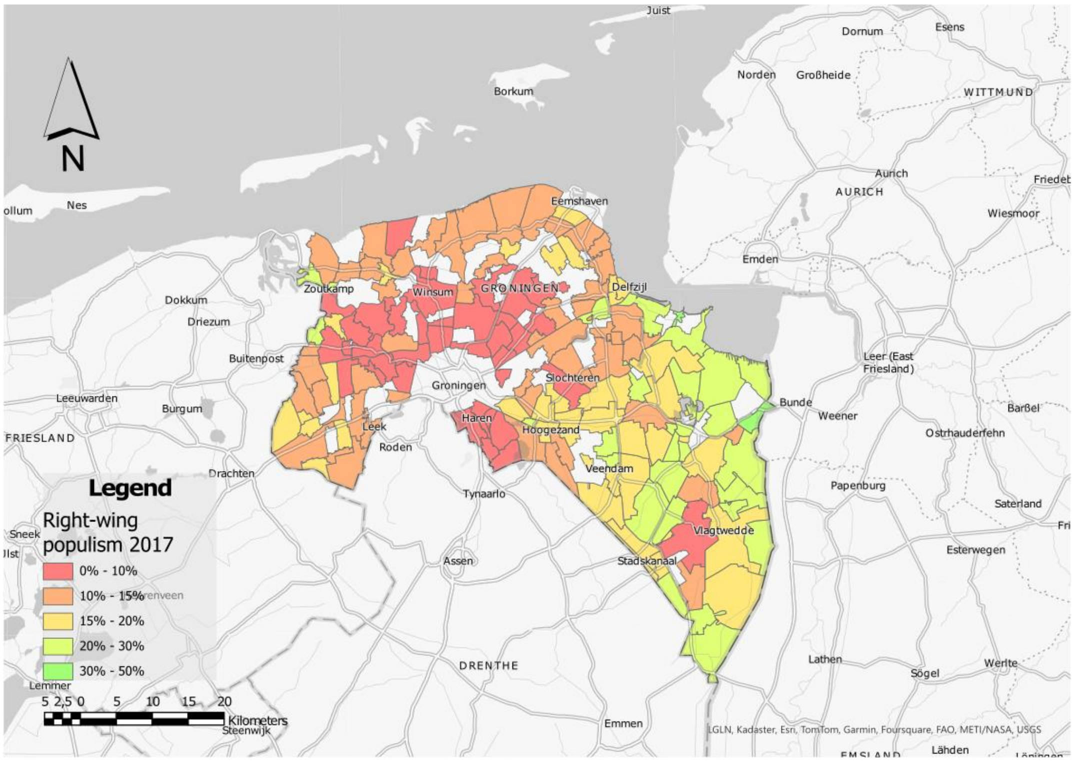

Figure 21: Right-wing populism in the national election of 2017

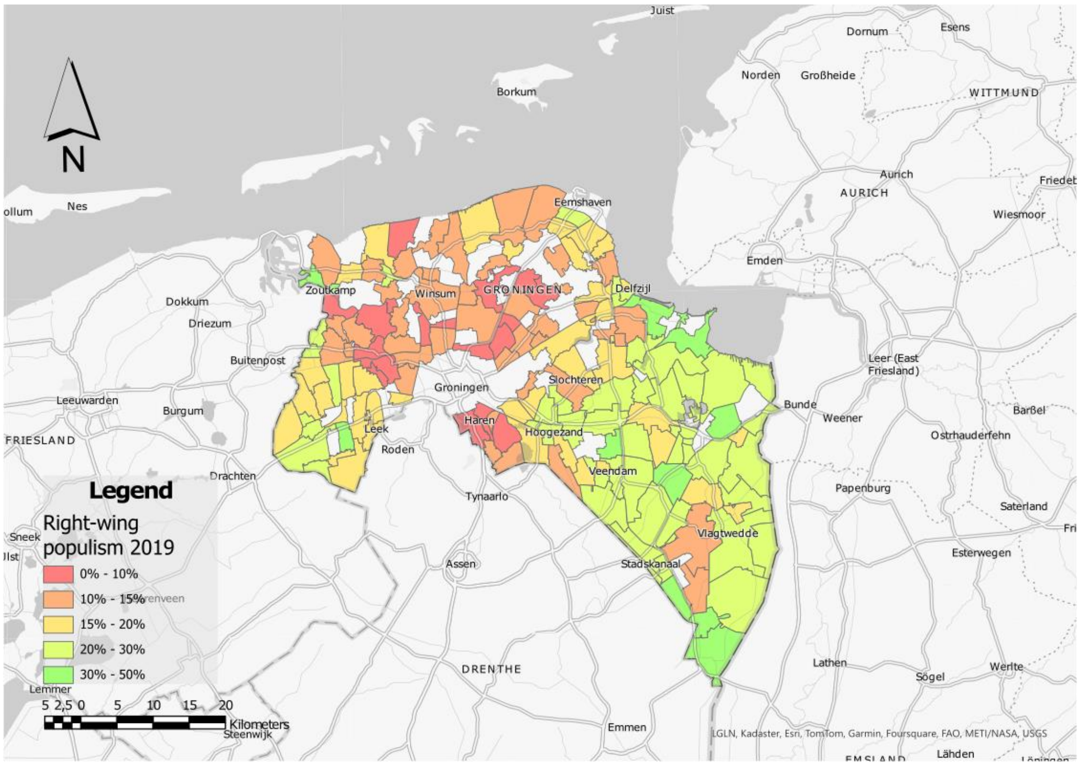

Figure 22: Right-wing populism in the regional election of 2019

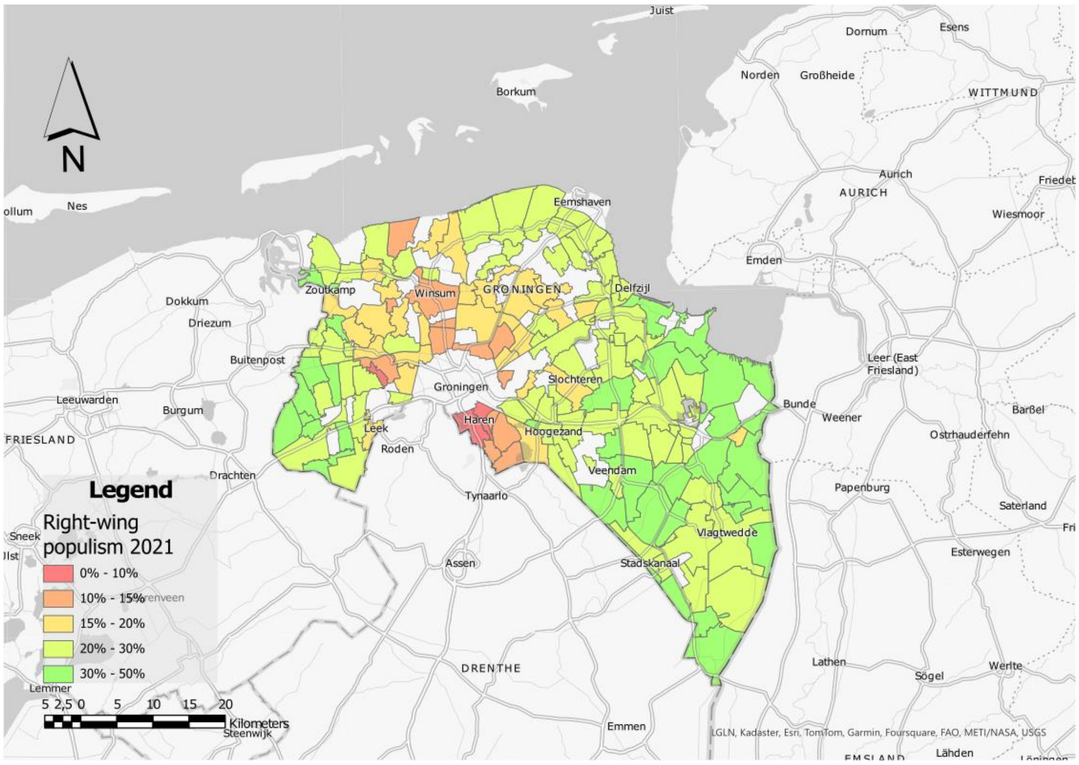

Figure 23: Right-wing populism in the national election of 2021

Left-wing populism follows similar patterns as right-wing populism (See Figure 24-27). It performs well in Eastern Groningen and poorly in Central Groningen. However, unlike right-wing populism, left-wing populism scores well in Northern Groningen and underperforms in the town of Ter Apel. Left-wing populism was most prominent in the 2015 election but has since declined in popularity in the Groningen countryside.

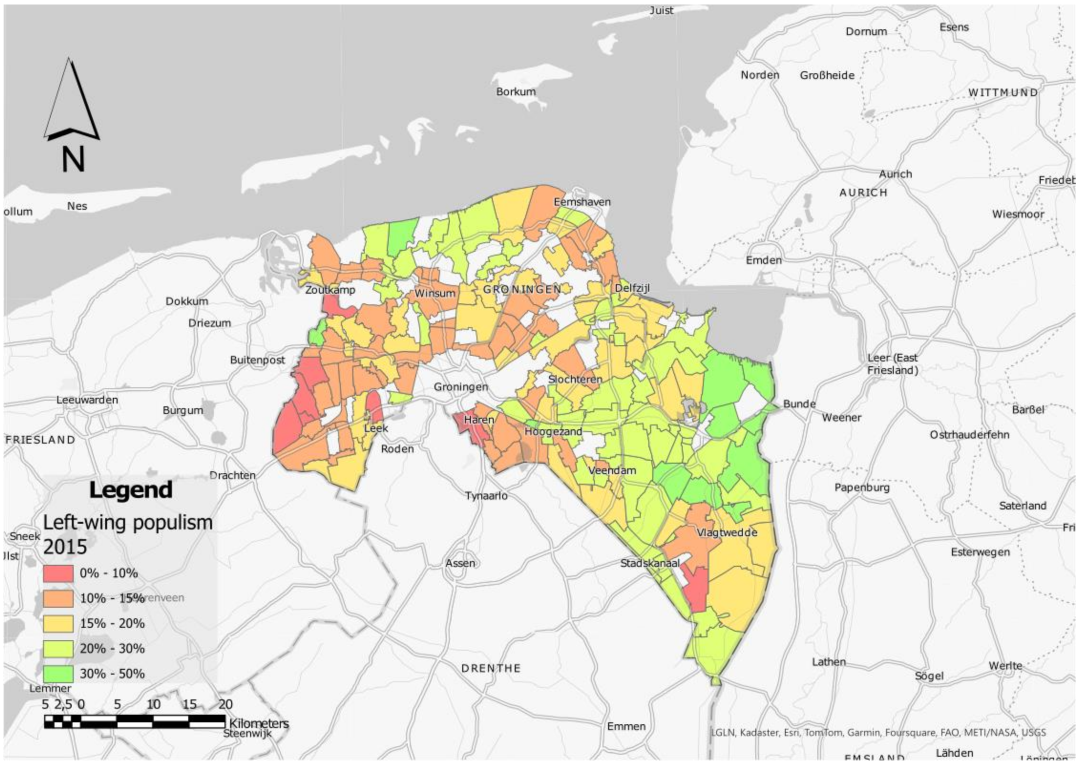

Figure 24: Left-wing populism in the regional elections of 2015

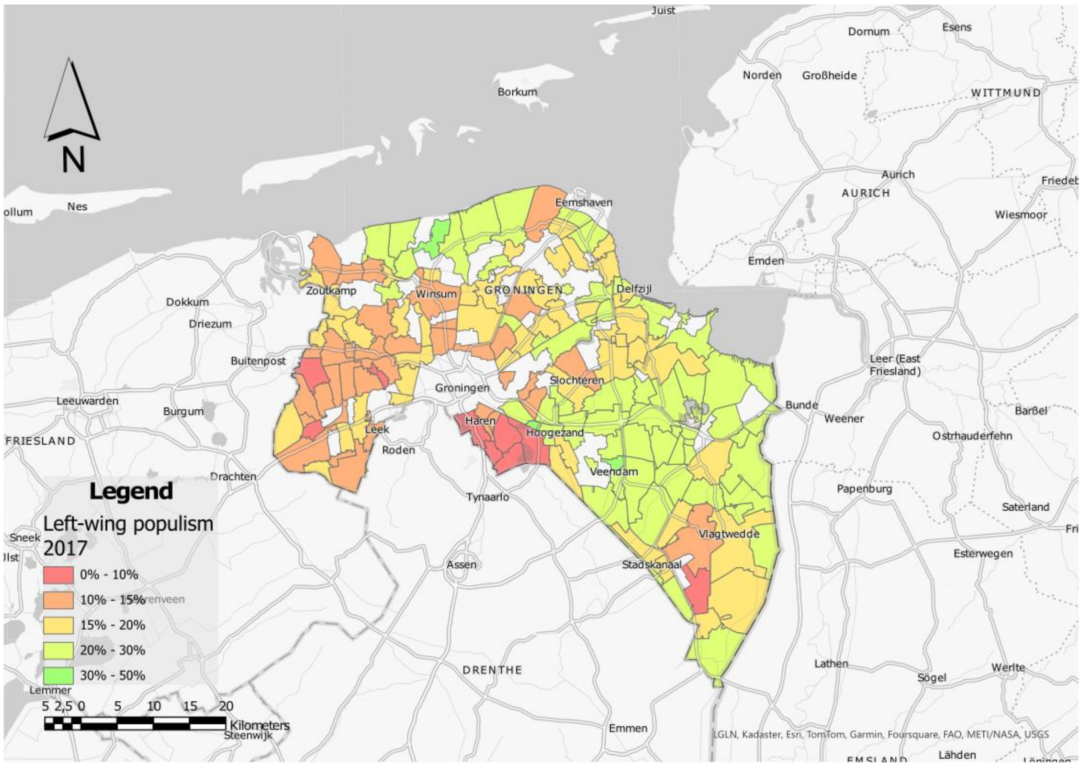

Figure 25: Left-wing populism in the national elections of 2017

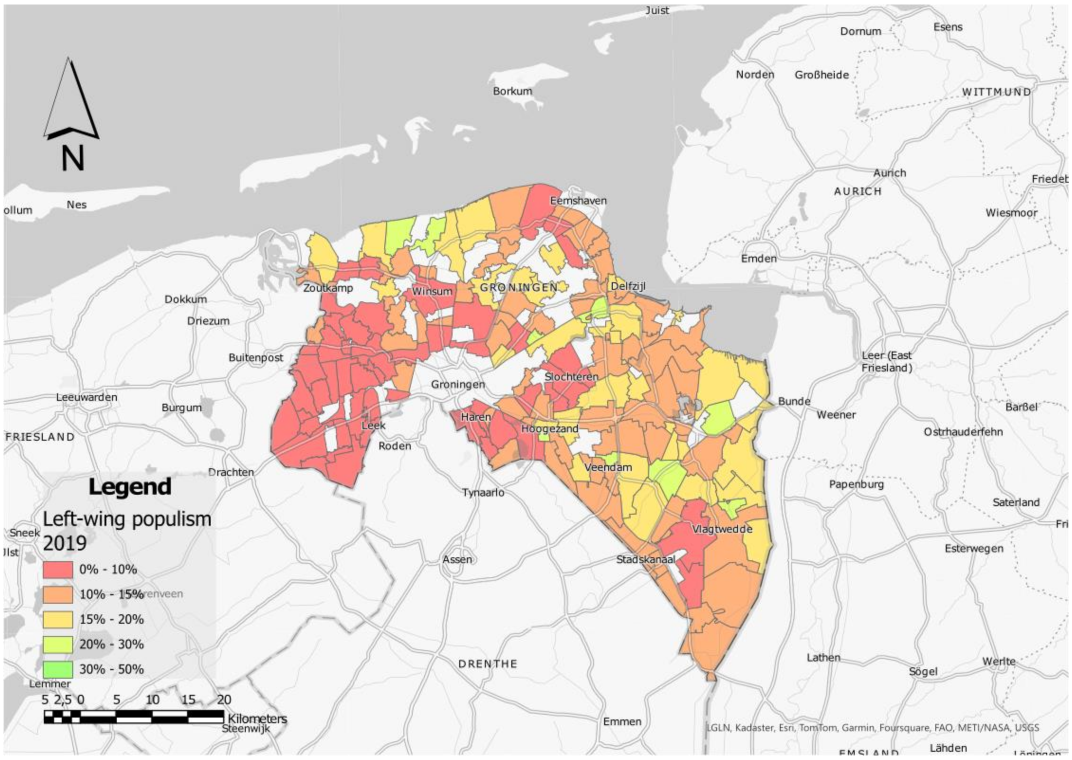

Figure 26: Left-wing populism in the regional elections of 2019

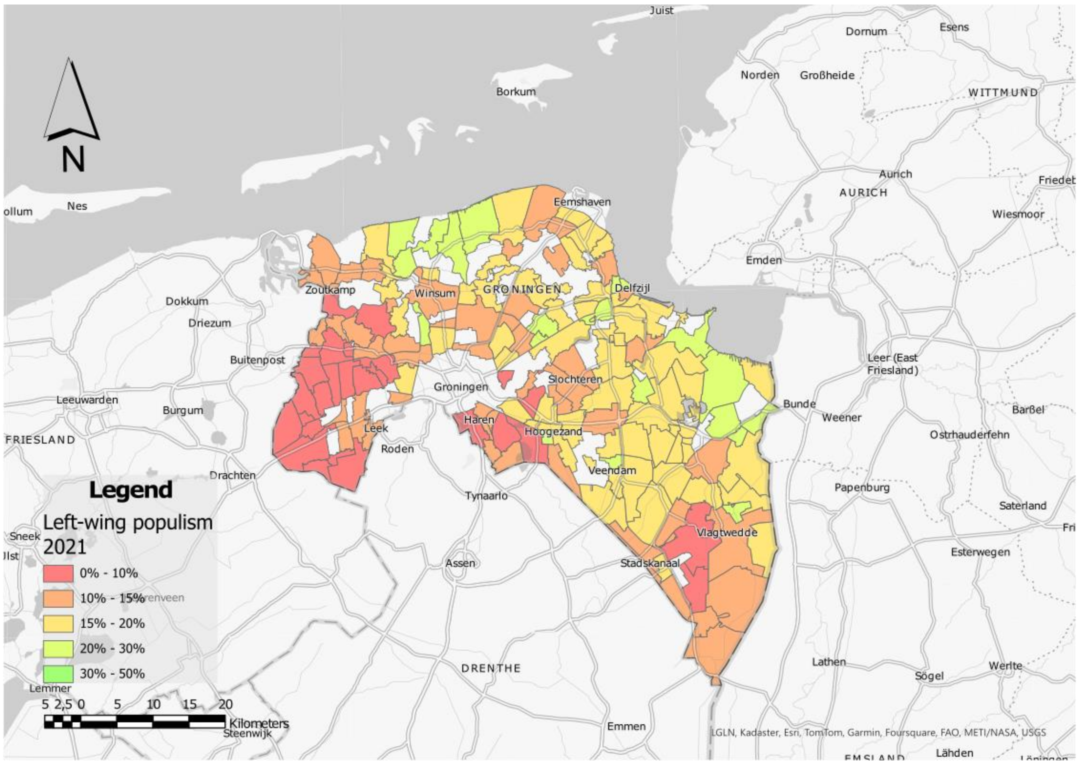

Figure 27: Left-wing populism in the national elections of 2021

Localism is concentrated around the municipalities of Eemsdelta and Veendam (See Figures 28 & 29). Between 2015 and 2019 support for localist parties has increased in the region between these two municipalities. The strongholds of localism align with Figures 5 and 6, which show the earthquake-affected areas in Groningen.

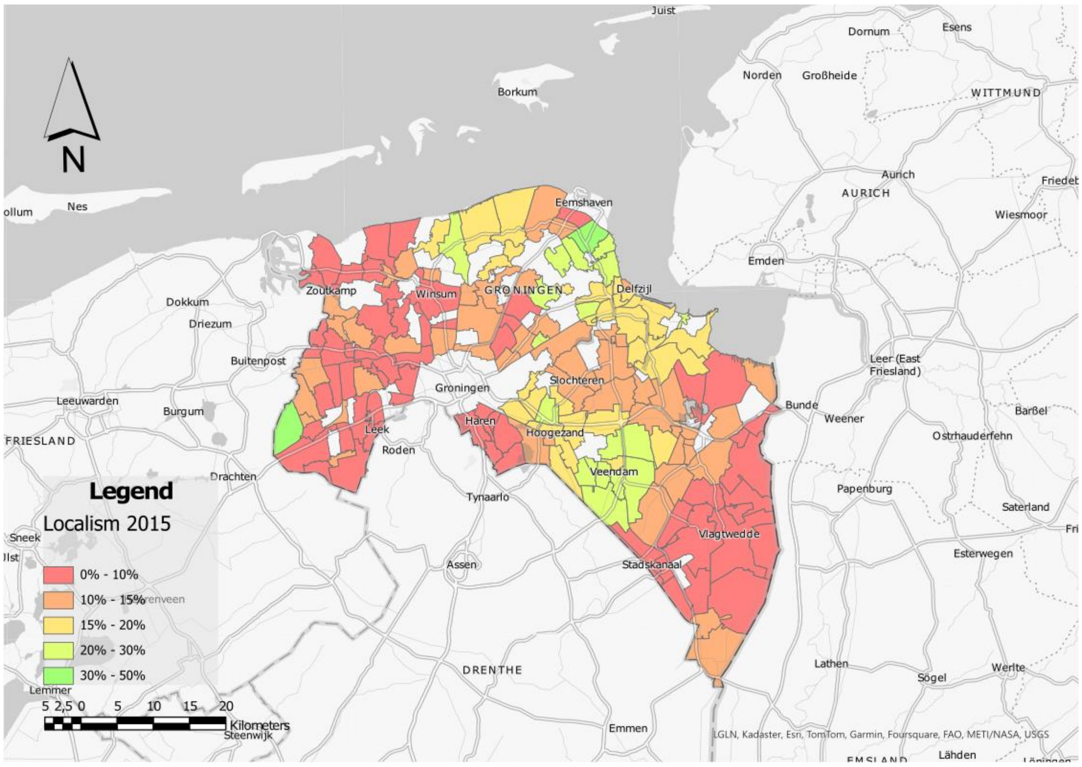

Figure 28: Localism in the regional elections of 2015

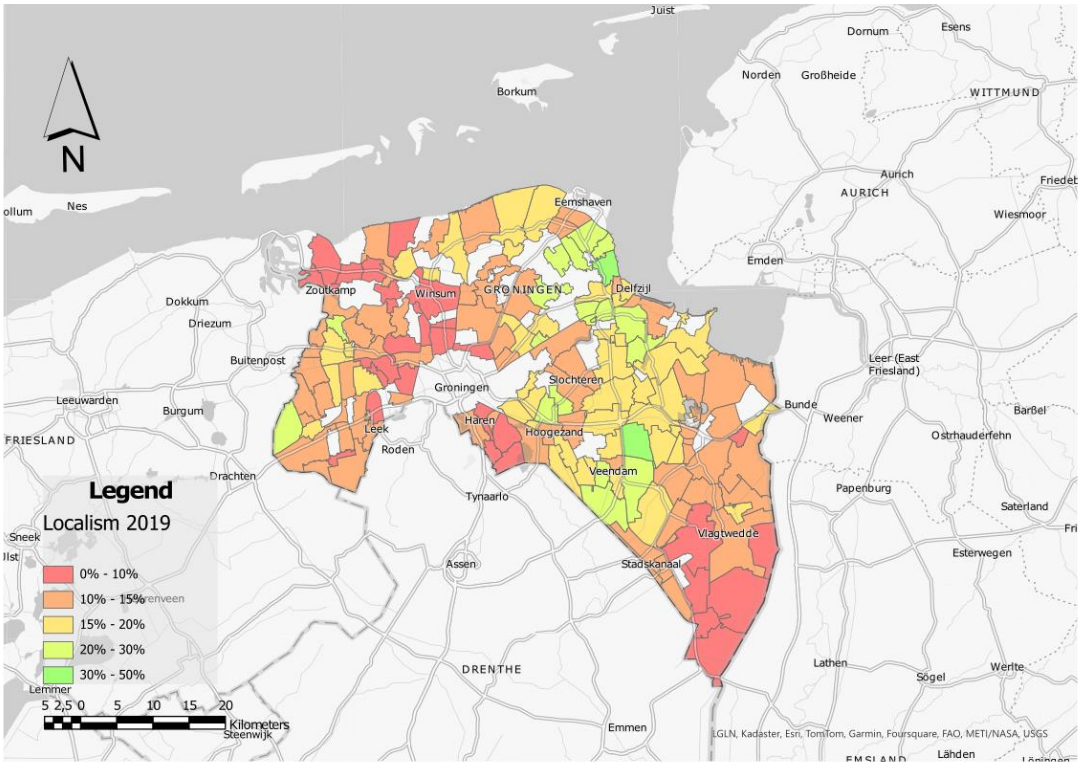

Figure 29: Localism in the regional elections of 2019

4.2 Statistical analysis

This chapter presents the findings from the statistical analyses, as described in the methodology. These analyses address research questions three, four, and five. The first part of this chapter covers the regression diagnostics. The regression diagnostics determines whether the assumptions of the spatial error tests are met and whether corrective measures are necessary. The second part focuses on the main body of the model. The main body of the model is divided into two segments: one discussing the provincial elections and the other discussing the national elections.

4.2.1 Regression diagnostics

Before performing the spatial error tests, it is important to satisfy its various assumptions. As outlined in the methodology, assumptions 3, 5, 6, and 7 require statistical tests to determine whether they have been violated. These assumptions are discussed individually below. Table 3 for 2015 and Table 4 for 2019 presents the regression diagnostics for the provincial elections. Table 5 for 2017 and Table 6 for 2021 presents the regression diagnostics for the national elections.

4.2.1.1 Assumption 3

Assumption 3 states that the error term is spatially autocorrelated. This assumption can be tested using the Moran's I. The results of the Moran's I tests are all significant, indicating that assumption 3 holds for all models. Consequently, the spatial error test is the appropriate specification for all models.

4.2.1.2 Assumption 5

Assumption 5 states that the error term has a constant variance, known as homoscedasticity. The absence of constant variance is referred to as heteroscedasticity. Given the presence of spatial autocorrelation in all models, the standard Breusch-Pagan and Koenker-Bassett tests are inadequate for measuring homoscedasticity in the dataset. Therefore, a modified Breusch-Pagan test that accounts for spatial autocorrelation is used.

The results of the Breusch-Pagan tests indicate that, for the provincial elections, the tests are significant at the 95% level for models 3 and 4 of left-wing populism in 2015 and for localism in 2015 and 2019. For the national elections, the tests are significant at the 95% level for models 3 and 4 of right-wing populism in 2017, model 4 of right-wing populism in 2021, and model 3 of left-wing populism in 2017. These significant results indicate that heteroscedasticity is present in these models, thereby violating assumption 5.

Violations of this assumption tend to result in underestimated p-values. Consequently, tests that should not be deemed significant can appear so. As a precaution, significance levels of 10% are included in the tables of the regression results.

4.2.1.3 Assumption 6

Assumption 6 states that the error term has a normal distribution. This assumption can be assessed using the Jarque-Bera test. The results from these tests indicate that, for the provincial elections, the tests are significant at the 95% level across all models in 2015, and for all models of localism in 2019. For the national elections, no test is significant at the 95% level. These significant results indicate that the error term does not have a normal distribution for these models, thereby violating assumption 6.

Similar to assumption 5, violations of this assumption lead to issues with the p-values. Therefore, the precautionary measure mentioned in that section is also applicable to address this violation.

2015

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Jarque-Bera (Sig)	0,00025***	0,00025***	0,00001***	0,00001***	0,01921**	0,01813**	0,00755***	0,02289**
Breusch-Pagan (Sig)	0,40414	0,45621	0,08267*	0,05280*	0,26547	0,21738	0,00037***	0,00050***
Koenker-Bassett (Sig)	0,43864	0,51074	0,30748	0,25616	0,27131	0,22724	0,00917***	0,00841***
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***
Spatial Breusch-Pagan (Sig)	0,35515	0,20077	0,06983*	0,06158*	0,28644	0,43725	0,00030***	0,00092***
	(1) Localism	(2) Localism	(3) Localism	(4) Localism				
Jarque-Bera (Sig)	0,00000***	0,00000***	0,00000***	0,00000***				
Breusch-Pagan (Sig)	0,73706	0,88547	0,00509***	0,01690**				
Koenker-Bassett (Sig)	0,80781	0,93762	0,51317	0,63286				
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***				
Spatial Breusch-Pagan (Sig)	0,86924	0,80881	0,00001***	0,00021***				

Table 3: Regression diagnostics of the regional election in 2015 (* = 90% ** = 95% * = 99%)**

2019

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Jarque-Bera (Sig)	0,49436	0,49823	0,11653	0,15379	0,24801	0,13782	0,08414*	0,08104*
Breusch-Pagan (Sig)	0,74979	0,69595	0,29629	0,20026	0,66896	0,83594	0,17530	0,09033*
Koenker-Bassett (Sig)	0,73085	0,65745	0,41448	0,32205	0,62894	0,79706	0,23901	0,14305
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***
Spatial Breusch-Pagan (Sig)	0,88010	0,19464	0,07044*	0,07836*	0,42749	0,25174	0,19378	0,16751
	(1) Localism	(2) Localism	(3) Localism	(4) Localism				
Jarque-Bera (Sig)	0,00000***	0,00000***	0,00000***	0,00000***				
Breusch-Pagan (Sig)	0,55367	0,65845	0,06903*	0,03689**				
Koenker-Bassett (Sig)	0,62780	0,75214	0,44347	0,32616				
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***				
Spatial Breusch-Pagan (Sig)	0,75094	0,74775	0,01061**	0,03189**				

Table 4: Regression diagnostics of the regional election in 2019 (* = 90% ** = 95% * = 99%)**

2017

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Jarque-Bera (Sig)	0,14782	0,15095	0,06817*	0,35969	0,09742*	0,49877	0,55492	0,46564
Breusch-Pagan (Sig)	0,54344	0,71524	0,00002***	0,00005***	0,94240	0,44565	0,26416	0,32459
Koenker-Bassett (Sig)	0,51723	0,68359	0,00056***	0,00053***	0,94976	0,38695	0,25463	0,30234
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***
Spatial Breusch-Pagan (Sig)	0,67161	0,40594	0,00006***	0,00068***	0,51032	0,59122	0,03295**	0,20462

Table 5: Regression diagnostics of the national election in 2017 (* = 90% ** = 95% * = 99%)**

2021

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Jarque-Bera (Sig)	0,38857	0,27844	0,35707	0,62231	0,70529	0,64001	0,12131	0,16327
Breusch-Pagan (Sig)	0,47813	0,99148	0,32805	0,23933	0,47823	0,96005	0,37417	0,21680
Koenker-Bassett (Sig)	0,40703	0,98768	0,14159	0,13849	0,44624	0,95265	0,36893	0,22663
Moran's I (Sig)	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***	0,00000***
Spatial Breusch-Pagan (Sig)	0,54998	0,58244	0,09258*	0,04312**	0,49527	0,43927	0,50247	0,41463

Table 6: Regression diagnostics of the national election in 2021 (Bold text is significant at the 95% level, bold and underlined text is at the 90% level) (* = 90% ** = 95% * = 99%)**

4.2.1.4 Assumption 7

Assumption 7 states that there should be no high dependence between two or more independent variables, known as the absence of multicollinearity. To measure the multicollinearity present in the dataset, VIF (Variance Inflation Factor) values are used (See Tables 7-10). The VIF values for the selected variables indicate that variables “seniors” and “natural population change” in 2015 exceed the acceptable threshold of 4. This suggests that corrective measures are necessary. The correlation matrices show a strong correlation between these two variables (see Tables 15-30 in the Appendix), indicating that they cannot be included in the same model. Consequently, the variable “seniors” is excluded from model 4, as “natural population change” is one of the two main independent variables of interest for model 4.

Although VIF scores below 4 do not require corrective measures, the variables “social benefits” and “loneliness” have VIF scores close to the threshold. The correlation matrices show that “social benefits” strongly correlate with “loneliness” and “low-income households”. To ensure that strong multicollinearity is absent from the dataset, the variable “social benefits” has been excluded. This decision is based on the fact that the economic dimension of population decline already includes “low-income households”, while “loneliness” is the sole variable representing the social aspect of population decline.

Implementing these corrective measures ensures that there is no strong multicollinearity present in the dataset, thus satisfying assumption 7.

	Provincial elections				National elections			
(3)	2015		2019		2017		2021	
Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Population change	1,18	0,844121	1,22	0,819803	1,23	0,81506	1,28	0,783313
Population > 65 yr	1,32	0,755488	1,25	0,800555	1,29	0,772388	1,15	0,866359
Damage claims earthquakes	1,08	0,929936	1,11	0,904833	1,07	0,937419	1,18	0,848156
Low income	2,52	0,396562	2,43	0,411222	2,28	0,438334	2,14	0,467584
Social security	3,35	0,298684	3,23	0,309468	3,06	0,326308	2,82	0,35427
Loneliness	3,01	0,332277	3,69	0,27136	3,04	0,329475	3,37	0,297115
Ammenities distance	1,19	0,839458	1,11	0,898858	1,15	0,870807	1,16	0,861703

Table 7: VIF values model 3 (Original variable list)

	Provincial elections				National elections			
(3)	2015		2019		2017		2021	
Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Population change	1,15	0,870595	1,2	0,835393	1,2	0,836156	1,27	0,790304
Population > 65 yr	1,21	0,824753	1,21	0,825436	1,22	0,816438	1,13	0,887202
Damage claims earthquakes	1,05	0,950017	1,05	0,948141	1,06	0,94418	1,09	0,91779
Low income	1,9	0,52717	2,21	0,45248	1,94	0,515893	2,02	0,495538
Loneliness	2,17	0,461272	2,46	0,406826	2,04	0,489936	2,22	0,451238
Ammenities distance	1,18	0,847859	1,11	0,899826	1,14	0,873876	1,16	0,861778

Table 8: VIF values model 3 (Corrected variable list)

	Provincial elections				National elections			
(4)	2015		2019		2017		2021	
Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Natural change	**4,27**	0,234121	3,87	0,258534	3,66	0,273431	**4,77**	0,209488
Net migration	1,4	0,715384	1,45	0,689892	1,44	0,693956	2,18	0,458627
Population > 65 yr	**4,22**	0,236698	3,73	0,268371	3,74	0,267599	3,54	0,282826
Damage claims earthquakes	1,08	0,929836	1,11	0,899212	1,07	0,931898	1,19	0,841148
Low income	2,53	0,39522	2,43	0,411087	2,28	0,438299	2,15	0,466016
Social security	3,36	0,29788	3,26	0,307072	3,09	0,323789	2,82	0,354003
Loneliness	3,01	0,332197	3,72	0,268828	3,04	0,32942	3,39	0,295234
Ammenities distance	1,2	0,833985	1,16	0,865546	1,19	0,841188	1,2	0,832049

Table 9: VIF values model 4 (Original variable list)

	Provincial elections				National elections			
(4)	2015		2019		2017		2021	
Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Natural change	1,39	0,717011	1,45	0,691139	1,38	0,726438	2,11	0,474584
Net migration	1,35	0,738636	1,42	0,704109	1,39	0,717227	2,15	0,465072
Damage claims earthquakes	1,05	0,952789	1,06	0,944958	1,06	0,940287	1,1	0,912152
Low income	1,9	0,526645	2,2	0,454466	1,92	0,519847	2,01	0,496405
Loneliness	2,12	0,47158	2,45	0,408371	2	0,50106	2,25	0,44534
Ammenities distance	1,18	0,845214	1,13	0,882515	1,17	0,853539	1,17	0,853446

Table 10: VIF values model 4 (Original variable list)

4.2.2 Main body of the model

After ensuring that the various assumptions are satisfied, the main body of the model can be discussed. This segment presents the main results, including the coefficients and their levels of significance. These variables are interpreted in this chapter. The different election types are discussed individually below. These sections are divided into various segments, each focusing on the categories of variables. Table 11 for 2015 and Table 12 for 2019 present the main models for the provincial elections.

4.2.2.1 Provincial elections

The first elections discussed are the provincial elections, which feature three distinct voting patterns as dependent variables: right-wing populism, left-wing populism, and localism. This segment describes the correlations between these voting patterns and various independent variables, following the model format outlined in the methodology. The spatial error models for the 2015 provincial elections are presented in Table 11, and the results of the 2019 provincial elections are shown in Table 12.

4.2.2.1.1 Demographic Dimension

The first category of variables represents the demographic dimension of population decline, which includes only the variable “seniors”. Due to multicollinearity issues identified in the previous section, this variable is included only in model 3. In 2015, “seniors” significantly correlates with right-wing and left-wing populism at the 95% level. In 2019, it correlates significantly only with right-wing populism at the 95% level.

The coefficients indicate that in 2015, with every increase in the percentage of seniors by 1 within a postcode district, the percentage of votes for right-wing populist parties decreases by 0,13, and the percentage of votes for left-wing populist parties decreases by 0,23. In 2019, every increase in the percentage of seniors by 1 within a postcode district results in a 0,32 decrease in the percentage of votes for right-wing populist parties.

4.2.2.1.2 Contextual Dimension

The next category of variables represents the contextual dimension of Groningen Province, which includes only the variable “damage claims earthquakes”. In 2015, “damage claims earthquakes” correlates significantly with localism in models 3 and 4 at the 95% level. In 2019, the variable significantly correlates with localism in models 3 and 4, and with left-wing populism in model 3 at the 95% level.

The coefficients show that in 2015, every increase in the percentage of damage claims by 1 within a postcode district, the percentage of votes for localist parties increases by 0,0007 in model 3 and by 0,0008 in model 4. In 2019, every increase in the percentage of damage claims by 1 within a postcode district results in a 0,0008 increase in votes for localist parties in both models and a 0,0003 increase in votes for left-wing populist parties in model 3.

4.2.2.1.3 Economic Dimension

The subsequent category of variables represents the economic dimension of population decline, which includes only the variable “low-income households”. The variable “social security” was initially part of this dimension, but it was excluded due to multicollinearity issues identified in the previous section. In 2015, “low-income households” significantly correlates with right-wing and left-wing populism in models 3 and 4 at the 95% level. In 2019, it significantly correlates only with right-wing populism in models 3 and 4 at the 95% level.

The coefficients indicate that in 2015, for every increase in the percentage of low-income households within a postcode district by 1, the percentage of votes for right-wing populist parties increases by 0,09 for models 3 and 4. For left-wing populist parties, the percentage of votes increased by 0,08 in model 3 and by 0,09 in model 4. In 2019, every increase in the percentage of low-income households by 1 within a postcode district results in a 0,11 increase in the percentage of votes for right-wing populist parties by 0,11 in models 3 and 4.

4.2.2.1.4 Social Dimension

The following category of variables is the social dimension of population decline, which includes only the variable “loneliness”. In 2015, “loneliness” correlates significantly with right-wing and left-wing populism in models 3 and 4 at the 95% level. In 2019, “loneliness” significantly correlates with right-wing and left-wing populism in models 3 and 4 at the 95% level.

The coefficients indicate that in 2015, for every increase of 1 in the percentage of people feeling lonely within a postcode district, the percentage of votes for right-wing populist parties increases by 0,27 for model 3 and by 0,24 for model 4. For left-wing populist parties, the percentage of votes increased by 0,46 in model 3 and by 0,40 in model 4. In 2019, An increase of 1 in the percentage of people feeling lonely within a postcode district results in a 0,53 increase in the percentage of votes for right-wing populist parties in model 3 and a 0,51 increase in model 4. For left-wing populist parties, the percentage of votes increases by 0,55 in model 3 and by 0,56 in model 4.

4.2.2.1.5 Amenities

The next category of variables represents amenities and includes only the variable “amenities”. In 2015, “amenities” significantly correlates with right-wing populism at the 95% level in models 3 and 4. Conversely, in 2019, this variable significantly correlates with left-wing populism at the 95% level in models 3 and 4.

The coefficients indicate that in 2015, for every increase of 1 in the average distance from core amenities of a postcode district, the percentage of votes for right-wing populist parties increases by 0,004 in model 3 and by 0,003 in model 4. In 2019, an increase in the percentage of the average distance from core amenities within a postcode district by 1, results in a 0,005 increase in the percentage of votes for left-wing populist parties in models 3 and 4.

4.2.2.1.6 Population Decline

The final and main category of variables pertains to population decline, which includes three variables: “population change”, “natural change”, and “net migration”. In 2019, the first variable, “population change” significantly correlates with model 1 of left-wing populism at the 95% level. In 2015, there are no significant correlations with population change at the 95% level.

The coefficients indicate that in 2019, for every increase of the percentage of population change in the past 15 years by 1 within a postcode district, the percentage of votes for left-wing populist parties decreases by 0,06 in model 1.

Subsequently, the components of population change are analysed. The first variable, “natural change” significantly correlates with right-wing and left-wing populism in model 4 in 2015 at the 95% level. In 2019, it significantly correlates with right-wing populism in model 4 at the 95% level.

The coefficients indicate that in 2015, every increase by 1 of the percentage of natural population decline within a postcode district, increases the percentage of votes for right-wing populist parties by 0,10 in model 4, while the percentage of votes for left-wing populist parties increases by 0,14 in model 4. In 2019, every increase in the percentage of natural population decline by 1, increases the percentage of votes for right-wing populist parties in model 4 by 0,24.

The final variable “net migration”, only significantly correlates with model 2 of left-wing populism at the 95% level. The coefficient indicates that for every increase in the percentage of net migration by 1 within a postcode district, the percentage of people voting for left-wing populist parties decreases by 0,06.

2015

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Population change	-0,030483		-0,012796		-0,052118*		-0,030080	
Natural change		0,053093		0,098167***		0,091326		0,139271**
Net migration		-0,032772*		-0,016117		-0,055508*		-0,032756
Population ≥ 65 yr			-0,125753***				-0,233966***	
Damage claims earthquakes			-0,000109	-0,000080			0,000140	0,000145
Low income households			0,085450***	0,092704***			0,080818**	0,089181**
Loneliness			0,274234***	0,238741***			0,463544***	0,403774***
Ammenities distance			0,003714**	0,003454**			0,004011	0,004194
Constant	0,087879***	0,086618***	-0,057095*	-0,070676**	0,189760***	0,188030***	-0,019890	-0,048518
Observations	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000
λ	0,659509***	0,687867***	0,560555***	0,604346***	0,665594***	0,697113***	0,622905***	0,638191***

	(1) Localism	(2) Localism	(3) Localism	(4) Localism
Population change	0,011891		0,005682	
Natural change		0,044966		0,027681
Net migration		0,010938		0,007580
Population ≥ 65 yr			-0,132249*	
Damage claims earthquakes			0,000733***	0,000770***
Low income households			0,015919	0,017872
Loneliness			0,073649	0,029920
Ammenities distance			-0,002951	-0,002018
Constant	0,128666***	0,128283***	0,121503**	0,104229*
Observations	159,0000	159,0000	159,0000	159,0000
λ	0,748707***	0,747615***	0,698557***	0,700704***

Table 11: Spatial error models regional elections 2015 (* = 90% ** = 95% * = 99%)**

2019

	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Population change	-0,0325562		-0,001138		-0,055833***		-0,026453	
Natural change		0,133355*		0,245617***		-0,013319		0,029361
Net migration		-0,034093		-0,005303		-0,056062***		-0,027284
Population ≥ 65 yr			-0,316386***				-0,047612	
Damage claims earthquakes			-0,000298	-0,000277			0,000303**	0,000288*
Low income households			0,110038***	0,108457***			-0,018466	-0,018645
Loneliness			0,533218***	0,509844***			0,554589***	0,559395***
Ammenities distance			0,004792*	0,003613			0,004838***	0,004638**
Constant	0,176646***	0,176845***	-0,055218	-0,105660	0,123892***	0,124104***	-0,146223***	-0,156813***
Observations	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000	159,0000
λ	0,708983***	0,735929***	0,602609***	0,634784***	0,674989***	0,687784***	0,601370***	0,61029***

	(1) Localism	(2) Localism	(3) Localism	(4) Localism
Population change	0,010476		0,012047	
Natural change		0,039659		0,022610
Net migration		0,009995		0,012369
Population ≥ 65 yr			-0,098661	
Damage claims earthquakes			0,000801***	0,000830***
Low income households			0,020169	0,018894
Loneliness			0,082195	0,050474
Ammenities distance			-0,001012	-0,000802
Constant	0,145098***	0,145136***	0,109491*	0,099957*
Observations	159,0000	159,0000	159,0000	159,0000
λ	0,669791***	0,667734***	0,631169***	0,647073***

Table 12: Spatial error and Ordinary Least Squares models of the regional election in 2019 (* = 90% ** = 95% * = 99%)**

4.2.2.2 National elections

The second elections discussed are the national elections, which feature two voting patterns as dependent variables: right-wing populism and left-wing populism. This segment analyses the correlations between these voting patterns and various independent variables, following the model format outlined in the methodology. The spatial error models for the national elections are presented in Table 13 for 2017 and Table 14 for 2021.

4.2.2.2.1 Demographic Dimension

Examining the significance levels of the demographic dimension reveals that in 2017, the variable "seniors" significantly correlates with right-wing and left-wing populism in model 3 at the 95% level. In 2021, "seniors" significantly correlates with right-wing populism in model 3 at the 95% level.

The coefficients indicate that in 2017, for every increase of the percentage of seniors within a postcode district by 1, the percentage of people voting on right-wing populist parties decreases by 0,30, and the percentage of votes for left-wing populist parties decreases by 0,18 in model 3. In 2021, every increase in the percentage of seniors by 1 within a postcode district results in a 0,42 decrease in the percentage of votes for right-wing populist parties.

4.2.2.2.2 Contextual Dimension

Subsequently, analysing the significance levels of the contextual dimension reveals that in 2017, the variable "damage claims earthquakes" significantly correlates with left-wing populism in models 3 and 4 at the 95% level. In 2021, no significant correlations are observed between this variable and any voting pattern at the 95% level.

The coefficients indicate that in 2017, for every increase by 1 in the percentage of damage claims within a postcode district, the percentage of votes for left-wing populist parties increases by 0,0004 in models 3 and 4.

4.2.2.2.3 Economic Dimension

Next, investigating the significance levels of the economic dimension reveals that in 2017, the variable "low-income household" significantly correlates with right-wing populism at the 95% level in models 3 and 4. In 2021, "low-income households" also significantly correlate with right-wing populism at the 95% level in models 3 and 4.

The coefficients indicate that in 2017, for every increase in the percentage of low-income households by 1 within a postcode district, the percentage of votes for right-wing parties increases by 0,11 in models 3 and 4. In 2021, an increase in the percentage of low-income households within a postcode district by 1, results in an increase of the percentage of votes for right-wing populist parties by 0,12 in model 3 and 0,13 in model 4.

4.2.2.2.4 Social Dimension

Thereafter, examining the significance levels of the social dimension reveals that in 2017, the variable "loneliness" significantly correlates with both right-wing and left-wing populism at the 95% level. In 2021, this variable also significantly correlates with both right-wing and left-wing populism at the 95% level.

The coefficients indicate that in 2017, for every increase of 1 in the percentage of people feeling lonely within a postcode district, the percentage of votes for right-wing populist parties increases by 0,48 in model 3 and by 0,41 in model 4. For left-wing populism, the percentage of votes increases by 0,82 in model 3 and 0,79 in model 4. In 2021, for every increase of the percentage of people feeling lonely within a postcode district by 1, the percentage of people voting for right-wing populist parties increases by 0,46 in model 3, and by 0,43 in model 4. For left-wing populism, the percentage of votes increases by 0,67 for model 3 and by 0,68 for model 4.

4.2.2.2.5 Amenities

Examining the significance levels of the amenities category reveals that in 2021, the variable “amenities” correlates significantly with right-wing populism at the 95% level in models 3 and 4. In 2017, no significant correlations are observed between “amenities” and any voting pattern at the 95% level.

The coefficients indicate that in 2021 for every increase in the average distance from core amenities by 1 within a postcode district, the percentage of votes for right-wing populist parties increases by 0,013 in model 3, and by 0,011 in model 4.

4.2.2.2.6 Population Decline

The last category, population decline, presents varied outcomes for its three variables.

The first variable, “population change”, significantly correlates with left-wing populism in model 1 at the 95% level in 2021, the sole significant correlation observed for this variable. The coefficients indicate that within a postcode district in 2021, every increase in the percentage of population change in the past fifteen years by 1 results in a 0,07 decrease in votes for left-wing populist parties in model 1.

The subsequent variable, “natural population change” exhibits a significant correlation at the 95% level with right-wing populism in models 2 and 4 in 2017, and left-wing populism in model 4 in 2017. In 2021, “natural population change”, significantly correlates with right-wing populism in models 2 and 4.

The coefficients reveal that in 2017, every increase in the percentage of natural population change in the past fifteen years within a postcode district by 1 results in a 0,13 increase in the percentage of votes for right-wing populist parties in model 2 and a 0,21 increase in model 4. For left-wing populist parties, the percentage of votes increases by 0,11 in model 4. In 2021, for every increase of 1 in the percentage of natural population change within a postcode district in the past fifteen years, the percentage of votes for right-wing populist parties increases by 0,20 in model 2 and by 0,32 in model 4.

The final variable, “net migration”, only significantly correlates with left-wing populism in model 2 at the 95% level in 2017 and 2021. The coefficients of these correlations indicate that in model 2 every increase in the percentage of net migration over the past 15 years within a postcode district by 1 results in a 0,05 decrease in votes for left-wing populist parties in 2017 and a 0,06 decrease in 2021.

2017								
	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Population change	-0,029914		-0,005907		**-0,046820***		-0,021564	
Natural change		**0,139554*****		**0,213686*****		0,052269		**0,108529****
Net migration		-0,034970		-0,015153		**-0,049838****		-0,026805
Population ≥ 65 yr			**-0,297860*****				**-0,178419*****	
Damage claims earthquakes			0,000036	0,000014			**0,000403****	**0,000383****
Low income households			**0,109592*****	**0,113331*****			0,003632	0,003722
Loneliness			**0,483943*****	**0,412643*****			**0,815334*****	**0,786163*****
Ammenities distance			0,003456	0,002794			-0,000893	-0,001272
Constant	**0,142188*****	**0,141341*****	-0,065231	**-0,094963***	**0,179919*****	**0,179213*****	**-0,141009*****	**-0,163887*****
Observations	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000
λ	**0,721729*****	**0,623880*****	**0,685728*****	**0,706749*****	**0,664986*****	**0,694125*****	**0,494423*****	**0,500767*****

Table 13: Spatial regressions 2017 (* = 90% ** = 95% * = 99%)**

2021								
	(1) Right wing populism	(2) Right wing populism	(3) Right wing populism	(4) Right wing populism	(1) Left wing populism	(2) Left wing populism	(3) Left wing populism	(4) Left wing populism
Population change	-0,077400		0,003808		**-0,069287****		-0,034638	
Natural change		**0,201937****		**0,320979*****		-0,016116		0,053072
Net migration		-0,051537		0,013454		**-0,064307****		-0,029553
Population ≥ 65 yr			**-0,424675*****				-0,048797	
Damage claims earthquakes			-0,000303	-0,000301			0,000246	0,000221
Low income households			**0,121761*****	**0,125498*****			-0,018836	-0,017321
Loneliness			**0,461930*****	**0,425850****			**0,672866*****	**0,681485*****
Ammenities distance			**0,012774*****	**0,011485*****			0,002194	0,001867
Constant	**0,243231*****	**0,241767*****	0,013509	-0,059040	**0,149070*****	**0,145926*****	**-0,164935*****	**-0,177335*****
Observations	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000	157,0000
λ	**0,681313*****	**0,713617*****	**0,568877*****	**0,589662*****	**0,681762*****	**0,700007*****	**0,570811*****	**0,585811*****

Table 14: Spatial regressions 2021 (* = 90% ** = 95% * = 99%)**

5 Discussion

In this chapter, the results and statistical analysis are discussed. Here the outcomes of the statistical tests are placed in the context of the theoretical framework to answer research questions 3 to 6.

5.1 To what extent do the demographic effects of population decline correlate with voting behaviour?

The first part of the discussion answers the third research question: ”To what extent do the demographic effects of population decline correlate with voting behaviour?”

The analysis shows that the percentage of seniors within a postcode district significantly correlates with right-wing populism in the selected national and provincial elections. This correlation is negative, indicating that regions with high senior populations are less likely to vote for right-wing populist parties. This is in line with the research of De Voogd & Cuperus (2021), who state that seniors are less likely to vote for populist parties. Therefore, the ageing of the population, due to population can contribute to lower levels of right-wing populist voting.

For left-wing populist parties, the analysis shows that the ideology significantly correlates with the percentage of seniors within a postcode district in 2015 and 2017. Similarly to right-wing populism, these correlations are negative, indicating that regions with relatively high numbers of seniors are less likely to vote for left-wing populist parties in 2015 and 2017. While 2015 and 2017 align with the research of (De Voogd & Cuperus, 2021), the elections of 2019 and 2021 do not. This change in significance could have to do with the decline of left-wing populism in Groningen (See Figures 24-27). This can be explained by the shift of the protest vote from urban to rural communities, where right-wing populists perform better than left-wing populists (De Voogd & Cuperus, 2021). Since seniors tend to be loyal voters, they are less likely to be part of this protest vote (De Voogd & Cuperus, 2021). The size of the coefficients supports this, with the coefficient of left-wing populism being larger than that of right-wing populism in 2015.

5.2 To what extent do the economic effects of population decline correlate with voting behaviour?

The second part of the analysis addresses the fourth research question: “To what extent do the economic effects of population decline correlate with voting behaviour?”

The analysis reveals a significant correlation between the percentage of low-income households in a postcode district and support for right-wing populist parties in the selected national and provincial elections. These correlations are positive, suggesting that regions with relatively high percentages of low-income households are more likely to vote for right-wing populist parties. This finding aligns with research by van Leeuwen et al. (2020), who state that low-income households are more likely to support populist parties. Consequently, it is plausible that the potential economic deterioration due to population decline could increase support for right-wing populist parties.

For left-wing populist parties, the analysis shows significant correlations only in the 2015 elections. As with right-wing populism, the positive correlations indicate that regions with higher percentages of low-income households were more likely to vote for left-wing populist parties in 2015. While this finding for 2015 is consistent with the research of van Leeuwen et al. (2020), the other three selected election years do not align with their research.

The shift in protest votes from left-wing to right-wing populist parties may explain this change in significance levels (De Voogd & Cuperus, 2021). Economic hardship can lead to increased distrust in the government, resulting in protest votes (Lynch et al., 2022), thereby explaining this shift.

The coefficients for right-wing populism are larger than those for left-wing populism in every selected election year. This is consistent with Lynch et al. (2022), who state that low-income households are more likely to vote for right-wing populist parties rather than left-wing populist parties.

5.3 To what extent do the social effects of population decline correlate with voting behaviour?

The third part of the analysis answers the fifth research question: "To what extent do the social effects of population decline correlate with voting behaviour?"

The analysis indicates a significant correlation between support for right-wing populist parties and the percentage of people feeling lonely within a postcode district in the selected national and provincial elections. These positive correlations suggest that areas with relatively high levels of loneliness are more likely to vote for right-wing populist parties. his finding is consistent with research by Alexander Langenkamp (2021), which indicates that loneliness is associated with increased support for populist parties.

The analysis also shows significant correlations between support for left-wing populist parties and the percentage of people feeling lonely within a postcode district. This aligns with Langenkamp's (2021) findings that loneliness is linked to greater support for populist parties. Therefore, it is plausible that increased loneliness due to population decline could boost support for right-wing and left-wing populist parties.

Among all significant correlations in the models, the coefficients for the percentage of people feeling lonely are the largest. This supports the findings of Lynch et al. (2022), who argue that loneliness is a more accurate predictor of populist voting behaviour than economic or cultural factors.

Contrary to Lubbers & Scheepers (2000), the coefficients for left-wing populism are higher than those for right-wing populism in all models. Given the significant changes in populism since 2000, recent developments could explain this shift. The difference in country could also explain the difference, since Lubbers & Scheepers (2000) focussed on Germany, while Groningen is in the Dutch context.

5.4 To what extent do the effects of population decline on the availability of amenities correlate with voting behaviour?

The fourth part of the analysis addresses the sixth and final sub-question: "To what extent do the effects of population decline on the availability of amenities correlate with voting behaviour?".

The analysis reveals a significant correlation between the average proximity to facilities and the percentage of votes for right-wing populist parties in 2015 and 2021. These significant correlations are positive, indicating that in these two elections, right-wing populist parties received more votes as the average distance to facilities increased. The findings for these two elections align with research from De Voogd & Cuperus (2021).

For left-wing populist parties, the analysis shows a significant correlation between the average proximity to facilities and the percentage of votes in 2019. However, This correlation is negative, suggesting that left-wing populist parties received more votes when the average distance to facilities was shorter. This finding contrasts with De Voogd & Cuperus (2021).

One possible explanation for these unexpected results is that combining different types of facilities into a single variable may have affected the analysis. The disappearance of various amenities impacts different age groups in distinct ways (Hoover-Dempsey & Sandler, 1997; Glendinning et al., 2003; Machon et al., 2020; Zhang, Loo & Wang, 2021), which likely influences voting behaviour differently.

5.5 To what extent is there a relationship between local population decline and voting behaviour in the Groningen countryside?

The final part of the discussion is about the main research question: "To what extent is there a relationship between local population decline and voting behaviour in the Groningen countryside?"

The analysis indicates that the percentage of votes for left-wing populist parties significantly correlates with population change in 2019 and 2021 in model 1. However, after including other independent variables in model 3, these correlations lose significance. Since the percentage of votes for right-wing populist parties shows no significant correlations with population change, it is plausible that there is no increase that there is no increase in populist voting behaviour in regions experiencing population decline. This aligns with the findings of van Leeuwen et al. (2020), who found no significant correlations between populist voting behaviour and population decline. Consequently, hypotheses 1 and 2 are not supported, as neither right-wing nor left-wing populism significantly correlates with population decline.

Further analysis by splitting population change into natural population change and net migration might yield different results due to their different characteristics (Serow, 1996; CBS, 2024b).

The analysis reveals that the percentage of votes for right-wing populist parties significantly correlates with natural population change for the two selected national elections in model 2. In model 4, the percentage of votes for right-wing populist parties significantly correlates with natural population change across all selected national and provincial elections. These correlations are positive, indicating that population growth is associated with higher percentages of votes for right-wing populist parties.

For left-wing populist parties, significant correlations appear in model 4 only for the 2015 and 2017 elections. Similar to right-wing populist parties, these positive correlations suggest that regions with natural population growth are more likely to vote for left-wing populist parties.

Notably, the significant correlations of model 4 align with those for the percentage of seniors within a postcode district. The variable "Seniors" is excluded from model 4 due to multicollinearity concerns, which could have led to omitted-variable bias. Therefore the variable "Natural population change" may serve as a substitute for the percentage of seniors within a postcode district. Consequently, it is unlikely that the percentage of votes for either right-wing or left-wing populism significantly correlates with natural population change. This supports hypothesis 3, indicating that the percentage of votes for right-wing populist, left-wing populist, and localist parties does not significantly correlate with natural population change.

Regarding net migration, significant correlations appear only in model 2 for the percentage of votes for left-wing populist parties in 2017, 2019 and 2021. These correlations are negative, indicating that in these models, the percentage of votes for left-wing populist parties significantly correlates with migratory population decline. However, in model 4, after adding the other independent variables, there are no longer significant correlations between net migration and the percentage of votes for left-wing populist parties. This does not support hypotheses 4 and 4, which stated that the percentage of votes for right-wing and left-wing populist parties would significantly correlate with migratory population decline.

Therefore, the findings of van Leeuwen et al. (2020) that population decline does not significantly correlate with populist voting behaviour aligns with the findings of this thesis, despite the stronger population decline in Groningen’s Countryside compared to the rest Netherlands. Additionally, there is no significant correlation between any form of population decline and localist voting behaviour.

5.6 Localism & difference between national and regional elections

In addition to addressing the sub-questions and the main research question, other interesting findings emerged.

The percentage of votes for localist parties significantly correlates with only one independent variable: the percentage of damage claims in a postcode district, in both provincial elections. This aligns with Otjes et al., (2020), who found that individuals affected by the Groningen earthquakes are more likely to vote for localist parties. The lack of correlation between the percentage of votes for localist parties and any other independent variable, suggests that localist parties do not benefit as much as populist parties from the protest vote.

A comparison of the two types of elections reveals another interesting pattern. The model results show little difference between national and provincial elections. This finding supports the NOS (2023) exit-poll results, which, indicate that most people base their provincial council votes on national issues.

6 Conclusion

This thesis answers the research question: “To what extent is there a relationship between local population decline and voting behaviour in the Groningen countryside?” This question is answered using six sub-questions. In this conclusion, the results of the sub-questions are summarized, followed by an overall conclusion.

The first two sub-questions are answered using the maps in the results section.

The first sub-question is: “How are voting patterns spatially distributed in the countryside of the province of Groningen?”. The maps reveal that voting patterns differ spatially. Right-wing populism is concentrated in Eastern Groningen, left-wing populism in Northern Groningen, and localism in Central Groningen.

The second sub-question is: “How is population decline spatially distributed in the countryside of the province of Groningen?”. Different forms of population decline are mapped. Natural population decline primarily occurs in Eastern Groningen and Delfzijl and Surroundings, while migratory population decline is most prevalent in Northern Groningen and Delfzijl and Surroundings. Overall, Delfzijl and Surroundings experiences the highest levels of population decline, whereas Western Groningen experiences the lowest.

The remaining four sub-questions are answered through the quantitative analysis.

The third sub-question is: “To what extent do the demographic effects of population decline correlate with voting behaviour?”. The statistical analysis indicates that the demographic effects of population decline significantly correlate with the percentage of votes for right-wing populist parties. These effects also significantly correlate with the percentage of votes for left-wing populist parties from 2015 to 2017. However, it is plausible that due to a shift in the protest vote from left-wing to right-wing populist parties, this correlation is no longer observed. The analysis shows that regions with older populations are less likely to vote for right-wing populist parties. Seniors were also less likely to vote for left-wing populist parties from 2015 to 2017.

The fourth sub-question is: “To what extent do the economic effects of population decline correlate with voting behaviour?”. The statistical analysis reveals significant correlations between the economic effects of population decline and the percentage of votes for right-wing populist parties. The economic effects of population decline also correlate significantly with the percentage of votes for left-wing populist parties in 2015. Similar to the previous sub-question, the disappearance of these significance levels can be due to the protest vote shifting from left-wing to right-wing populist parties. Regions with more low-income households are more likely to vote for right-wing populist parties and were also more likely to vote for left-wing populist parties in 2015.

The fifth sub-question is: “To what extent do the social effects of population decline correlate with voting behaviour?”. The statistical analysis indicates significant correlations between the social effects of population decline and the percentage of votes for both right-wing and left-wing populist parties. The coefficients suggest that the social effects are the most accurate predictor for populist voting behaviour. The social effects are a stronger predictor for the percentage of votes for left-wing populist parties than right-wing populist parties. Regions with higher rates of loneliness are more likely to vote for both right-wing and left-wing populist parties.

The sixth sub-question is: “To what extent do the effects of population decline on the availability of amenities correlate with voting behaviour?”. The statistical analysis indicates significant correlations between the effects of population decline on the availability of amenities and the percentage of votes for right-wing populist parties in 2015 and 2021. Similarly, there is a significant correlation between the effects of population decline on the availability of amenities and the percentage of votes for left-wing populist parties in 2019. These seemingly inconsistent results could be due to the aggregation of the various types of amenities.

The conclusions outlined above provide a well-supported answer to the main question.

The main research question is: “To what extent is there a correlation between local population decline and voting behaviour in the Groningen countryside?”. The statistical analysis reveals significant correlations between natural population change and the percentage of votes for right-wing populist parties. Left-wing populism also shows significant correlations between their percentage of votes and natural population change, but only in 2015 and 2017. These correlations are likely significant because natural population change acts as a substitute for the excluded variable “seniors”. Consequently, there is likely no direct significant correlation between natural population decline and the percentage of votes for either right-wing or left-wing populist parties.

The statistical analysis shows no significant correlations between net migration and the percentage of votes for right-wing populist, left-wing populist and localist parties. Similarly, total population decline also shows no significant correlations with the percentage of votes for these ideologies. This aligns with the findings of Van Leeuwen et al. (2020), who state that there is no significant correlation between population decline and populist voting behaviour. This suggests that even though the Groningen countryside experiences higher levels of population decline than the rest of the Netherlands, there is still no significant correlation between population decline and voting behaviour for right-wing populist, left-wing populist, and localist parties.

While population decline does not correlate with populist or localist voting behaviour, some potential effects of population decline do significantly correlate with right-wing or left-wing populism. These effects concern the ageing of the demographic structure, the deterioration of the economic situation, and the weakening of social networks. Therefore, population decline’s influence on these factors could influence voting behaviour.

7 Reflection

Writing this thesis has been a journey of ups and downs.

On the positive side, the thesis has pushed me to acquire new skills and improve existing ones. I have significantly improved my skills in Excel and ArcGIS and learned to use GeoDa. My statistical skills have expanded as I learned about spatial regressions, and my writing abilities have also improved. This process has reinforced my passion for working with numbers, a field I wish to pursue further. Additionally, I enjoyed the thesis subject, which combined my interest in politics with population studies.

However, the process also had its challenges. The scope of the thesis may have been too broad, and I struggled to accurately estimate how long tasks would take. Consequently, the process took much longer than I had hoped, and I faced mental difficulties during this time. I neglected other aspects of my life, such as spending time with friends, as I did not allow myself time for those activities.

I am grateful to Leo van Wissen for his invaluable assistance throughout the process. Despite the challenges, I am proud that I persevered and can now submit a thesis I am proud of.

For future research, a qualitative study on the effects of population decline on voting behaviour could be valuable. Given that voting is a highly personal act, such a study could provide more context to the quantitative data. It could also verify whether the assumptions made in the data align with real-world behaviours and confirm what individuals in specific postcodes actually voted for.

Another potential research topic could explore the impact of voters in postcodes without voting booths. While their votes are included in this thesis, their influence on other polling stations is not accounted for, and their overall impact remains unknown. Investigating this group and their effect on the results in other postcodes would be beneficial, as it addresses a limitation of this thesis.

Lastly, a study on the effect of earthquakes on voting behaviour, particularly localism could be insightful. The results of my model indicate that earthquakes are the only variable significantly correlated with the percentage of votes for local parties. Understanding the implications of this significant correlation would be interesting.

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9. Appendix

2015

	P_DF_15	65+_15	IND_AA	LINK_15	SZ_15	ENZ_15	VOORZ_15
P_DF_15	1						
65+_15	-0,1255	1					
IND_AA	-0,1337	-0,1246	1				
LINK_15	-0,1348	0,2794	-0,1198	1			
SZ_15	-0,2405	0,1429	-0,1444	0,7411	1		
ENZ_15	-0,2521	0,3468	-0,0895	0,67	0,7489	1	
VOORZ_15	-0,235	-0,1218	0,0325	-0,0037	0,086	0,2057	1

Table 15: Correlation Matrix model 3 including Social Security 2015

	P_DF_15	65+_15	IND_AA	LINK_15	ENZ_15	VOORZ_15
P_DF_15	1					
65+_15	-0,1255	1				
IND_AA	-0,1337	-0,1246	1			
LINK_15	-0,1348	0,2794	-0,1198	1		
ENZ_15	-0,2521	0,3468	-0,0895	0,67	1	
VOORZ_15	-0,235	-0,1218	0,0325	-0,0037	0,2057	1

Table 16: Correlation Matrix model 3 excluding Social Security 2015

	P_B_15	P_M_15	65+_15	IND_AA	LINK_15	SZ_15	ENZ_15	VOORZ_15
P_B_15	1							
P_M_15	-0,4037	1						
65+_15	-0,8664	0,3395	1					
IND_AA	0,1067	-0,1795	-0,1246	1				
LINK_15	-0,262	0,0133	0,2794	-0,1198	1			
SZ_15	-0,1239	-0,1569	0,1429	-0,1444	0,7411	1		
ENZ_15	-0,303	-0,0734	0,3468	-0,0895	0,67	0,7489	1	
VOORZ_15	0,1393	-0,2901	-0,1218	0,0325	-0,0037	0,086	0,2057	1

Table 17: Correlation Matrix model 4 including Social Security and Seniors 2015

	P_B_15	P_M_15	IND_AA	LINK_15	ENZ_15	VOORZ_15
P_B_15	1					
P_M_15	-0,4037	1				
IND_AA	0,1067	-0,1795	1			
LINK_15	-0,262	0,0133	-0,1198	1		
ENZ_15	-0,303	-0,0734	-0,0895	0,67	1	
VOORZ_15	0,1393	-0,2901	0,0325	-0,0037	0,2057	1

Table 18: Correlation Matrix model 4 excluding Social Security and Seniors 2015

2017

	P_DF_17	_17	IND_AA	LINK_17	SZ_17	ENZ_17	VOORZ_17
P_DF_17	1						
_17	-0,1097	1					
IND_AA	-0,1495	-0,099	1				
LINK_17	-0,1281	0,3624	-0,112	1			
SZ_17	-0,2562	0,2173	-0,1335	0,6894	1		
ENZ_17	-0,2549	0,3967	-0,1298	0,6724	0,7705	1	
VOORZ_17	-0,2309	-0,1414	0,0586	-0,2239	-0,1286	-0,1036	1

Table 19: Correlation Matrix model 3 including Social Security 2017

	P_DF_17	_17	IND_AA	LINK_17	ENZ_17	VOORZ_17
P_DF_17	1					
_17	-0,1097	1				
IND_AA	-0,1495	-0,099	1			
LINK_17	-0,1281	0,3624	-0,112	1		
ENZ_17	-0,2549	0,3967	-0,1298	0,6724	1	
VOORZ_17	-0,2309	-0,1414	0,0586	-0,2239	-0,1036	1

Table 20: Correlation Matrix model 3 excluding Social Security 2017

	P_B_17	P_M_17	_17	IND_AA	LINK_17	SZ_17	ENZ_17	VOORZ_17
P_B_17	1							
P_M_17	-0,3827	1						
_17	-0,8413	0,3124	1					
IND_AA	0,1099	-0,1933	-0,099	1				
LINK_17	-0,2958	0,0265	0,3624	-0,112	1			
SZ_17	-0,1503	-0,1643	0,2173	-0,1335	0,6894	1		
ENZ_17	-0,3166	-0,0812	0,3967	-0,1298	0,6724	0,7705	1	
VOORZ_17	0,2001	-0,3134	-0,1414	0,0586	-0,2239	-0,1286	-0,1036	1

Table 21: Correlation Matrix model 4 including Social Security and Seniors 2017

	P_B_17	P_M_17	IND_AA	LINK_17	ENZ_17	VOORZ_17
P_B_17	1					
P_M_17	-0,3827	1				
IND_AA	0,1099	-0,1933	1			
LINK_17	-0,2958	0,0265	-0,112	1		
ENZ_17	-0,3166	-0,0812	-0,1298	0,6724	1	
VOORZ_17	0,2001	-0,3134	0,0586	-0,2239	-0,1036	1

Table 22: Correlation Matrix model 4 excluding Social Security and Seniors 2017

2019

	P_DF_19	65+_15	IND_AA	LINK_19	SZ_19	ENZ_19	VOORZ_19
P_DF_19	1						
65+_15	-0,1107	1					
IND_AA	-0,1543	-0,0911	1				
LINK_19	-0,1489	0,3468	-0,0802	1			
SZ_19	-0,2439	0,254	-0,1939	0,6985	1		
ENZ_19	-0,256	0,4064	-0,1137	0,7324	0,7977	1	
VOORZ_19	-0,288	0,0001	0,0354	-0,0072	0,0685	0,1133	1

Table 23: Correlation Matrix model 3 including Social Security 2019

	P_DF_19	65+_15	IND_AA	LINK_19	ENZ_19	VOORZ_19
P_DF_19	1					
65+_15	-0,1107	1				
IND_AA	-0,1543	-0,0911	1			
LINK_19	-0,1489	0,3468	-0,0802	1		
ENZ_19	-0,256	0,4064	-0,1137	0,7324	1	
VOORZ_19	-0,288	0,0001	0,0354	-0,0072	0,1133	1

Table 24: Correlation Matrix model 3 excluding Social Security 2019

	P_B_19	P_M_19	65+_15	IND_AA	LINK_19	SZ_19	ENZ_19	VOORZ_19
P_B_19	1							
P_M_19	-0,4029	1						
65+_15	-0,8442	0,3074	1					
IND_AA	0,1109	-0,1955	-0,0911	1				
LINK_19	-0,2933	0,0053	0,3468	-0,0802	1			
SZ_19	-0,2026	-0,1259	0,254	-0,1939	0,6985	1		
ENZ_19	-0,3561	-0,0626	0,4064	-0,1137	0,7324	0,7977	1	
VOORZ_19	0,0946	-0,3105	0,0001	0,0354	-0,0072	0,0685	0,1133	1

Table 25: Correlation Matrix model 4 including Social Security and Seniors 2019

	P_B_19	P_M_19	IND_AA	LINK_19	ENZ_19	VOORZ_19
P_B_19	1					
P_M_19	-0,4029	1				
IND_AA	0,1109	-0,1955	1			
LINK_19	-0,2933	0,0053	-0,0802	1		
ENZ_19	-0,3561	-0,0626	-0,1137	0,7324	1	
VOORZ_19	0,0946	-0,3105	0,0354	-0,0072	0,1133	1

Table 26: Correlation Matrix model 4 excluding Social Security and Seniors 2019

2021

	P_DF_21	_21	IND_AA	LINK_20	SZ_21	ENZ_21	VOORZ_21
P_DF_21	1						
_21	-0,0009	1					
IND_AA	-0,2066	-0,0428	1				
LINK_20	-0,0992	0,2602	-0,1307	1			
SZ_21	-0,2139	0,1679	-0,1622	0,6504	1		
ENZ_21	-0,2643	0,3196	0,0407	0,6872	0,7593	1	
VOORZ_21	-0,2804	-0,0714	0,0761	-0,1862	-0,1286	-0,1493	1

Table 27: Correlation Matrix model 3 including Social Security 2021

	P_DF_21	_21	IND_AA	LINK_20	ENZ_21	VOORZ_21
P_DF_21	1					
_21	-0,0009	1				
IND_AA	-0,2066	-0,0428	1			
LINK_20	-0,0992	0,2602	-0,1307	1		
ENZ_21	-0,2643	0,3196	0,0407	0,6872	1	
VOORZ_21	-0,2804	-0,0714	0,0761	-0,1862	-0,1493	1

Table 28: Correlation Matrix model 3 excluding Social Security 2021

	P_B_21	P_M_21	_21	IND_AA	LINK_20	SZ_21	ENZ_21	VOORZ_21
P_B_21	1							
P_M_21	-0,6399	1						
_21	-0,8344	0,4686	1					
IND_AA	0,1064	-0,2194	-0,0428	1				
LINK_20	-0,2527	0,0655	0,2602	-0,1307	1			
SZ_21	-0,1937	-0,0562	0,1679	-0,1622	0,6504	1		
ENZ_21	-0,3149	-0,027	0,3196	0,0407	0,6872	0,7593	1	
VOORZ_21	0,1972	-0,3274	-0,0714	0,0761	-0,1862	-0,1286	-0,1493	1

Table 29: Correlation Matrix model 4 including Social Security and Seniors 2021

	P_B_21	P_M_21	IND_AA	LINK_20	ENZ_21	VOORZ_21
P_B_21	1					
P_M_21	-0,6399	1				
IND_AA	0,1064	-0,2194	1			
LINK_20	-0,2527	0,0655	-0,1307	1		
ENZ_21	-0,3149	-0,027	0,0407	0,6872	1	
VOORZ_21	0,1972	-0,3274	0,0761	-0,1862	-0,1493	1

Table 30: Correlation Matrix model 4 excluding Social Security and Seniors 2021