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Population change and new firm formation in urban and rural regions

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Abstract

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Abstract
Several regions across the EU, including the Netherlands, are faced with the challenges of population decline, which entails changing demographics and related social and economic implications. Social ties are disrupted by continuous out-migration, causing a decrease in support systems which may adversely affect the liveability of an area. This paper will determine the impact of this context on the development of economic activities. Therefore, this paper looks into the connection between population decline and the level and the form of entrepreneurship, in order to describe and analyse the relation between these variables. The researchers question the linearity of the relation at hand, and will therefore investigate whether there is a tipping point in the relation between decline and entrepreneurship capital. Special attention is paid to structural changes such as sector adaptation in response to the changing need of the population. The

nature of population decline and its consequences can also differ depending on the type of region it occurs in. The nature of entrepreneurship in the process of depopulation may therefore also change. The difference between decline in urban areas (in the south of the Netherlands) and decline in rural areas (in the north of the Netherlands) is therefore incorporated in the present research. In order to establish the impact of population decline on entrepreneurship, it examines data on population density, size, growth and decline, together with firm dynamics in the years 2003 till 2009 retrieved from the LISA database. The results indicate that the positive relationship between population change and firm formation is much stronger in rural regions than for intermediate or urban. The negative impact of strong decline on entrepreneurship capital is however shifted around when interacting with rural regions. Furthermore, we find a negative effect of ageing and for rural regions a negative effect of a decrease in youngsters.

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Abstract

Several regions across the EU, including the Netherlands, face the challenges of population decline, which entails changing demographics and related social and economic implications. Social ties are disrupted by continuous out-migration, causing a decrease in support systems which may adversely affect the liveability of an area. This paper looks into the connection between population decline and composition, and the level of new firm formation, in order to describe and analyse the relation between these variables. Although it is clear that fewer people will eventually lead to fewer (new) firms, we assess whether this inherent negative relationship differs across different degrees of population change and across regional contexts. Population decline occurs in different types of regional contexts which could also lead to different consequences. In this study, we distinguish between urban and rural areas in order to assess whether different regional contexts lead to distinct outcomes.

In order to establish the impact of population decline on entrepreneurship, the paper examines data on population density, size, growth and decline, together with firm dynamics in the years 2003 till 2009 retrieved from the LISA database. In general, the results show that population growth is indeed positively related to the occurrence of entrepreneurship. When we assess different levels of population decline, we find that the relationship between population change and entrepreneurship holds most strongly for declining regions. This suggests that it will become more difficult for regions in decline to maintain the same level of supply, affecting their autonomy and possibly the standard of living. Concerning the urban-rural dimension, urban regions will experience stronger impacts by population change. In conclusion, we find a clear distinction in the impact of the intensity of population change on new firm formation, particularly in the case of rural regions. Thus, the regional context and the severity of decline needs to be included in determining what kind of coping mechanism is needed when dealing with the consequences of decline.

Key words: population decline, new firm formation, urban and rural regions

Introduction

In the near future, regional decline of population and associated decline in employment and amenities will increasingly occur in many developed countries (Fésüs et al., 2008; Polèse and Shearmur, 2006; Wissen, 2010). Population decline is a complex problem entailing many social and economic implications: with mainly young people leaving, fewer children are born and the ageing population is left with fewer employment opportunities and retail and care facilities (Haartsen and Venhorst, 2010; Wissen, 2010). As a direct consequence of the fact that primarily young people migrate from these regions that undergo population decline, the labour force shrinks and tax revenue decreases, thereby forming a strain on social expenditure. This process can make it difficult for small communities to maintain adequate infrastructure, educational and medical facilities, and other public services, which in turn can make it difficult to attract new immigrants or prevent current residents from relocating (Fésüs et al., 2008; Haartsen and Venhorst, 2010; Mai and Bucher, 2005; Polèse and Shearmur, 2006; Simmie and Martin, 2010), thereby creating a negative spiral. Furthermore, social ties are disrupted by continuous out-migration, causing a decrease in support systems and social capital, which can have detrimental effects on the liveability.

Entrepreneurship can play an important part in maintaining the quality of life in declining regions. The economic impact of entrepreneurship has been firmly established (see, for example (Acs and Armington, 2004; Stam, 2009). It drives competition, innovation and consequent GDP and employment growth. The economic implications and positive consequences of entrepreneurship and new firm formation are widely recognized and have been heavily researched in the past 30 years. Recently, in addition to the economic effects of entrepreneurship, several non-economic consequences associated with entrepreneurship have been identified. It can contribute to the level of social capital in that it creates trust (Morris and Lewis, 1991; Westlund, 2003). Also, it can offer places where people meet and interact. However, private businesses, including grocery stores, restaurants and other commercial establishments are less likely to operate in areas that have a relatively small number of residents, as they require a minimum number of customers to remain viable (McGranahan and Beale, 2002). This paper will therefore assess the relationship between population decline and new firm formation, in order to describe and analyse the relation between these variables. Although it is clear that fewer people will eventually lead to fewer (new) firms, we assess whether this inherent negative relationship differs across different degrees of population change and across regional contexts.

The number of studies addressing population decline and its consequences has increased substantially in the past decade. This study aims to contribute to the literature by assessing the role of entrepreneurship in areas that are currently facing population decline. Though research on depopulation is far from novel –

already in 1890, Arsene Dumont addressed the issue of the declining population in France – the effects of population decline are still unclear (SER, 2011). Traditionally, entrepreneurship has been seen as a mechanism of economic growth. However, research regarding entrepreneurship characteristics in a non-growing context seems to be lacking, with this paper we aim to contribute to filling this research gap. Specifically, to assess the relationship across different degrees of population change and across regional contexts. The aim of this research is not to solve population decline, but to focus on the consequences of a decrease in population. We follow Van Wissen (2010), who claims that "*it is pointless to combat population decline, but dealing with its consequences is worthwhile*".

Two aspects that influence new firm formation are incorporated in the study. First the actual change in population; a growing population is positively related to new firm formation in a country or region (Bosma et al., 2008; Verheul et al., 2001). As we want to determine the relationship between negative population change and new firm formation, population growth needs to be incorporated too, since it entails an implicit comparison to growing regions. Therefore from this point onwards the term population change is used, which leads us to the first research question: What is the impact of population change on the level of entrepreneurship? More specifically, how does this relation develop depending on the intensity of decline or growth? The relation at hand is often assumed to be linear, however the positive effects of growth will be lacking in declining regions, possible leading to an additional loss of (small) businesses and fewer start-ups. The question whether there is a threshold level for a minimum amount of firms in a region, despite declining circumstances, resulting in a hold or slow down the decreasing number of start-ups. The second research question is concerned with the type of region. Population decline occurs in different types of regional contexts which could also lead to different consequences. The nature of population decline and its consequences can differ depending on the type of region it occurs in. In this study, we distinguish between urban and rural areas in order to assess whether different regional contexts lead to distinct outcomes. Urban areas can have important advantages for entrepreneurship such as a closer proximity to consumer market. The question we aim to answer is therefore the following: Does the relationship between new firm formation and population change, develop differently when focussing on urban or rural regions?

In what follows, we first elaborate on the impact of population decline on entrepreneurship, followed by a section describing the data and methodology used. Subsequently the key findings are presented. The final section presents the discussion and our conclusions.

Population change and new firm formation

We are interested in the effects of population change, specifically decline, on start-up rates. A well-recognized way to assess regional distribution of start-up rates is the eclectic framework by Verheul and others (2001) that integrates the supply side of entrepreneurship, the demand side and institutions (Verheul et al., 2001; Wennekers et al., 2005). The demand side variables represents entrepreneurial opportunities, while supply side variables represent the resources and abilities of individuals and their attitudes towards entrepreneurship including demographics, wage rates and employment status (Bosma et al., 2008; Verheul et al., 2001; Wennekers et al., 2005). The institutional environment influences the supply side of entrepreneurship and is often related to culture (Wennekers, 2010). Examples of institutional issues are the fiscal environment, labour market regulations and intellectual property rights (Wennekers, 2010), but also 'background' institutions, such as trust and social institution as the education system (Verheul et al., 2001). The effects of population dynamics are felt in each of the dimensions.

Population change

The focus of this paper is on population change in explaining new firm formation. There are a number of ways that it can influence new firm formation. First, a growing population provides opportunities for new economic activity as new and bigger consumer markets emerge because of the growing population (Armington and Acs, 2002; Wennekers et al., 2005). Particularly goods and services sought by individuals should create new prospects for new firms and lead to start up activity (Reynolds et al., 1995).Then, population growth may also be a push factor to engage in new economic activity in order to make a living; by the additional strain placed on salaries by the expanding population and thereby lowering the opportunity costs for self-employment (Verheul et al., 2001). Several studies indeed find that population growth is positively related to start up rates (see for example, (Armington and Acs, 2002; Bosma et al., 2008; Reynolds et al., 1995; Wennekers et al., 2005). Although there are also studies that did not find a significant effect (Audretsch and Fritsch, 1994; Garofoli, 1994). As population growth reflects an increase in both supply and demand for new entrepreneurship, it can be expected that its effect on the rate of new firm formation is positive.

Yet, population change occurs in two directions – growth and decline – and differs in degrees of intensity. The expected positive relation to new firm formation does not need to be equally strong for different levels of population change. Population change could potentially have an extra effect on new firm formation, when the amount of change is higher. This idea is built on the theory on branching and self-feeding growth by Frenken and Boschma (2007). They explain a branching process in which product innovation is generated by recombining and modifying current routines. Their evolutionary perspective suggests that growth is self-feeding. Frenken and Boschma argue that the probability of innovation increases with the variety available for recombination. The idea of endogenous growth also holds for cities: the more variety already present, the higher the probability new varieties can be created through recombining old routines. The reciprocity between diversity and new firm formation is non-linear in that the potential for new ideas rises more than proportional with the stock of existing ideas (Frenken and Boschma, 2007).

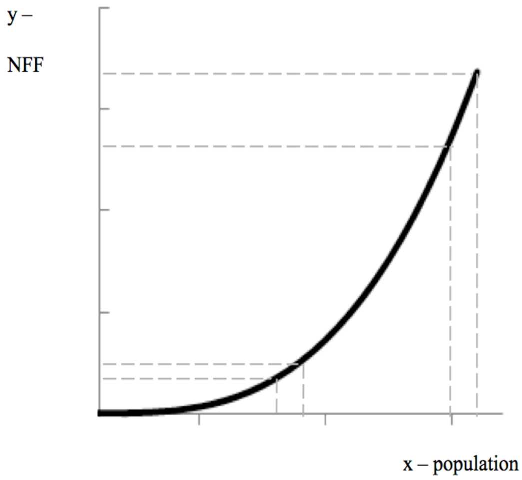

Figure 1. Slope of relation new firm formation

Also, for population decline, the impact is likely to be adverse by the increased risk of starting up a new business. The risks will be higher in a declining region, given the uncertainties that accompany decline. Not only can the augmented risk of failure affect the level of entrepreneurship, but the possibly reduced support system caused by a disruption of social ties can also have an impact. Starting a new firm is a highly social process, as information, new ideas and resources are predominantly acquired via personal networks (Aldrich et al., 1998; Davidsson and Honig, 2003). Population decline affects the level of support: financial, emotional and other (Fésüs et al., 2008). These consequences can possibly cause an amplified effect in the case of strong decline but also in the opposite case of strong growth.

The result is an exponential relationship population (x-axis) and opportunities by recombinations reflected by new firm formation (y-axis). Figure 1 visualizes that relationship, with two hypothetical 'ranges' of population change indicated, at two different degrees of change: the amount of population change is equal (x-axis), but the corresponding development in new firm formation differs significantly. Frenken and Boschma (2007) do indicate that the relation is not endlessly exponential; it will reach a 'ceiling' after which there is no more room for improvement. The hypothesis accordingly, is that municipalities facing strong population change, will experience an additional loss or growth in their start-up rate. With additional we mean, additional to the expected change in new firm formation corresponding to the linear function of population size and start-up rates.

Urban and rural regions

The impact of the degree of population change depends on the regional context. The theory of Frenken and Boschma (2007) is helpful in explaining the possible differences between urban and rural regions as well. Urban – more densely populated – regions are often accompanied by a higher diversity of the population, leading to a higher variety in demand. Higher diversity also stimulates new firm start-ups; more diversified cities have a higher chance of creating new innovations than less diversified cities (Bosma et al., 2008; Frenken and Boschma, 2007). The same amount of population change in rural regions (left and bottom part of the graph) and in urban regions (upper part of the line in Figure x) leads to different number of recombinations. In other words, to different start-up rates.

Particularly, those municipalities that are already sparsely populated can expect to experience the loss of people, the breaking down of networks, quite clear. Their current 'stock' of people is, after all, smaller. Also, urban regions have important advantages for entrepreneurship over rural regions: conditions for entering a market are thought to be more favourable in more densely populated regions (Audretsch and Fritsch, 1994), as the consumer market is in closer proximity and due to a more developed business infrastructure ((Bruderl and Preisendorfer, 1998; M. Fritsch and Mueller, 2008). Similar to population growth, agglomeration effects can positively affect new firm formation through increased local market opportunities regarding the consumer market and necessary inputs (Reynolds et al., 1995). Urbanisation also improves the likelihood of recruiting a more skilled workforce and enables ideas and knowledge to flow faster. Moreover, the risk of starting a business in urban areas is considered relatively low due to the rich employment opportunities, which function as a safety net in the case the firm fails (Stam, 2009). Hence, the relative impact of population change is likely to be higher in rural regions than in urban regions.

The advantages of entrepreneurship in urban regions, in comparison to rural regions facing population decline will most likely mean that population decline has a different impact for the different regional contexts. The mediating effect of urbanisation on population change could mean that urbanised areas experience less severe consequences of population decline (Haartsen and Venhorst, 2010). Several studies show indeed that agglomeration, controlled for other determinants, has a positive impact on the rate of new firm formation (Armington and Acs, 2002; Audretsch and Fritsch, 1994; Bosma et al., 2008). However, the influence of population density on new firm formation is not univocally agreed upon. A higher degree of urbanisation can lead to the pursuit of economies of scale. Economics of scale will enable firms to serve their clients more efficiently, leaving fewer opportunities for small firms (Verheul et al., 2001).

As for rural areas, population decline in a region with fewer inhabitants will have a relatively bigger impact; the lower limit of the critical mass for maintaining the same level of public services and local businesses is reached easier in rural regions. On the other hand, every region will need a minimum supply of facilities in retail trade, repair and personal services (Wennekers, 2006). That would mean there is a lower limit of supply and demand, easing the slope of population change and new firm formation in the case of decline in rural regions. Taking another look at the graph in Figure 1, this idea is also visualized. Given that urbanisation has an absolute zero, the curve cannot continue in the negative, showing the described relation. In other words, we expect population decline to affect both types of regional contexts and show a fall in the formation of new firms. For rural regions we expect to see a minimum level of firms that will still form, forming a lower limit of new firms. As for urban areas in particular, given their larger current stock of both people and firms, they are expected to be in the steeper part of the graph, based on the theory of Frenken and Boschma (2007). One new ‘connection’ will generate many new re-combinations, until they hit their – undefined – ceiling and the effect stabilizes.

To summarize, a number of hypothesises are formulated throughout the text. H1: Population change is positively related to new firm formation. H2: *Strong* population change will generate an additional loss or growth in start-up rates. H3: The impact of the degree of population change depends on the regional context. This third hypothesis breaks down in three sub hypothesises. H3a: The relative impact of population change is higher in rural regions than in urban regions. H3b: Rural regions will have a minimum level of new firm formation (a lower limit of start-ups). H3c: Urban regions will see more extreme effects until they reach their ceiling.

Control variables

In addition to the changes in population size and regional contexts, many other economic, technological, demographic, cultural and institutional variables determine the level of entrepreneurship. This study groups these variables into three broad categories: demand and supply factors, and institutions (Bosma et al., 2008; Verheul et al., 2001). Supply and demand factors have already been mentioned before discussing the main explanatory variables, and will be discussed simultaneously.

Population change lies at the root of societal change, making *age distribution* an important determinant for the level of entrepreneurship that needs to be controlled for. People of a certain age are considered more likely to start a business. Several publications show that the probability of a person starting their own business increases with age. People typically start a business in the age of 25 and 40 years old. New entrepreneurs in the Netherlands are most frequently among the age group between 25 and 34 years of age (Verheul et al., 2001; Wennekers, 2005). Thus, we expect aging to have a negative relation to the rate of new firm formation. On the other side, the share of youngsters is an indicator of the presence of young families. Although research regarding family dynamics is quite rare (Aldrich and Cliff, 2003), one can argue that potential entrepreneurs with young families might be more reluctant to take on the risk of starting a new firm, influencing startup rates negatively. Also a growing proportion of children live in single-parent families (Aldrich and Cliff, 2003), for whom the perceived risks will likely be even greater. Therefore, it can be argued that an increase in youngsters will have an adverse effect on the start-up rates in the same region.

The effect of *immigration* is mainly on the supply side, caused by the type of person that immigrates. Immigrants will have a lower risk aversion; moving to another country or region has a certain risk involved, as does starting a business (Wennekers, 2005). Immigration can, however, also have an indirect effect via population growth, creating more demand (Verheul et al., 2001). Yet, we assess the impact of the total immigration, not the net amount. Immigration is therefore interpreted as a supply factor, with an expected positive relation to start-up rates. The third control factor is income. Income can be seen as both a demand and supply factor. *Income growth* increases demand but it also facilitates access to capital for aspirant entrepreneurs. Verheul and others (2001) discuss conflicting hypotheses explaining the impact of one particular form of income, wages, on start-up rates. The first hypothesis argues that high wages cause high opportunity costs of being self-employed, and therefore relate to a lower level of new firm formation. The second hypothesis argues that high wages are positively correlated to start-up rates, as higher income is a sign of a prosperous economy with above average survival rates. In addition, Bosma and others, (2008) mention the potential negative influence on self-employment due to the high costs of hiring employees. *Unemployment rates* generate similar hypotheses as described for wages. High unemployment rates may serve as a push factor, causing necessity entrepreneurship, thus increasing start-ups. On the other hand, high unemployment rates can indicate a lack of entrepreneurial opportunity, thus associating with low new firm formation ((Audretsch and Thurik, 2000; Verheul et al., 2001). On the supply side, the *level of education* is positively associated with entry rates. Highly skilled labour and the proportion of college graduates are found to be positively related to start-up rates (Armington and Acs, 2002; Audretsch and Fritsch, 1994).

Other control variables influencing demand in a region and thereby the rate of new firm formation, are technologies, consumer demand and the industrial structure of the economy (Verheul et al., 2001). These factors influence the *sectorial structure* and the (diversity in) market demand leading to opportunities for entrepreneurship. The variety in the regions sector structure represents more opportunities for new firm formation (Bosma et al., 2008). Also a high degree of services in a certain municipality may positively affect entry rates because of lower average start-up costs (e.g. (M. Fritsch, 1997). Bosma et al. (2008) also include the size of the local industry as a demand factor, as greater competition can contribute to new start-ups.

Finally, the institutional context of the region influences new firm formation. As explained earlier, the institutional environment influences the supply side of entrepreneurship and is often related to culture (S. Wennekers, 2010). Given that this study focusses only on the Netherlands and many institutional aspects such as property rights and bankruptcy laws are regulated at the national level – and thus the same – we focus on the so-called background institutions: the entrepreneurship culture of the region and level of social capital. As a proxy for an entrepreneurial culture, the share of the *public sector* in the region is included. A Swedish study finds evidence that a large government sector has a negative impact on new firm formation (Nyström, 2008), the size of the public sector is therefore hypothesised to have a negative impact on the dependent variable. The level of social capital is measured via the proxy *voter turnout* for the elections for the Lower House (Tweede Kamer) in 2006. Voter turnout is a simple measure, but is associated with the level of social capital and reflects on participation and involvement (Cox, 2003; Guiso et al., 2004).

Data and methodology

In order to determine the spatial distribution of new firm formation in the context of population decline, this study examines data on population density, size, growth and decline, retrieved from Statistics Netherlands (CBS). To determine the current and past state of entrepreneurial activities and firm dynamics, we use the LISA database. To avoid effect of coincidental occurrences in a certain year, data is used from 2003 till 2009. This database provides information at the firm level per year, thereby uncovering start-ups, firm closures, sector changes and the number of jobs for all establishments in the Netherlands that have paid jobs. The start-up data only includes genuinely new firms, excluding relocations. Every establishment is traceable through time and space by a unique identification number. A total of 8900 cases were excluded from analyses, as these firms indicated that they had a total of zero jobs in a particular year. The data is truncated, due to which information on new start-ups in 2003 and on discontinuation in 2009 is unavailable. The dataset consists of over 6.4 million cases between 2003 and 2009, which were aggregated to the municipality level for the purpose of analyses. The analyses are performed with all municipalities, aggregated to the number of municipalities in 2009 (441) to facilitate comparisons between several years. This local level was chosen, as new businesses are likely to be located in the home region and serve local markets and are therefore influenced by local conditions (Bosma et al., 2008; Stam, 2009). A consequence of using a relative low aggregation level is the probability the municipalities are spatially dependent. We therefore correct for spatial autocorrelation.

New firm formation is calculated using the labour market approach. There are two basic methods for comparing entry activity across markets. The first is known as the ecological approach, as it standardizes the number of new firms relative to the stock firms in the given market at the beginning of the period (Audretsch and Fritsch, 1994; Koster, 2006). This current study uses the second method: the labour market approach, which uses the potential workforce in the region as the denominator for standardising the number of entrants. The reason for the preference of this method is that it is based on the theory of entrepreneurial choice. That is, each new firm is started by an individual someone (Audretsch and Fritsch, 1994). An important implicit assumption made by the labour market approach is that the entrepreneur is in the same labour market within which that new firm operates. Considering the fact that most new firms are initially established at home or in close proximity to it (Stam, 2009) and, that most new entrepreneurs will have some work experience in the region, the implications of this assumption are acceptable as we also correct for this empirically using spatial regressions.

Table 1. Overview of variables including data sources

New firm formation – dependent variable		**Mean (SD)**
Start-ups rates, labour market approach. Mean over 2004-2009, LISA dataset		10,43 (3,32)
Explanatory variables		
POP_CHANGE: Changes in population size between 2003 – 2009 (centered), retrieved from the Statistic Netherlands on municipality level. For analyses, five categories are used: strong growth (>5 per cent), growth (> 1 to 5 per cent growth), stable (-1><1), decline (1 to 5 per cent decline) and strong decline (>5 per cent decline).	*POP_CHANGE*	0,00 (4,02)
	STRONG DECLINE	0,02 (0,15)
	DECLINE	0,23 (0,42)
	STABLE	0,33 (0,47)
	GROWTH	0,32 (0,47)
	STRONG GROWTH	0,09 (0,29)
URBANISATION: Population density – based on address density per square kilometre (centered), retrieved from the Statistic Netherlands on municipality and neighbourhood level. For analysis, three main categories are used: urban, intermediately urban and rural. Urban are all municipalities with address	*URBANISATION*	0,00 (70,57)
	RURAL	0,29 (0,45)
	INTERMEDIATE	0,53 (0,49)
	URBAN	0,17 (0,38)

density >2500 and rural are all municipalities with address density of <1000.	
Age distribution – measured by changes in age structure per municipality between 2003 – 2009, in the categories "*UNDER_15*", and *"OVER_65"*. The potential workforce is left out of analyses due to multicollinearity. Data retrieved from the Statistics Netherlands.	*UNDER_15* -1,07 (0,74) *OVER_65* 1,99 (0,95)
Control variables	
HIGH_EDU: share of higher educated inhabitants relative to the active workforce, mean over 2000-2007. Small municipalities were excluded from the source dataset for privacy reasons. These municipalities are estimated based on the share of higher educated in the COROP region. Data originates from the EBB (Enquete Beroepsbevolking) executed by Statistics Netherlands.	22,93 (7,10)
SETTLERS: Average number of settlers between 2003 and 2009 per inhabitant per municipality. Statistic Netherlands, municipality level.	3,73 (1,06)
INCOME: The development in average income between 2003 and 2007. Due to changes in the definitions used by the Statistic Netherlands the year 2008 and 2009 are excluded from analysis.	0,05 (0,02)
UNEMPL: Unemployment rates – over the years 2003-2008, data from Statistic Netherlands, and computations by A. Edzes.	5,03 (1,75)
LQ: Sector structure – Location quotient (LQ) per sector in 2003, based on the LISA dataset.	
PUBLIC_SEC: Share public sector – The average share of the public sector, measured in number of jobs relative to the total number of jobs per municipality, based on the LISA dataset.	25,30 (9,61)
VOTING: Voter turnout – the voter turnout for the elections of the Lower House (Tweede Kamer) in 2006. Data retrieved from Statistics Netherlands.	82,81 (3,81)

Identifying declining regions

Although the overall Dutch population is not expected to decrease until 2040 (Haartsen and Venhorst, 2010) rural and peripheral regions such as the Northeast of Groningen, Zeeuwsch-Vlaanderen and de Achterhoek are already undergoing population decline. The only industrialized region which is already confronted with decline is the South of Limburg. The current state of population change is visualized in Figure 2. In total, 110 municipalities have seen more than 1 per cent decline, of these declining regions only 10 have had more than 5 per cent decline. For the purpose of analyses, the municipalities are divided into five categories: strong growth, growth, stable, decline and strong decline. With these five categories, we are able to distinguish the impact across different degrees of population change.

Urban and rural regions

If the standard OECD methodology is applied to define rural areas, it would appear that there are no predominantly rural areas in the Netherlands. The OECD methodology defines rural areas as having a population density below 150 inhabitants per square kilometre (OECD, 2008). However, according to the perception of the Dutch population, the Northern part of the country is a typically rural area (Haartsen, 2002). Therefore we adopt a method frequently used in Dutch policies, which is based on address density per square kilometre, either at postal code area or at municipality level. Address density uses the concentration of human activities such as living, working and utilizing amenities as indicators of urbanization: the lower the concentration of these activities, the lower the level of urbanization (Haartsen, 2002). Rural areas are then defined as the areas with less than 1000 addresses per square kilometre. In line with general perception of the Dutch population, the three northern provinces of Friesland, Drenthe and Groningen are the most rural in this respect, together with Zeeland (these are black outlined in the figure).

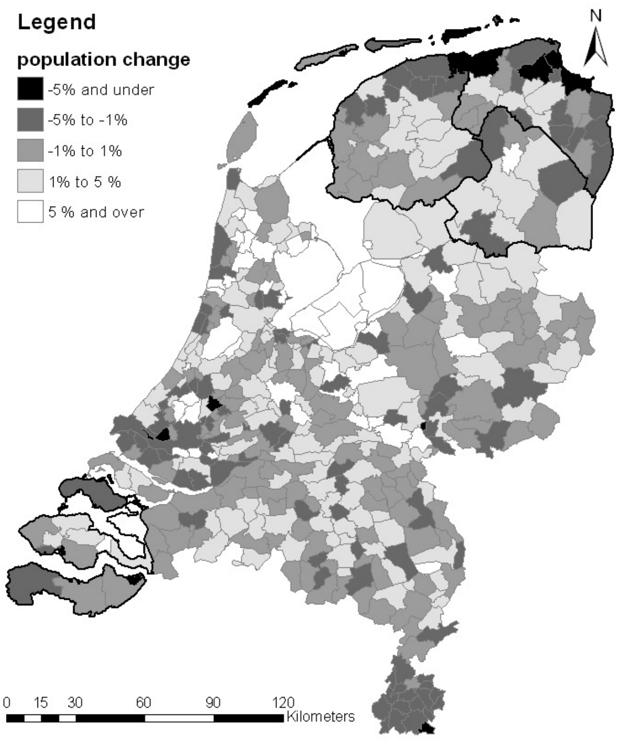

Figure 2. Population change in the Netherlands in the period 2003-2009 (4 most rural provinces outlined)

Results

On the basis of the dataset described in the previous section we now address our research questions. First, descriptive results about the link between population change and the rate of new firm formation, in different regional contexts, are presented. Second, multiple regression models are presented in which the focus is on explaining the distribution of new firm formation by the intensity of population change and the level of urbanisation.

Descriptives

Starting with the absolute number of new establishments in a municipality in relation to the absolute number of inhabitants in that municipality, we expect to find a positive linear relation: the size of the municipality in number of inhabitants predicts the number of newly registered firms in that same municipality. The general picture is indeed linear: a larger population results in more firm start-ups (figure not shown). A decreasing consumer market, with a corresponding decline in demand, is followed by a decreasing number of suppliers; a natural economic process (SER, 2011). The relation between population change and new firm formation is hypnotized to be non-linear. More specifically it is expected to be exponential.

The graph (Figure 3) shows the correlation between population change in five categories and the dependent variable: new firm formation per municipality. These correlations suggest that the impact in municipalities with more than 5 per cent decline is less severe than in municipalities with less decline (minus 1 up to 5 per cent). Also, over 5 percent growth appears to be less favourable then moderate growth. These two outcomes suggesting nonlinearity in the relation.

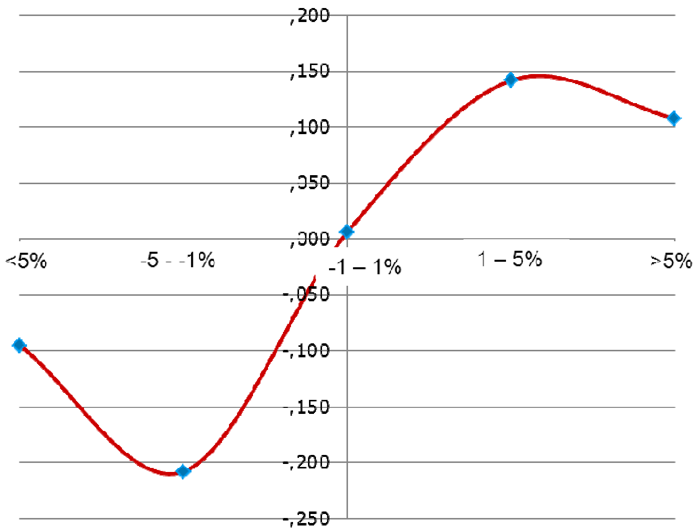

Figure 3. Pearsons correlations Population Change and New firm formation

An interesting question is whether sparsely populated towns are affected more than the expected linear effect by population decline than larger municipalities. The scatterplot provides a visualisation of the relation between population size and the start-up rates. The reference lines in the scatterplot in Figure 4 represent the mean of the x- and y-axes. Thus, quadrant I and III represent those municipalities smaller than average, and quadrant I and II depict those regions with a higher start-rate than average. It shows that smaller municipalities have relatively more start-ups than larger municipalities. This suggests that those municipalities indeed have a certain lower limit of supply. There appears to be a minimum supply needed, as described by Wennekers (2006).

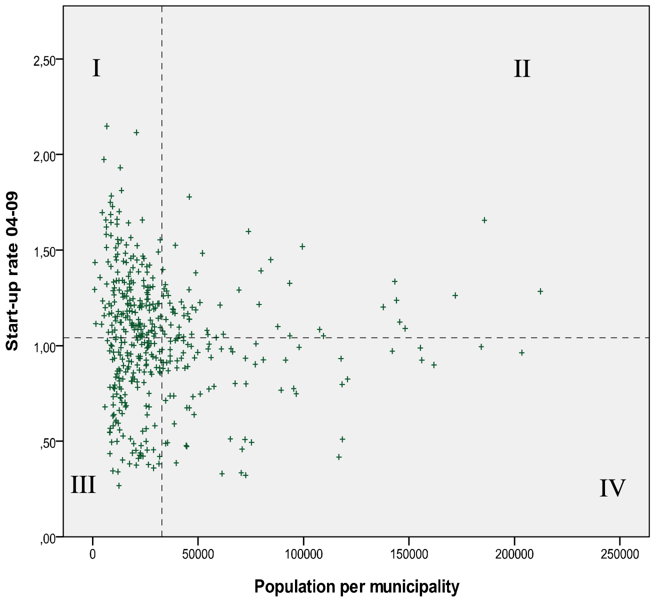

Figure 4. Scatterplot municipalities (x-axis) and start-up rates (y-axis).

	NFF all regions	NFF in rural regions	NFF in intermediate regions	NFF in urban regions
Strong Decline	-,095**	,030	-0,195***	-,179
Decline	-,208***	-0,188**	-0,222***	-0,308***
Stable dummy	,006	-,117	0,121*	-0,216*
Growth	,142***	0,166*	,061	0,364***
Strong growth	,108**	0,232***	0,116*	,178
N	441	128	238	75

Table x. Pearsons correlations *POP_CHANGE* and urbanisation

Multiple regression analysis

In the regression model below we take a closer look at the impact of the changing population, the degree of urbanization and the interaction effect between the two. As mentioned, there are many other aspects than population change and regional context that determine the level of new firm formation. In order to gain insight in the pure relation between new firm formation and our explanatory variables, we need to control for these other influences. Therefore, this second part of the result analysis concerns a multiple regression analysis.

The first model presented in Table 2, gives the results of the OLS regression without interaction variables and without a spatial lagged dependent variable or a spatial error term. The second column presents the same regression, but with additional interaction terms. The fit of the model improves, although the coefficients of population change vary slightly and *GROWTH* and *STRONG_GROWTH* are not significantly different from the reference category anymore. Model 2 is then used as a benchmark. We tested empirically for multicolinearity by means of VIF (variance inflation factors) and results indicated mulicolinearity was not a problem, using a VIF of 10 as a critical threshold (Haan, 2002).

Because of likely spatial dependence among municipalities, we use the robust Lagrange Multiplier tests to find out whether a spatial lag (LM^r_ρ) or the spatial error model (LM^r_λ) is more appropriate to describe the data (Anselin, 1996). When using the robust tests, the null hypothesis of the spatially lagged dependent variable must be rejected at 1% significance, whereas the hypothesis of no spatially autocorrelated error term cannot be rejected. This indicates that the spatial lag model is the most appropriate model to estimate. The fit of the model improves from a R square of 0,41 to 0,74 in Model 4, confirming the spatial lag to be the best fit.

All models presented in this paper show fairly robust results for the control variables[1]: An aging society will effect new firm formation negatively, although there is no evidence that an increase or decrease of youngsters has any influence on the start-up rates of the region. The share of higher educated is positively related to the dependent, the number of settlers and unemployment rates do not seem to have a significant influence and income is strong positive. The coefficients do change somewhat throughout the models, a clear example of which is income. Also, we find that most sectors[2] have a significant effect on the dependent variable. Overall, a higher degree of specialization in the municipality has a negative impact on

[1] The control variables are not included in the table, though they were included in the model. The full table can be found in the appendix.

[2] The sector classification of the Dutch data used in this study is initially very detailed with a 5 digit SBI code. As this provides us with unnecessary specifics, the classification is first aggregated to 2 digit SBI codes and further aggregated into 8 main categories as depicted Appendix 1. The 8 categories used are based on a classification provided by Van Oort in 2004.

the start-up rate, in line with conclusions on relatedness drawn by Boschma (2009). Finally, a larger share of jobs within public sector has the expected negative sign, as does the voting turnout from 2006.

Levels of decline

In general, the results show that population growth is indeed positively related to the occurrence of new firms in that region. As expected, declining regions have lower start-up rates. Then we assess different levels of population decline and find that the relationship between population change and entrepreneurship holds most strongly for declining regions. Model 4 shows that the effects of strong decline is about 3,5 times stronger than of moderate decline (compared to the reference category 'stable regions'). Based on the descriptives, specifically the correlation between start-up rates and different levels of decline (see figure 3), we expected to find a relative small difference –or maybe even an upward trend – between strong declining municipalities and municipalities with moderate decline. This turns out not to be the case. The easing of the downward slope does not actually happen. However, surprisingly, growing regions do not generate a significant impact. That is, compared to stable regions, growing regions in the Netherlands do not show elevated levels of entrepreneurship. This means that the relationship between population change and new firm formation is mainly determined by the negative impact of decline and not by the positive effects of growth. This suggests that it will become more difficult for regions in decline to maintain the same level of supply, affecting their autonomy and possibly the standard of living.

DEP. New firms per 1000 potential workers	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	OLS 1	OLS 2	Spat. lag 1	Spat. Lag 2
	B(SE)	B(SE)	B(SE)	B(SE)
W_DEPENDENT			0,72 (0,03)***	0,71 (0,03)***
LEVELS OF DECLINE				
STRONG_DECLINE	-3,35 (0,96)***	-4,45 (1,29)***	-1,30 (0,63)**	-2,00 (0,83)**
DECLINE	-1,20 (0,36)***	-1,72 (0,48)***	-0,31 (0,23)	-0,58 (0,31)*
Stable -	*Ref*	*Ref*	*Ref*	*Ref*
GROWTH	0,56 (0,32)*	-0,26 (0,43)	0,23 (0,21)	-0,30 (0,28)
STRONG_GROWTH	1,47 (0,50)***	0,45 (0,66)	0,29 (0,32)	-0,45 (0,43)
DEGREE OF URBANISATION				
RURAL	1,09 (0,34)***	-0,03 (0,54)	1,18 (0,23)***	0,45 (0,35)
Intermediately urban - Ref	*Ref*	*Ref*	*Ref*	*Ref*
URBAN	-1,59 (0,45)***	-2,75 (0,71)***	-1,16 (0,29)***	-1,83 (0,46)***
INTERACTION VARIABLES				
*Strong_Decline*Intermediate*		*Ref*		*Ref*
*STRONG DECLINE*RURAL*		2,68 (1,92)		1,75 (1,24)
*STRONG DECLINE*URBAN*		0,72 (3,01)		0,14 (1,94)
*Decline*Intermediate*		*Ref*		*Ref*
*DECLINE*RURAL*		1,49 (0,79)**		0,79 (0,51)

Decline*Urban		0,6 (1,03)		0,25 (0,66)
Growth*Intermediate		*Ref*		*Ref*
Growth*Rural		1,44 (0,72)**		1,08 (0,46)**
Growth*Urban		2,5 (0,92)***		1,34 (0,59)**
Strong Growth*Intermediate		*Ref*		*Ref*
Strong Growth*Rural		2,98 (1,26)**		1,87 (0,81)**
Strong Growth*Urban		1,87 (1,15)		1,47 (0,74)**
N	441	441	441	441
R square	0,38	0,41	0,73	0,74
LM_{ρ}	320,28***	314,42***		
LM^{r}_{ρ}	95,92***	104,33***		
LM_{λ}	224,36***	207,22***		
LM^{r}_{λ}	0,003	0,13		

Table 2. Regression outcome *, **, *** Indicates statistically significant at the 10%, 5% and

Urban and rural

Concerning the urban-rural dimension, we find that the effect of population change is much stronger for urban areas than it is in rural areas. The effects of population decline are in both contexts negative, but taking all significant outcomes into account, urban regions do worse. To facilitate interpreting the regression outcome, Table 4 is composed. Table 4 shows the cumulated coefficients of the degree of population change, the regional context, and the interaction effect of both.

	Rural	Intermediate	Urban
Strong Decline	-2	ref	-3,83
Decline	-0,58	ref	-2,41
Stable	ref	ref	ref
Growth	1,08	ref	-0,49
Strong Growth	1,87	ref	-0,36

Table 4. Significant outcomes of the regression model tallied up.

Even though a growing population does not generate a significant effect, the interaction term shows that urban and rural municipalities that are (strongly) growing do make a positive impact on start-ups compared to the stable regions. The interaction effects in the last model are additional to the main explanatory variables. Four interaction effects are statistically significant. Even though the influence of population density on new firm formation is not univocally agreed upon, we expected to find that the advantages of urban regions, mainly based on agglomeration effects, would result in a less severe impact of population decline on new firm formation. The results show, nevertheless, that the overall effect of urban regions, compared to intermediate, remain negative throughout.

Conclusion

The main goal of this paper is to analyze the relationship between new firm formation and population change in different regional contexts, from an empirical point of view. Data from the LISA database and Statistics Netherlands over the period 2003-2009 is used to test the relationship. We have used multiple regression models for the case of 441 municipalities and the results show that population change is positively related to the start-up rate of the region.

Why is the effect of growth different from decline? They are after all, two sides of the same relationship. The results show, however, two different types of relation. Population decline is always a bad thing, regardless of the regional context it appears in. Growth in contrast, is not positive per se. Growth has a strong spatial component.

Rurality an sich does not seem to matter for new firm formation. Urban areas on the other hand, have a negative impact throughout. Given the many potential benefits that accompany urbanity, there are apparently other aspects that play an important role, causing it to have a negative sign. This could be explained by economics of scale or competition that is too much. Also, in the context specific: in the Netherlands, most growth and economic development is seen in surrounding regions of the larger cities, such as in Amersfoort and not in the four major cities.

The positive effects of growing rural regions can be partially explained by selective migration. Cottage industry is a good illustration of this phenomenon; nascent entrepreneurs relocated their home to the periphery and start a – part time – business from their home. Also, in a remote village, with a growing population, it is more likely to start a small business or shop from home. In conclusion, we find a clear distinction in the impact of the intensity of population change on new firm formation, particularly in the case of rural regions. Thus, the regional context and the severity of decline needs to be included in determining what kind of coping mechanism is needed when dealing with the consequences of decline.

Beyond the scope of this current paper, important questions arise: how can the well-being of inhabitants of declining regions are guaranteed despite decreasing amenities, and whether entrepreneurship can contribute to building or maintaining a resilient region. Also, based on the data available for this paper, it is not possible to know who the new entrepreneurs are and what type of firm they start. Neither is it possible to know the motivation for their start-up. Likely, the motivation in a declining region differs from a growing region. Future research is needed in order to answer these questions.

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Sector classification, derived from (van Oort, 2002)

Production (P) – 9,73% of total jobs in NL	Labour intensive, Capital intensive, Knowledge intensive process industry, Knowledge intensive production
Distribution (D)13,46% of total jobs in NL	Administrative distribution (D-A) Physical Distribution (D-P)
Information Activities (IA) (21,26% of total jobs in NL	Co-ordination activities (IA-C) Knowledge services (IA-K)
Resource base activities (RBA) 3,10% of total jobs in NL	Mineral resources (RBA-M Agriculture (RBA-A)
Consumer based activities (CBA) 9,46% of total jobs in NL	Consumer base activities (CBA
Information infrastructure (II) 12,23% of total jobs in NL	Institutions (II-I) Education (II-E)
Physical infrastructure (PI) 8,03% of total jobs in NL	Physical infrastructure (PI)
Well-being (WB) 22,74 % of total jobs in NL	Health care (WB-H) Leisure activities (WB-L)

DEP. New firms per 1000 potential workers		Model 1	Model 2	Model 3	Model 4
		OLS 1	OLS 2	Spat. lag 1	Spat. Lag 2
		B(SE)	B(SE)	B(SE)	B(SE)
Explanatory variables	*W_Dependent*			0,72 (0,03)***	0,71 (0,03)***
	Levels of decline				
	STRONG_DECLINE	-3,35 (0,96)***	-4,45 (1,29)***	-1,30 (0,63)**	-2,00 (0,83)**
	DECLINE	-1,20 (0,36)***	-1,72 (0,48)***	-0,31 (0,23)	-0,58 (0,31)*
	Stable	*Ref*	*Ref*	*Ref*	*Ref*
	GROWTH	0,56 (0,32)*	-0,26 (0,43)	0,23 (0,21)	-0,3 (0,28)
	STRONG_GROWTH	1,47 (0,50)***	0,45 (0,66)	0,29 (0,32)	-0,45 (0,43)
	Degree of urbanisation				
	RURAL	1,09 (0,34)***	-0,03 (0,54)	1,18 (0,23)***	0,45 (0,35)
	Intermediately urban	*Ref*	*Ref*	*Ref*	*Ref*
	URBAN	-1,59 (0,45)***	-2,75 (0,71)***	-1,16 (0,29)***	-1,83 (0,46)***
Interaction variables	**Interaction variables**				
	*Strong_Decline*Intermediate*		*Ref*		*Ref*
	*STRONG DECLINE*RURAL*		2,68 (1,92)		1,75 (1,24)
	*STRONG DECLINE*URBAN*		0,72 (3,01)		0,14 (1,94)
	*Decline*Intermediate*		*Ref*		*Ref*
	*DECLINE*RURAL*		1,49 (0,79)**		0,79 (0,51)
	*DECLINE*URBAN*		0,6 (1,03)		0,25 (0,66)
	*Growth*Intermediate*		*Ref*		*Ref*
	*GROWTH*RURAL*		1,44 (0,72)**		1,08 (0,46)**
	*GROWTH*URBAN*		2,5 (0,92)***		1,34 (0,59)**
	*Strong Growth*Intermediate*		*Ref*		*Ref*
	*STRONG GROWTH*RURAL*		2,98 (1,26)**		1,87 (0,81)**
	*STRONG GROWTH*URBAN*		1,87 (1,15)		1,47 (0,74)**
Control variables	**Control variables**				
	UNDER_15	-0,11 (0,20)	-0,14 (0,2)	-0,15 (0,13)	-0,17 (0,13)
	OVER_65	0,14 (0,19)	0,14 (0,19)	-0,35 (0,12)	-0,34 (0,12)***
	HIGHER EDUCATION	0,04 (0,02)	0,03 (0,02)	0,05 (0,02)***	0,05 (0,02)***
	SETTLERS	-0,09 (0,13)	-0,08 (0,13)	0,02 (0,08)	0,02 (0,08)
	INCOME	28,79 (6,09)***	29,02 (6,09)***	16,71 (395)***	16,65 (3,92)***
	UNEMPL	0,17 (0,09)*	0,17 (0,09)*	0,05 (0,2)	0,06 (0,06)
	Location quotient				
	LQ information infrastructure	*Ref*	*Ref*	*ref*	*Ref*
	LQ RESOURCE BASED ACTIVITIES	-0,07 (0,06)	-0,05 (0,06)	-0,07 (0,04)	-0,06 (0,04)
	LQ PRODUCTION	-2,59 (0,55)***	-2,57 (0,55)***	-1,93 (0,35)***	-1,93 (0,36)***
	LQ PHYSICAL INFRASTRUCTURE	-2,04 (0,43)***	-2,03 (0,44)***	-1,29 (2,78)***	-1,31 (0,28)***
	LQ DISTRIBUTION	-3,70 (0,66)***	-3,53 (0,67)***	-1,89 (0,43)***	-1,82 (0,43)***

	LQ CONSUMER BASED ACTIVITIES	-3,43 (0,62)***	-3,35 (0,63)***	-2,16 (0,39)***	-2,15 (0,4)***
	LQ WELL BEING	-1,96 (0,83)**	-1,93 (0,83)**	-0,83 (0,54)	-0,83 (0,53)
	LQ INFORMATION ACTIVITIES	-2,67 (1,07)**	-2,65 (1,08)***	-2,4 (0,69)***	-2,41 (0,7)***
	Institutional Context				
	PUBLIC_SEC	-0,21 ((0,03)***	-0,2 (0,03)***	-0,15 (0,02)***	-0,16 (0,02)***
	VOTING	-0,07 (0,04)	-0,07 (0,04)**	0,01 (0,02)	0,02 (0,02)
	N	441	441	441	441
	R square	0,38	0,41	0,73	0,74
	LM_{ρ}	320,28***	314,42***		
	LM^{r}_{ρ}	95,92***	104,33***		
	LM_{λ}	224,36***	207,22***		
	LM^{r}_{λ}	0,003	0,13		

Table x. Regression outcome *, **, *** Indicates statistically significant at the 10%, 5% and 1% level respectively.