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Shrinking and Growing Regions in the Northern Netherlands

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Collaborative Data Project

Minor Data Wise

Authors: Augustin Procopi (s34842760 | a.procopi@student.rug.nl), Qihao Yi (s3414434 | q.yi.2@student.rug.nl), Raili Engler (s3140091 | r.engler@student.rug.nl), Rik Keppel (s3773787 | t.h.keppel@student.rug.nl), Tim Kramer (s2770660 | t.m.kramer@student.rug.nl), Wilbert van Renselaar (s3447294 | h.w.van.renselaar@student.rug.nl)

Supervisor: Arya Babai (m.babai@rug.nl)

External supervisor: Jelmer Hitzer (jr.hitzert@cbs.nl)

Abstract

The Dutch provinces Groningen, Friesland and Drenthe consist of growing and shrinking municipalities. The aim of this project is to gain insight into the housing market in Northern Netherlands. The selected indicators for this study are housing stock, housing price, population dynamics, satisfaction with the region, willingness to move and perceived vacancy rate. The indicators are visualised and analysed in the dashboard and by using statistical testing. Based on our datasets, the housing price and satisfaction with the region is higher in growing regions, the perceived vacancy rate is higher for shrinkage regions and the population increase is higher for regions that are nearby county capitals compared to regions that are located further away. However, no significant difference was found in the housing stock increase among shrinking and growing regions. Another finding is that the willingness to move is higher for growing regions. The findings of this study and the corresponding dashboard can be used to support policymaking but there are also implications for future research. A further study could assess the differences between rural and urban regions within shrinkage and urban regions. It is strongly recommended to read this report as a supporting document to our dashboard; the dashboard is the main deliverable of the project.

Content

1. Introduction

This project is set up in collaboration with the minor Data Wise and CBS North-Netherlands. The official English concept for CBS (Centraal Bureau voor de Statistiek) is Statistics Netherlands. The mission of Statistic Netherlands is to publish reliable and coherent statistical information which responds to the needs of Dutch society. The responsibility of CBS is twofold: firstly, to compile (official) national statistics and secondly to compile European statistics. Statistics Netherlands is since 2004 an autonomous administrative body (Huygens, n.d.). This means that CBS performs public service tasks but operates independently and not under the direct authority of a Dutch ministry. The Minister of Economic Affairs and Climate is politically responsible for relevant legislation, budget, and conditions. CBS is financed from the state budget. (Business.gov, 2020).

The project partner from CBS is Jelmer Hitzert. After studying the masters Real Estate and Cultural Geography at the University of Groningen, Jelmer held several positions in governmental companies. Such as, Kadaster, Ministry of Economic Affairs and Fries Social planning agency. Since May 2019, he has been working at CBS as a Coordinator of the Urban Data Centres..

The CBS publishes dashboards between-whiles. The plan for our dashboard is not that it will be directly posted by CBS since the standards of those dashboards lie far beyond our knowledge and skills. However, the CBS is considering building a housing market dashboard for Northern Netherlands and will use our dashboard as an example. For example, as an instance for the selection of indicators or for ways of visualising. Therefore, our work will not be directly used, but certain aspects/parts. When the project is finished and our dashboard is transmitted to CBS, the team is excited to see what parts will be taken over.

The main aim of this paper is to investigate the housing market in the North of the Netherlands, especially the shrinkage regions in comparison with growing regions. Stuart-Fox et al. (2019) identified two types of shrinkage regions: population shrinkage and household shrinkage. Population shrinkage is used to define shrinkage regions. Growing regions are identified by whether the population is increasing in that region. According to Rijksoverheid (2019), the three northern provinces have several shrinkage or potential shrinkage regions. Groningen and Friesland contain shrinkage regions and Friesland and Drenthe contain potential shrinkage regions. Potential shrinkage regions are regions that do not undergo population shrinkage at the moment but are likely to do in the future. SER (2010) states that shrinkage is a combination of different demographic processes, like aging, migration and the birth rate. The interaction of these factors is various in different shrinkage regions. Therefore it is hard to provide a blueprint for shrinkage regions regarding population dynamics. SER (2010) also noticed that there are some shrinkage regions in the North of the Netherlands. Overall, the three northern provinces will have a slight and flattening increase of

population. The population increase is mainly caused by the growing cities. Especially younger people are moving from rural areas to cities for their study. For Drenthe it is also likely that affluent elderly will move to Drenthe for their retirement (SER, 2010). That can lead to a rare combination of youth population decline and population growth.

Stuart-Fox et al. pointed out that the northern province Groningen is subject to earthquakes in several parts of the province. This can both have an impact on the social and economic environment but also on the housing market. The liveability of the region has decreased over time, the housing prices are lower and it takes more time to sell a house. According to Boelhouwer et al. (2016), earthquakes are the main motive in these regions to move to another region. We can conclude that the earthquakes in Groningen are an important factor while considering shrinkage in these regions. The municipalities that are in the earthquake area and are also shrinkage regions are Appingedam, Delfzijl, Loppersum, Eemsmond, and De Marne.

Considering all above mentioned, we were able to come up with the following general research question for our research paper. Important to mention that this research paper is an addition to the dashboard we build, this dashboard should be seen as our main deliverable.

Research Question: *What insights can be found regarding the dynamics of the housing market in the Northern Netherlands using open data?*

In the following section, the indicators will be described more elaborately by using past research and literature. Based on the literature research, six hypotheses, one for each indicator, will be drawn up.

2. Indicators

A look will be taken at six indicators that are related to shrinkage/growing areas. The selected indicators are divided into two categories: registered [H1-H3] and subjective indicators [H4-H6]. More information about the selection of the indicators can be found in the progress report (Procopi et al., 2020).

2.1. Housing stock

There are two components of the housing stock, the countryside housing stock and the urban housing stock. Heins (2004) states in his report that the rural housing stock also has the requirements to protect the rural area from urbanization because of nature conservation. This can possibly lead to a shortage of housing stock in rural areas since the construction of new houses is limited. Heins also points out that this limitation is less important for the urban areas since there is less nature to conserve or protect.

When we come to the situation in the north of the Netherlands, there are different trends between the housing stock in rural areas compared to the cities. Sociaal Planbureau Groningen (2019) shows that the housing stock in the cities, e.g. Groningen, is increasing. Whereas the housing stock in the rural part of the shrinkage regions is decreasing. There is a small increase of the housing stock in the urban part of shrinkage regions. However, this is a significantly smaller increase compared with cities in regions that are not exposed to shrinkage. Deilmann et al. (2009) shows as well that shrinkage regions in Europe will lead to a decrease of the housing stock. A housing stock decline of 1 percent a year is necessary for some regions to maintain the vacancy rate of homes below 20 percent. In line with the previous research, the first hypothesis states:

H1: The housing stock is increasing faster in the growing municipalities compared to shrinkage municipalities. Even a stock decrease is possible in shrinking municipalities.

2.2. Housing price

Several attempts have been made to get a better understanding of the relation between housing prices and the dynamics of the population. Previous research has established that there is a relationship between these two factors. Maennig (2008) found out that there is a negative relationship between the shrinkage of the region and the housing price; i.e. the housing price decreases if a region undergoes shrinking. However, the effect of the population dynamics on the housing price is weaker when a region is growing. Feng et al. (2018) and Glaeser & Gyourko (2005) confirms this asymmetrical reaction of the housing prices with regards to population dynamics. In other words, the housing price is decreasing at a higher rate when the

population decreases compared to housing price decrease when the population increases. These articles indirectly suggest that the housing price will increase higher in growing regions compared to shrinkage regions. Having considered the research mentioned above, the second hypothesis states:

H2: The relative increase of housing prices is higher in growing municipalities compared to the shrinking municipalities.

2.3. Population dynamics

Dam et al. (2018) mentioned that there is a considerable amount of migration from the north of the Netherlands to the Randstad. The reason behind this phenomenon might be the increasing inequality between the wages, as Hamouda et al. (2012) states in his paper. The wages within the Randstad area tend to increase faster than other areas in the Netherlands. Broersma and Oosterhaven, (2009) mentioned another explanation for the migration to the Randstad, namely that there is a positive relationship between the agglomeration effect and economic development in for example the Randstad. So the Randstad area tends to enjoy superior advantages in attracting migration by offering a higher variety of jobs.

Besides the migration to the Randstad, there is migration from rural to urban regions within the three Northern provinces because there are more jobs or education facilities within the cities (CBS, 2008). On other hand, Kempen et al. (2000) state that some people tend to move from cities to rural regions because of for example unaffordable housing costs in the city. However, Heins et al. (2004) and Fuguitt and Zuiches (1975) show that people will move from the city to rural areas but the rural areas nearby the city are preferred above the rural areas which are far from the city since the majority of jobs are within the cities. The three county capitals -Groningen, Leeuwarden and Assen- are the three biggest cities regarding population density (Rijksoverheid, 2019) Having considered the previous research mentioned above, the third hypothesis is stated:

H3: The municipalities near the county capitals ánd the county capital will have a higher population increase compared with municipalities that are far from the county capitals.

2.4. Satisfaction with the region

Most studies investigate residents' general satisfaction with their home, including the actual house, the neighborhood and region. Residential satisfaction is the subjective evaluation of various house, neighborhood and regional characteristics. Satisfaction with the region has however been shown to be an

essential independent predictor of housing satisfaction (Abidin et al., 2019). The indicator that is going to be focused on in this research is residents' satisfaction solely with the living environment in the region.

One of the main predictors of regional satisfaction is the distance travelled to medical centers, schools, shopping, work etc (Abidin et al., 2019). Quality of streets and roads, homogeneity regarding social class, race, and ethnic group, crime rates and the physical environment also factor into the reported neighborhood satisfaction (Abidin et al., 2019).

Positive neighborhood norms are an important basis for residents' neighborhood satisfaction and attachment (Van Assche et al., 2019). These norms are unwritten social rules for interactions with neighbors and one's behavior in common spaces (Van Assche et al., 2019). The presence of positive neighborhood norms in the form of friendships, mutual trust, helping and a sense of community have shown to result in higher neighborhood satisfaction and could also predict lower moving intentions of the residents (Van Assche et al., 2019). The previous research on this topic leads to this data project's fourth hypothesis:

H4: Satisfaction with the region is higher in growing regions, compared to shrinking regions.

2.5. Willingness to move

Mobility as defined by Speare in his 1974 study on residential satisfaction can be measured by the wish to move to a new home in the first year and subsequent mobility one year later. He found the wish to move in the first year to be positively related to subsequent mobility. Naturally, satisfaction with the initial home was negatively related to wish to move and subsequent mobility. Residential satisfaction, wish to move, duration of residence, and home ownership had significant independent effects on subsequent mobility. However, together these factors only explained 24 per cent of the variance in residential mobility, while residential satisfaction and home ownership explained 25 per cent of the variance in residents' wish to move.

This clearly raises the question of what factors into the variables in order to explain the other circa 75 percent of the mobility and wish to move variables. Why do all factors together only account for 25 per cent of the variance in residential mobility? One may consider that the wish to move is not the same as the propensity to move, which would indicate that the residents have desires, plans, inclinations or expectations about future mobility (Morris et al., 1976). Still, why does residential satisfaction have a relatively small impact on the wish to move? One may contemplate whether people often move spontaneously, whose intention or desire to move is not caught by the 'wish to move' variable. They may be happy with their house, however stumble across one that they feel would suit them better, and spontaneously move.

Additional factors that may factor into the intention or desire to move are financial constraints, family and personal circumstances, housing stock and various other indicators also considered in this project. One should also consider that in most studies on this topic, residential mobility includes any move, even if it is just down the block. The shrinkage regions in the North of the Netherlands considered in our project are larger regions and are concerned with mobility over longer distances than within local neighborhoods. Nonetheless, the trend of the literature on this topic indicates that the willingness to move is a significant predictor of subsequent changes in address. The fifth hypothesis therefore states:

H5: Residents in shrinking regions report a higher willingness to move than those in growing regions.

2.6. Vacancy rates of homes

In 2014, more than 400 thousand houses were unoccupied and 190 thousand remain unoccupied for more than 18 months in the Netherlands (Statistics Netherlands, 2014). An increasing vacancy rate indicates that the region would indicate shrinking. Nonetheless, due to the decline in population, an increasing vacancy of housing will be inevitable (PBL Netherlands Environmental Assessment Agency, 2010). Residents of the area may notice this trend when the streets and neighbourhood get emptier. Stores, medical centers and schools may also reduce in number. Location is a primary factor people take into consideration when deciding on which property to buy (Abidin et al., 2019). The easy mobility and closeness of facilities provided by cities has attracted large parts of the global population for the past decades (Abidin et al., 2019). Therefore, one may expect that if people notice the vacancy rate of homes in their neighbourhood rising, they plan differently for the future as they foresee facilities and mobility to also reduce. If regular citizens have noticed an increased vacancy rate, private investors and builders are probably also less likely to purchase properties in the area, which could halt the housing market all together. This line of reasoning guides the sixth hypothesis explored in this project:

H6: The vacancy rate of homes is higher in shrinking regions, compared to growing regions.

3. Main deliverable

Our main deliverable is a dashboard of the housing market in the Northern Netherlands. The Northern Netherlands has regions that undergo shrinkage whereas other regions are growing slightly or more extreme. This dashboard was built to provide better insight in the indicators that are relevant for the population dynamics of regions.

The dashboard shows visualisations of 6 indicators which are divided into two sub-categories: registered and subjective indicators. The registered indicators are visualised using public CBS data that is provided on Statline. The three registered indicators are housing stock, housing price and population dynamics. The data is visualised on municipality level for the years 2015-2019. The subjective indicators are based on the Woon Onderzoek 2018 (Residence Investigation 2018). Woon Onderzoek 2018 is a national questionnaire with subjective questions filled in by a representative number of Dutch inhabitants. The three subjective indicators are satisfaction with the region, willingness to move and the vacancy rate in the region. The data is visualised on COROP region level, that is a group of adjacent municipalities, for the year 2018. The dataset was retrieved from DANS (Data Archiving and Networked Services). Several different ways of visualisation, such as maps, graphs and boxplots, are used to visualise the data in a structured manner.

An accountability section is also available on the dashboard. The accountability section contains a summary of the provided information, the references to the used data sets, information about the handling of data from merged municipalities and information about the legal issues. Besides the accountability section, there is a download section. This section contains links for downloading the reports and datasets used.

4. Method

The methods that are used in the research are described on three levels; the gathering, processing and analysis of data

4.1. Data gathering

To test the stated hypotheses, data was collected to describe the indicators of interest. Several open data sources were used which took into account the North of the Netherlands. The CBS provides two main sources of data that are relevant for this study: Statline and Woon Onderzoek. Statline is the platform where CBS publishes numerous datasets regarding broad, nationwide subjects.

A dataset on the dwelling and non-residential stock is used to visualise the housing stock (CBS, 2020a). Only the dwelling stock is used in the dataset since the housing stock is investigated instead of the whole building stock. The housing stock is based on the initial stock, new constructed houses, other auditions (e.g. from non-residential to residential), demolished houses and other withdrawals (e.g. from residential to non-residential). CBS (2020a) shows that the data is abstracted from the Key Register Addresses and Buildings (BAG). This registers all the addresses in the Netherlands and these are provided by all the municipalities.

The development of the housing purchase prices is represented by a dataset that contains data about the average purchase price (CBS, 2020b). The average purchase price is calculated by sum up the purchase transactions divided by the number of sold houses. CBS (2020b) retrieves the data from the Netherlands' Cadastre, Land Registry and Mapping Agency (Kadaster); the Kadaster is involved in all the purchases of the houses. It is the official registry of all purchases of houses, which is why it can be considered a trustworthy and valid source.

CBS (2020c) is a data set about the population dynamics of the Netherlands. This dataset is used for the indicator migration within the region since it provides information about the population growth or decrease for each municipality which is related to migration. Especially, the population growth ratio (per thousand inhabitants) is retrieved from the data to describe the relative change of population. CBS (2020c) based the data on the Municipal population register and this data is quite accurate. Only in a few cases, data is missing and then the CBS will estimate the values itself with the help of statistical methods.

The Woon Onderzoek 2018 dataset is used for all the three subjective indicators (see Table 1). The Woon Onderzoek is a survey that is conducted by Dutch citizens in which they are asked questions about their way of life, their satisfaction with their region, the type of house they live in, etc. (Dugteren et al.,

2019). BZK (2017) shows that the WoonOnderzoek is made representative with the use of oversampling if the sample is overrepresented or underrepresented. A weighting factor is applied to correct these samples for over- or underrepresentation and make them representative. However, oversampling is only applied by Woon Onderzoek if the outcomes will be reliable on a level of 95 percent.

Indicator	**Question**
Satisfaction with the region	How satisfied are you with the region where you are living?
Vacancy rate of homes in neighbourhood	How has the vacancy rate of homes in your area changed in the past 5 years?
Willingness to move	Do you want to move within 2 years?

Table 1: Questions from the Woon Onderzoek which represents the subjective indicators

4.2. Data processing

Initial data processing for the CBS datasets entailed filtering out municipalities that are or were not in the provinces Drenthe, Friesland or Groningen. The CBS datasets were extracted into the dashboard using CBS's Application Programming Interface (API). This API enabled us to programmatically extract the data in a machine-readable format: ideal for use in a dashboard. Since the datasets do not contain a column describing which province each municipality belongs to, these datasets were combined with a dataset describing all municipalities that existed in 2019 including which province they belong to (CBS, n.d.). Combining these two datasets removed all municipalities that did not exist in 2019 from the data as a side effect.

Due to name changes, fusions, and other mutations, some municipalities did not exist over the entire 2015-2019 timespan. This resulted in missing data for these municipalities. For example, the municipality Midden-Groningen came into existence in 2018 as result of the fusion between the municipalities Hoogezand-Sappemeer, Slochteren and Menterwolde. This means that over the period 2015-2017 there is no data on Midden-Groningen, even though there were people living there.

Data was imputed to account for these missing data caused by mutations in municipalities. All mutations for municipalities in the North of the Netherlands (Drenthe, Friesland & Groningen) over the period 2015-2019 were collected. All of these mutations were consequently applied not only to the year they actually happened, but all years before as well. So for example, in the case of the municipality of Midden-Groningen, the fusion of its constituent municipalities was applied in 2015, 2016 and 2017 as well. This means that for

the variables housing stock and population, the values of Hoogezand-Sappemeer, Slochteren and Menterwolde were added to the (missing) values for housing stock and population of the municipality Midden-Groningen in 2015, 2016 and 2017. For the variable housing price, the average housing price of each constituent municipality was multiplied by its total number of houses (housing stock), added to the new imputed price field and subsequently divided by the imputed housing stock in that year. Due to the complexity of the operation combined with the format inconsistencies of the mutations, this imputation was done manually in Excel.

For the Woon survey data, very limited processing was necessary. After removing all respondents that were not from the North of the Netherlands, the only processing necessary was to count the frequency of each response per region and age group. As there was no missing data in our subsample (the North of the Netherlands) no further processing was needed.

4.3. Data analysis

The first two hypotheses of the registered indicators related respectively the housing stock and the housing price to the shrinkage and growth of regions. To these hypotheses, a differentiation is made between shrinkage and growing regions for the years 2015-2019, based on the data about the population dynamics. The means for respectively percentage housing stock change and percentage housing price change in growing and shrinking regions are compared with the help of the two-sample t-test. This test is suitable to compare two means and identify whether they are statistically significantly different from each other. The t-test requires independent variables, equal variances and normal distribution (McCrum-Gardner, 2008) and the used data affirms these requirements. The means on the municipality level are unknown since only the mean value for each municipality is given. However, the test is still suitable to use on the level of growing/shrinking region level, since the mean and variance is determined by the values of the municipalities and not the variance of the municipalities themselves.

The data for the population dynamics is also used to test the third hypothesis. A look will be taken at the population growth between 2015 and 2019 with respect to the municipalities with the highest population density: Groningen, Assen and Leeuwarden. The municipalities that are adjacent to these municipalities and the county capitals themselves are considered as municipalities that are near the county capitals whereas the other municipalities are considered as municipalities that are far from the county capitals. The municipalities Loppersum and Noardeast-Fryslân were adjacent to the county capital municipalities after but not before the merger of municipalities. These municipalities are considered as far from the county capital, since they are most of the time not adjacent to the county capitals for the observed time frame. The

means for the population growth for the ‘municipalities near the county capitals’ and the ‘municipalities far from the county capitals’ were tested.

The answers to the selected questions of the WoonOnderzoek 2018 are on the level of COROP regions [3 per province]. The answers to the questions in table 1 are analyzed separately per question. For the analysis, the COROP regions are separated into two categories: growing and shrinking regions. The mean is taken from the answers which are placed on a numeric scale from 1-5; where 1 is the one extreme and 5 the opposite extreme. The means for shrinkage and growing regions are compared to see if there is a significant difference between shrinking and growing regions for each question. The results of the analysis will show if the stated hypotheses are confirmed or rejected. This test is suitable since these variables of interest are, once again, tested independently from each other, can be assumed to have the same variance, and a normal distribution within the group.

The WoonOnderzoek also provides information about the age group of the respondents. To find out if there are significant differences between the age groups, an F-test is applied. The F-test is suitable to compare the means of more than two groups on their (in)significant difference (Winters et al., 2010). Therefore this test is suitable to see if there is a difference in mean between the 7 different age groups. If there is a significant difference between the age groups, age groups can become an indicator in the dashboard. If there are no significant differences, there is no need to display age groups separately. Significant differences can possibly help to explain which age groups are contributing more or less to a significant difference in the total mean between shrinking and growing regions. In the following section, the results of our data analysis will be presented.

5. Results

To start with, the dashboard of the housing market in Northern Netherland is the main deliverable/result of our research. Because part of this project is doing academic research, the dashboard is supported by this report in which we analyse the parts and figures displayed on the dashboard. Certain conclusions drawn based on the visualisations are added in the dashboard itself. To prevent overlapping between our dashboard analysis and report analysis, the dashboard can also be perceived as a significant part of our results. In this part, all 6-hypothesis stated in the literature overview will be analysed using significance testing and other methods.Registered indicators

Type of Municipality	**N**	**Mean**	**T-value**
Shrinking	21	1.03	-4,50 ***
Growing	21	2.77	
Significant values are indicated with * for P<0.10 ** for P<0.05 and with *** for P<0.01, no star: not significant			

Table 2: T-test for relative housing stock change between 2015-2019

H1: The housing stock is increasing faster in the growing municipalities compared to shrinkage municipalities, even a stock decrease for shrinkage municipalities is possible. - confirmed

In table 2, we can conclude with 99% significance that the stock increase in growing municipalities is relatively higher than the stock increase in shrinking municipalities when assuming equal variances. In addition, graph 1 is added which visualises the distribution of the data for both groups. For this hypothesis as well as for the second one, both groups consisted of 21 municipalities. A clear boxplot of the results can be found in appendix 3.

Type of Municipality	**N**	**Mean**	**T-value**
Shrinking	21	25.78	-1,19
Growing	21	29.61	
Significant values are indicated with * for P<0.10 ** for P<0.05 and with *** for P<0.01, no star: not significant			

Table 3: T-test for relative price change between 2015-2019

H2: The relative increase of housing prices is higher in growing municipalities compared to the shrinking municipalities. - rejected

In table 3 the outcome of the t-test on price changes is shown. There is a mean difference between shrinking and growing municipalities, however the t-test shows that this mean difference is not significant for either 90%, 95% or 99% level. A clear boxplot of the results can be found in appendix 3.

Type of Region	**N**	**Mean**	**T-value**
Near county capital	16	2.24	-1,89*
Far from county capital	26	-0.26	
Significant values are indicated with * for P<0.10 ** for P<0.05 and with *** for P<0.01, no star: not significant			

Table 4: Population dynamics between 2015-2019

H3: The municipalities near the county capitals and the county capital will have a higher population increase compared with municipalities that are far from the county capitals. - confirmed

The results of the last hypothesis regarding registered data can be found below in table 4. We are able to conclude with more than 90% certainty that municipalities 'far from county capital' having lower population increase compared to municipalities close to the capitals of the three Northern provinces Groningen, Friesland and Drenthe.

5.1. Subjective indicators

Part I: Dashboard

To determine whether displaying the subjective data per age group or on Northern Netherland level. The ANOVA test was used on the available data to observe significant differences among age groups. The results of those test are shown in the following table.

Subject	**N**	**F-value**
H5: Satisfaction with the region	4821	12,219***
H5: Willingness to move	4821	125,15***
H6: Vacancy rate	4821	11,16***
Significant values are indicated with * for P<0.10 ** for P<0.05 and with *** for P<0.01, no star: not significant		

Table 5: ANOVA test outcomes for difference among age groups

Table 5 shows that for all questions, we can state with more than 99% certainty that there is a significant difference among age groups on Northern Netherlands level. Based on this outcome, we assume that the

same will hold for COROP regional level and therefore age groups are displayed separately next to the overview per COROP-region (see dashboard).

Part II: Hypotheses

Type of Region	N [H4,H5]	Mean H4	T-value H4	Mean H5	T-value H5	N [H6]	Mean H6	T-value H6
Shrinking	982	3,58	-3,14***	1,57	-2,91***	812	3,16	3,68***
Growing	3839	3,72		1,68		3080	3,07	
Significant values are indicated with * for P<0.10 ** for P<0.05 and with *** for P<0.01, no star: not significant								

Table 6: Tests for subjective indicators

To analyse the hypotheses stated in the literature review, several tests were performed on COROP regional level. In table 6 below, a summary of the performed tests is given. Underneath the table, the results are explained, and possible explanations are given for each hypothesis.

H4: Satisfaction with the region is higher in growing regions, compared to shrinking regions. - confirmed

As shown in table 6, this study found enough evidence to conclude with more than 99% significance that people living in the growing areas in Northern Netherlands are experiencing a higher satisfaction rate compared to shrinking areas.

H5: Residents in shrinking regions report a higher willingness to move than those in growing regions. - rejected

Also, for the fifth hypothesis significant results were found on a 99% significance level. Other than expected, the results prove that people in shrinking areas are less willing to move in the coming 2 years compared to growing areas. Possible explanations and literature support will be given in the ‘discussions and advice’ section.

H6: The vacancy rate of homes is higher in shrinking regions, compared to growing regions. - confirmed

For the sixth and last hypothesis, enough evidence was found for the obvious effect of perceived vacancy rate in shrinking areas being heavier compared to growing areas. The sample set was around 18,5% smaller because the respondents who choose the ‘do not know’ option were removed from the dataset (see appendix 2).

In the following section, the results will be summarized followed by a discussion of our results and suggestions for further research will be given.

6. Discussion and advice

The main goal of this project was to create a housing monitor of shrinking and growing regions in the North of the Netherlands. Based on thorough literature reviews a number of indicators were taken under closer inspection in order to investigate their relationship to growing and shrinking regions. The data show that some of these market variables had a stronger identifying nature than others. Possible explanations, shortcomings and strengths of theory and research methods will be discussed further.

Instead of collecting data, previously collected datasets were reanalyzed for the purpose of this project. This provided a number of benefits, such as high reliability and validity and time. However, it also causes a number of limitations as to what can be concluded based on the available data. Previous research has been going deeply into the division between rural and urban areas, rather than growing and shrinking regions. In most Western countries, rural areas are also those that are shrinking; while urban areas are growing. Nonetheless, little can be said about this division in this project as these variables were not recorded. Additionally, only certain data was made available. For the housing price indicator, this data is on a municipality level with 42 scores. The thousands of pieces of data that were aggregated to these 42 scores were not made available. Aside from the data provided for this project, a number of other limitations have made more far reaching and concrete conclusions difficult. One is the possibility of unknown unknowns, which is a term used to describe all the information that may have gone unnoticed and could impact outcomes of the project. As none of the group members had a background in spatial sciences or the housing market, unknown unknowns were a risk. Nonetheless, a thorough literature review into previous research and discussion between members was a means to try to prevent this. Additionally, within the five year span that will be displayed in the dashboard, some municipalities divided and others merged. In order to maintain continuity when creating graphs, the assumption was made that the ratio that divided the municipalities would be the same in the years before the division, which is likely not 100 percent accurate. Finally, a general limitation of the dashboard is that it is purely informational, as it does not directly point in any direction that policy-makers can use to make decisions regarding the housing market. On the other hand, CBS's mission is to provide reliable information to policy makers that they can use to make decisions, rather than influencing them into certain directions.

Analysis of the data points to the conclusion that there is a significant countrywide increase in housing stock over the years. The difference in housing stock increase between growing and shrinking municipalities is also significant, with it being more pronounced in growing rather than shrinking regions, supporting the first hypothesis. Previous research suggests there to be a difference in housing stock dynamics between urban centers of shrinkage regions versus their rural part; rural parts are often actually

experiencing a decrease in housing stock, while their urban centers experience a small increase. Therefore, the data suggest the rural regions of shrinkage regions to have a larger decrease in housing stock, than urban centers are experiencing an increase. Nonetheless, the division of shrinkage regions into their urban and rural parts is beyond the scope of this paper and could be explored in further research.

The second hypothesis explored in this paper claims the change in housing prices to be higher in more urban municipalities compared to rural municipalities. The data suggests that the increase in selling price is not statistically different between shrinking and growing municipalities. Therefore the findings do not support the third hypothesis. Housing prices have been found to increase at a slower rate when the regional population increases, than they fall when the population decreases (Feng et al., 2018). This increased elasticity in housing prices in growing regions is theorized to be caused by the durability of the housing stock (Feng et al., 2018). Cities are usually faster to build new housing when demand has risen, inducing a rather slow increase in housing prices, than they are to demolish housing when demand declines. Especially private owners are not willing to demolish their house whenever there is an oversupply in the market. Therefore, if a region starts to experience growth, the effects are likely to only be observable significant time later. As mentioned before, the available data were aggregates of many separate price levels, which calls for a multi-level t-test. Unfortunately, the dataset (Statline, 2019) only displayed the average per municipality without mentioning the distribution. Therefore we were not able to perform other tests, which probably would have led to more significant results.

The third hypothesis explored in this research paper states that those municipalities close to county capitals and the county capital experience a higher population increase than those further away, and was supported by the data. Nonetheless, the population dynamics variable was a net increase or decrease, which was comprised of death rates, birth rates, migration etc. Further research could investigate further into what specifically caused population increases or decreases in certain regions.

Previous research on moving behavior has indicated that residential satisfaction, of which neighborhood satisfaction is a criterion, is negatively correlated to intentions to move and consequently moving. The data explored in this project shows support for the fourth hypothesis, stating satisfaction within the region to be higher in growing regions compared to shrinking regions. One research method that enhanced the power to find support for this hypothesis is the use of a five-point scale to measure satisfaction, ranging from “very unsatisfied” to “very satisfied”. It allowed the answer to be more specific and differences in the groups to be more easily identifiable. An age effect was also found to moderate the relationship between residents’ satisfaction and the region. Older respondents reported lower satisfaction levels than younger respondents. Nonetheless, these age effects may not be reliable and valid, as the number of participants is extremely small for some regions. For example, the number of participants, in between 17 and 24 years of age, in the

Delfzijl en omgeving region was so small, that only one participant reported to be unsatisfied with the region.

In line with the positive satisfaction reported in the previous question, the majority of respondents indicated that they definitely did not want to move within 2 years. However, the data did not show support for the fourth hypothesis, which states that residents of growing areas report a lower willingness to move than those living in shrinking areas. Instead a negative t-score indicates that the data points toward an effect, opposite to the one predicted. Residents of shrinking areas seem to actually be less willing to move than those in growing areas. An explanation for that could be that there is a clear negative correlation between willingness to move and age (graph can be found in appendix 1). Young people are more willing to move than elders. It has also been found that young people tend to live in urban areas that are generally growing, while elders are likely to live in rural areas that are shrinking. Therefore, the reverse effect that has been found could be explained by the fact that the populations in shrinking and growing regions differ in age, which consequently impacts their willingness to move. Additionally, although a similar number of participants were recruited for each of the age groups, it is likely that a higher percentage of those respondents in the young age groups are dwelling in growing, rather than shrinking regions.

The observed vacancy rate of homes in neighborhoods judged by its residents was hypothesized to correlate positively with shrinking of the region. The data showed support for this hypothesis, as a significant difference in the observed vacancy rate was found between growing and shrinking regions. Respondents recorded their answers using a six-point scale, ranging from “has become much more” to “do not know”. As individual percentage differences for each of these categories are rather small, the set up of the question makes it easier to find differences in the answers between the groups than if respondents had only for example two answer options.

The aim of this project was to provide the external partner with a comprehensible, clear and informational housing monitor that would make it easier for policy makers in the municipalities in the North of the Netherlands to make decisions on the housing market. Housing stock, observed vacancy rate of homes in the neighborhood, and residents’ satisfaction seem to be able to help distinguish between those regions that are shrinking and those that are growing. The data indicates that age effects play a role when considering the observed vacancy rate of homes in the neighborhood and residents’ satisfaction, which could also call for research into age effects in other variables of the market.

Using the housing monitor the municipalities can ensure a healthy, strong housing market by getting a clearer overview of the patterns and variables that are involved in shrinking and growing regions. Using the identified indicators as a signal for when regions may be growing or shrinking, they can predict what

the housing market will look like in certain regions in the future and what trend is happening at the moment. This way they can help ensure that the housing stock, prices, laws, public housing, etc. are in tune with what the market and people need or will need. Eventually, it could also be made public, which could make it easier for private home owners or potential home owners to make a decision on where they could move and when. In summary, the housing monitor can allow policy makers and potentially the public to efficiently reach information about the housing market in order to help them make their respective decisions.

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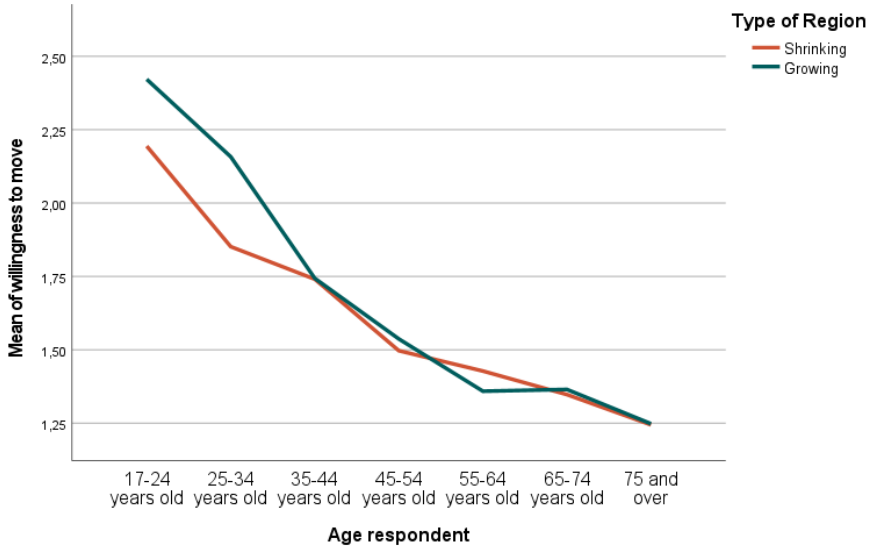
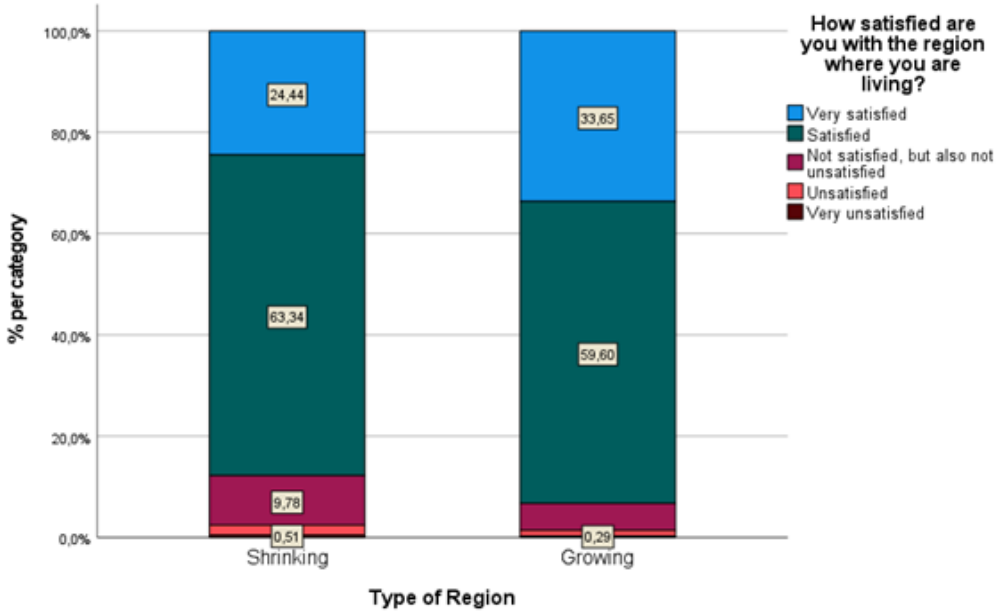
Appendix

Appendix 1 Graph depicting relationship between respondents' age and their willingness to move

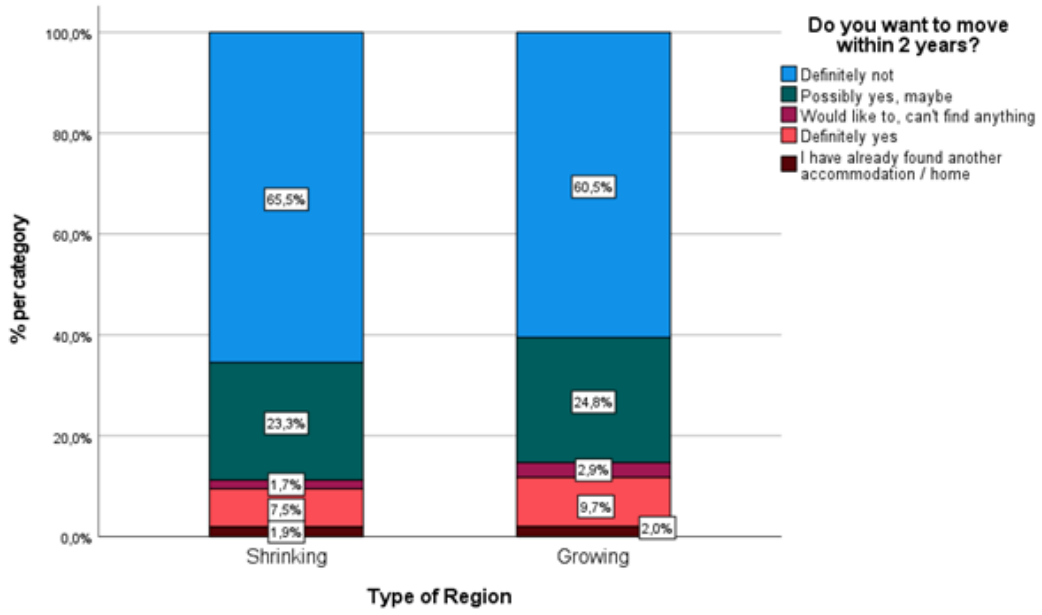


Appendix 2: Overview of distribution of answers for subjective indicators

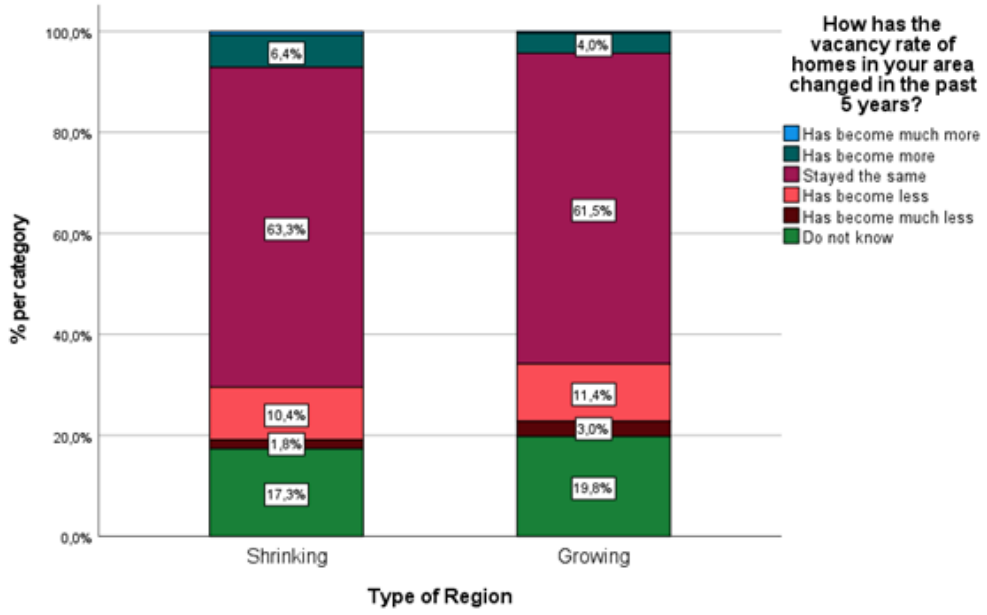
Hypothesis 4



Hypothesis 5

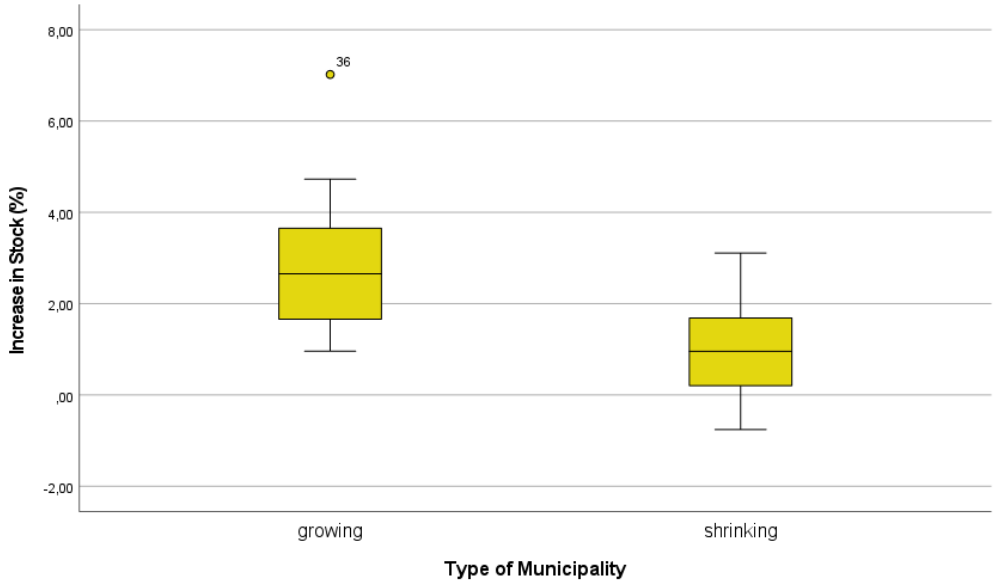


Hypothesis 6



Appendix 3: Box plots of indicators for registered data

H1: Boxplot of Percentage Stock Change per sub-category:



H2: Boxplot of Percentage Price Change per sub-category