The Dynamics of Urban Neighbourhood Development
and Economic and Entrepreneurial Activity

How Dutch Neighbourhoods Segregated in Terms of Socio-Economic Status After the Economic Crisis and How Vogelaar Policy Did Not Help to Stop This

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This thesis has been centered around the question: do socio-economic developments in neighbourhoods have a significant effect on economic activity in these neighbourhoods? By means of principal component analysis, socio-economic development has been defined as a combination of three neighbourhood characteristics: income, housing value and social security levels. Socio-economic development has been found to be a significant driver of economic activity. This thesis adds that Dutch neighbourhoods have seen a trend of segregation between low-income and high-income neighbourhoods after the economic crisis of 2008. These combined findings show that policy makers should consider the segregating trend not only from the social point of view, which is predominantly negative about segregation, but also from an economic point of view. Furthermore, the Vogelaar policy, which was in place to improve socio-economic status of neighbourhoods does not seem to have produced significant effects on socio-economic neighbourhood development.

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PREFACE

Before you lies the master's thesis "*The Dynamics of Urban Neighbourhood Development and Economic and Entrepreneurial Activity*". It has been written to complete the Master's programme Industrial Dynamics and Entrepreneurship at the Rotterdam Erasmus School of Economics.

Foremost, I would like to thank my supervisor, Frank van Oort, for his guidance and support. His enthusiasm for the subject has been inspiring. Writing this thesis has been stressful from time to time. I would like to thank Frank for his patience and my friends and family for their support.

I have aimed at answering several questions, which are now backed by results. Despite these answers, many new interesting questions have been raised throughout the process. I hope my contribution to the construction of datasets and through this research to be helpful in the quest of finding answers. I would like to encourage Frank and his colleagues to build further.

Enjoy reading,

Tijmen Burggraaf

Rotterdam, October 28, 2017

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1. INTRODUCTION

In August 2017, the influential urban economics scholar Richard Florida made a noteworthy announcement. He revised the findings of his book *The Rise of the Creative Class*, which had been influential since its publication in 2002. Florida's initial idea was that inflow of people belonging to the 'creative class' leads cities to flourish economically, creating an interesting environment for business and capital, which would benefit all (Florida, 2012). Now, fifteen years later, Florida judges his outcomes to be false. He still acknowledges that the creative class brings economic growth. However, only the creative class itself benefits from this growth, while lower income inhabitants often face problems paying the rising rents in their gentrifying neighbourhoods. Florida's new findings are that economic growth is only occurring for the rich, creative, predominantly white inhabitants. Less wealthy people are displaced into the suburbs. So, the 'haves' benefit from economic growth, while the 'have-nots' are forced further down the socio-economic ladder. (Florida, 2017) Florida's multidisciplinary combination of the sociology of gentrification and the dynamics of economic growth is an important one: a combination of which the outcomes impact neighbourhood life every day.

As is the case in both Florida's researches, the core of this research is the co-evolution of socio-economic neighbourhood characteristics and economic and entrepreneurial activity in neighbourhoods. Changes in neighbourhood characteristics are believed to have economic effects in the form of (among others) business growth and job growth (Moretti & Harcourt, 2012). In the rich academic history of urban research, the dynamics between social components and economic developments is a topic that has been thoroughly researched (Florida, 2012, 2017; Hochstenbach, 2017; Piketty, 2014; Sassen, 1996). This thesis aims to contribute to Florida's research by taking a specific neighbourhood approach. Despite recognizing that the effect may be the other way around, this thesis focuses on the effects of neighbourhood characteristics on economic activity, assuming neighbourhoods to develop exogenously from economic activity. (Hochstenbach, 2017)

To specify socio-economic characteristics in a workable measure, relevant neighbourhood characteristics are bundled in an index of average income levels in neighbourhoods, housing value and the degree to which people apply for social security. This index reflects the socio-economic position of neighbourhoods. Higher income levels, higher housing prices and a lower degree to which people appeal to social security push the index upwards and vice versa. The index is used as explanatory variable in the assessment of economic activity.

The core aim of this thesis is to support the quest to gain insight in economic dynamics on a neighbourhood level by adding empirical evidence. Accordingly, this research contributes to the existing

literature in the fields of urban economics and entrepreneurial economics. Furthermore, the outcomes will help policy makers to gain insights that will support them reaching their policy goals of urban neighbourhood development in the broad sense. Having defined this core aim, the following research question holds a central position throughout this research:

Does socio-economic development influence economic and

entrepreneurial activity in neighbourhoods?

This thesis aims not only at answering this question in a general sense. The effect of socio-economic development on economic activity in the creative industries and restaurants and cafés is assessed as well. Insight in the dynamics of the creative industries adds to the focus of Florida's research, while insight in restaurants and cafés is assessed to gain further insight in the *trickle-down* effects of economic growth, which is defined by Moretti as the growing demand for low-income jobs due to a rise in high-income jobs. (Moretti & Harcourt, 2012) So, are creative (mostly high income) jobs the only ones to benefit from socio-economic development? Or do employment opportunities in supporting jobs benefit as well?

An equally important question this research addresses lies in another component of neighbourhood development. Florida's initial research supports the idea that the inflow of the creative class acts as a driver to decrease differences between low-income and high-income neighbourhoods, (Florida, 2012), while the new research claims the opposite the gap is widening. (Florida, 2017) This outcome contributes to gentrification theory, in which the 'creative class' is the 'gentrifier'. Gentrification and the growing differences between neighbourhoods are widely believed to have a negative social impact, bringing along, amongst others, community resentment and conflict, increased crime and a loss of social diversity. (Atkinson & Wulff, 2009)

Despite this negative connotation, the global trend is that differences between neighbourhoods in cities are increasing, instead of decreasing.(Ham, Marcinczak, Musterd, & Tammaru, 2015) Most Western metropolitan regions face trends of gentrification and suburbanization. (Ham et al., 2015) But if growing differences are widely considered to be a negative phenomenon, which are the policies that will turn around the trend? Addressing this second issue adds value to the answer of the core research question, letting neighbourhood development trends and economic development intertwine further. After all, if the negative effects of growing differences between neighbourhoods as explained above are strengthened by growing differences in economic activity, policy can be conducted to target both.

In this research, growing differences are measured by differences in the above introduced socio-economic development index and referred to as segregation, acknowledging the variety of definitions

of segregation. (Massey & Denton, 1988) This thesis has been restricted to the geographic scope of the Netherlands during the period from 2005 up and until 2013, adding empirics to the existing literature of urban neighbourhood development in the Netherlands. Making this specification, the following sub question is addressed:

Have Dutch urban neighbourhoods experienced a trend of socio-economic segregation between 2005 and 2013?

Answering this sub question does not only contribute to segregation research in general, but also adds empirical insight in the dynamics in Dutch neighbourhoods, having relevance for both academics and policy makers.

The research separates different time periods to measure the separate effects before and after the economic crisis which started at the end of 2007. This separation adds new insights to a research conducted by the Netherlands Environmental Assessment Agency, *PBL*, who researched socio-economic segregation in Dutch cities from 2001 up and until 2012 and concluded that Dutch urban neighbourhoods have segregated. (Leefomgeving, 2016) Despite economic growth for low-income workers, who are predominantly and increasingly concentrated in low-income neighbourhoods, their position in comparison with inhabitants of high income neighbourhoods has worsened (Leefomgeving, 2016). This research adds new information on the post-crisis years. Besides that, the research aims at improving the PBL-research by conducting the research in a panel setting and by using the newly constructed socio-economic index based on the principal component analysis.

Answers to the core and sub questions can help policy makers to attain their policy goals. In the Netherlands, several policy plans have been introduced to stimulate living conditions in neighbourhoods, to stimulate economic activity and to diminish segregation between neighbourhoods. (Marlet & Woerkens, 2009) This research is a contribution to policy makers, evaluating the *Vogelaar* policy, which has been implemented in low-income urban neighbourhoods in the Netherlands between 2007 and 2011. Under this policy, neighbourhood specific investments were made in 40 neighbourhoods in the Netherlands in order to stimulate neighbourhoods, on average 388 euros per inhabitant per year. (Planbureau, 2013)

This research provides evidence to the question: did neighbourhoods that were aimed at by the Vogelaar policy experience more socio-economic development (as defined before) than comparable neighbourhoods that were not? Adding these outcomes to the outcomes of the core research supports the evaluation of the policy goals. When the policy was in place, it was claimed that the effects could only be measured after a few years, since it would take time for the policy measures to be effective.

(Planbureau, 2013) This data is available now. To my best knowing the policy has not been evaluated in a comparable way to this research.

To meet the research objectives several statistical methods have been used. First, neighbourhood level data obtained from *Statistics Netherlands* (*CBS)* has been used to conduct the index of socio-economic urban neighbourhood development using principal component analysis. This method is used to control for possible multicollinearity issues. Second, data on economic and entrepreneurial activity, obtained from *LISA* has been used to test if socio-economic urban neighbourhood development is a significant driver of new economic and entrepreneurial activity. Fixed effects regressions have been conducted in a panel setting, entailing both OLS-regressions and negative binomial regression methods.

The structure of this research is as follows. In chapter 2 the theoretical framework section discusses the relevant economic theory and the previous empirical findings regarding the subject, providing support for this research' hypotheses. In chapter 3, the data used to conduct the research is outlined. In chapter 4 the methodology deployed to test the hypotheses is presented, elaborating on the economic regression methods used. Chapter 5 presents the resulting findings, after which chapter 6 concludes with limitations, discussion, future research possibilities and policy implications.

2. THEORETICAL FRAMEWORK

The dynamics between neighbourhood characteristics and economic and entrepreneurial activity have been thoroughly researched in the past, as well as the topics of segregation and gentrification. The relevant theories supporting the questions of this research will be displayed in this chapter, beginning with the theories explaining economic and entrepreneurial activity, followed by the theories on segregation and gentrification.

1.1 SOCIO-ECONOMIC URBAN NEIGHBOURHOOD DEVELOPMENT AND ECONOMIC ACTIVITY

It can be argued that due to the clustering of knowledge in neighbourhoods, socio-economic development can have indirect knowledge spillover effects. The most common theory to this positive externality is the human capital theory. This theory is most often related to larger firms, but it is applicable to the smaller firms in the context of this research as well. The theory claims that firms are more competitive, and therefore generating a higher income level, if they are located in areas with higher levels of human capital, which is in turn accumulated through the ability to absorb and spillover knowledge of highly educated and skilled people (Marlet & Woerkens, 2009; Mathur, 1999).

In the urban economics literature, this kind of externality can be traced back to Losch (Losch, 1954) and Isard (Isard, 1954). On the new entrepreneurial level, the human capital theory entails that an increasing knowledge level empowers individuals' cognitive abilities, which in turn leads to more economic activity (Davidsson & Honig, 2003). In other words, the more educated residents are, the more human capital is available in neighbourhoods, the more (new) entrepreneurial activity may be expected to arise. Human capital in neighbourhoods is not only a driver of entrepreneurship though. It is found to be an important factor to market access for new entrepreneurs as well (Folmer, 2013; Kloosterman & Rath, 2011).

Hence, the accumulation of human capital is expected to trigger new entrepreneurial activity through both the supply and the demand side. A combination of theories would imply socio-economic development on the urban neighbourhood level to induce entrepreneurial activity indirectly. Accumulation of knowledge in neighbourhoods (human capital) increases the demand for entrepreneurial activity, which in turn would provide neighbourhoods with more entrepreneurial opportunities. This is especially of importance since entrepreneurial activity may be a boost for the economy (Folmer, 2013; Sleutjes, Oort, & Schutjens, 2012).

Academics observe a trend in Western countries towards more small and medium sized enterprises instead of large corporates, combined with a shift towards new dominant industries, most notably

services-, design-,technology- and cultural-intensive industries. (Folmer, 2013; Hutton, 2004; Mason, Carter, & Tagg, 2011) Following Allen Scott, these trends lead to a new capitalistic order labeled as *cognitive-cultural*, which is dominated by transfers of knowledge and information, making use of digital technology, whereby the acknowledgement is made that high levels of human capital are required to operate in these industries. (Folmer, 2013; Scott, 2011). This theory is backed by the creative capital theory, as propounded by the initial work of Richard Florida, who claims that economic growth is led by the 'creative class', highly creative and innovative people. (Florida, 2012) He finds positive externalities to be not only socio-economically in the form of higher income levels, but also ethnically in the form of more ethnic integration (Lee & Umberson, 1985).

Trends towards small businesses, operating in digital technology driven industries, enhance possibilities to work at home, hence: the economic potential of neighbourhoods increases (Folmer, 2013). In fact, academics have found home-based businesses to be of rising importance, in the Netherlands as well as in other parts of the world, increasing by 40% from 2006 to 2010 in the Netherlands (Folmer, 2013; Schutjens, Mackloet, & Korteweg, 2006). Based on this theoretic framework, the first hypothesis of this research is as follows:

Hypothesis 1.1:	*Socio-economic development gives a greater boost to economic and entrepreneurial activity in neighbourhoods in creative industries than in other industries*

Up until this point, human capital has been stated as an important factor to the supply side of entrepreneurship and economic activity in neighbourhoods, but the opposite can be claimed as well. When the supply of human capital rises, demand for services is expected to rise as well, for example the demand for barber shops and restaurants (Folmer, 2013). This theory is known as the *trickle-down* theory, put forward by Berkeley professor Enrico Moretti. He makes his theory vivid by claiming that in San Francisco for each software developer Twitter hires, five barista jobs are created. (Moretti & Harcourt, 2012) The trickle-down theory is found to be valid as well in the Netherlands, albeit less heavily, by Ponds et al. (Ponds, Marlet, & Woerkens, 2017) Based on the above findings, I hypothesize the following:

Hypothesis 1.2:	*Urban neighbourhoods that experience a large growth in creative industries experience a large growth in economic and entrepreneurial activity in restaurants and cafés as well.*

1.2 SOCIO-ECONOMIC DEVELOPMENT AND SEGREGATION

In academic literature, the segregation between urban neighbourhoods is referred to as *residential segregation,* being "the degree to which two or more groups live separately from one another, in different parts of the urban environment." (Massey & Denton, 1988). Residential segregation can be divided in racial segregation and income segregation, despite the large correlation both types of segregation mostly have. (Turner & Fortuny, 2009) This research is predominantly concerned with income segregation, which is driven by, amongst others, demographic preferences, public housing policies and gentrification.

Income segregation is found to have negative outcomes on a social level, for example an adverse effect on racial diversity in neighbourhoods (Lee & Umberson, 1985). Ham et al. state that a continuing increase in socio-economic inequality and growing segregation could have serious impact on the social stability of future cities. (Ham et al., 2015) Some even refer to income segregation as the 'suburbanization of poverty' (Hochstenbach, 2017).

The term gentrification is first used by the urban geographer Ruth Glass during the 1960's (Glass, 1964) and refers to demographic change as a driver of income segregation, which is split in two separate phenomena. Gentrification brings development to urban neighbourhoods, while displacing lower income residents. The inflow of more affluent residents in neighbourhoods is believed to bring development*,* increasing property value through investments in housing. (Atkinson & Wulff, 2009). It may have other developing effects as well as it may stabilize declining areas, reduce crime, encourage further development of neighbourhoods, increase local fiscal revenues, reduce vacancy rates and increase the social mix. (Atkinson & Wulff, 2009) So, the positive elements of gentrification occur in neighbourhoods, while the negative outcomes of segregation occur at the city level.

Gentrification has been subject to debate since the concept first emerged, including a lack of a consensus definition in academic literature, (Vigdor, Massey, & Rivlin, 2002). Some scholars, policy makers and commentators, most notably opponents of neoliberalism, point out the positive externalities of neighbourhood development. Others, predominantly left wing oriented people, point out the negative social effects of low-income displacement. (Atkinson & Wulff, 2009) Increasing demand and investments in housing projects is likely to increase rental prices in neighbourhoods, which in turn may force vulnerable lower income residents to move elsewhere, especially when these residents are in private rental housing. This effect is referred to as displacement. (Atkinson & Wulff, 2009; Freeman & Braconi, 2004). Displacement, in contrast to development, is most often referred to as a negative phenomenon, bringing along secondary psychological costs, community resentment and conflict, commercial and industrial displacement, increased cost and changes to social services, increased crime

and a loss of social diversity. (Atkinson & Wulff, 2009) The ambiguous effect gentrification can have leaves policy makers with a struggle to find the desirable balance of gentrification, allowing positive effects of gentrification to prosper, while fighting negative effects of displacement.

In the 1980's, scholars started to conduct research on the origins of gentrification, finding that gentrification is influenced by changing demographics and lifestyle preferences, professionals clustering in the city providing services for the 'gentrifiers' and a history of disinvestment that created opportunities to reinvest. Another argument why gentricication occurs is that home buyers may expect a certain neighbourhood to experience rising housing prices and therefore be an interesting investment opportunity (Atkinson & Wulff, 2009). The dominant view on gentrification is that the process is mostly autonomous, driven by changes in dynamic preferences and socio-economic conditions. (Hochstenbach, 2017) For the Netherlands, this is confirmed by Marlet et al, who research the development of old, monumental cities in the Netherlands and find the most important pull factors towards the city to be demographical and due to lifestyle preferences (Marlet, 2016). The only factor that is not perceived as autonomous is government policy, which especially in the Netherlands has large effects on gentrification due to relatively active housing policy where social rental housing is replaced by buy or private rent housing. (Hochstenbach, 2017; Marlet & Woerkens, 2009).

In the Netherlands, the city has been in demand since the 90's. Cities in the densely populated Randstad area see their number of inhabitants rise, while peripheral cities experience a declining population. The growth in the Randstad cities is mostly due to an inflow of young and highly educated people, while peripheral regions mostly experience an aging population. The growth of the city is accompanied with rising housing prices, especially in the old parts of the city, while peripheral regions experience declining housing prices (Hochstenbach, 2017; Marlet, 2016; Marlet & Woerkens, 2007, 2009). As follows from above findings, hypothesis 2.1 arises:

Hypothesis 2.1: *Dutch urban neighbourhoods have experienced a trend of socio-economic segregation between 2005 and 2013.*

The growing attractiveness of the large cities is not a coincidence. The Dutch government introduced policy, 'Grotestedenbeleid' (GSB) to boost the big cities in the Netherlands in 1994. GSB was introduced after Dutch cities experienced high crime rates, unemployment, poverty, congestion and other forms of impoverishment since the 1970's. The GSB ended in 2009 and composed of five targets: increasing the number of high and middle-income inhabitants in the cities, improving the living quality of neighbourhoods, improving safety, improving economic power in the city and improving the social quality of the society (Marlet & Woerkens, 2009).

In their evaluation of the GSB in 2010, Marlet et al. find that the cities under GSB policy saw their population become significantly more educated and affluent than cities not under GSB policy. Marlet et al. find both new housing projects and the integral GSB policy to be significant drivers of this trend. Because of new housing projects and due to selling social rental houses, both housing prices, safety and the quality of the living area have increased more in GSB cities than in other cities. (Marlet & Woerkens, 2009)

In 2007, the Dutch government started the so-called *Vogelaar* policy to improve low-income neighbourhoods. The policy, named after the responsible minister at that time, aimed at solving social, physical and economic problems in 40 neighbourhoods, classified on 18 criteria. Half of the criteria were based on socio-economic indicators, as income and social security status. The other half was based on socio-cultural indicators. The policy lasted up and until 2011, during which years almost € 1 billion was spent on urban neighbourhood development. Since 2011, the *Vogelaar* policy has been evaluated in several ways, but with a predominant focus on living conditions in neighbourhoods. (Planbureau, 2013) In a first assessment of the policy in 2009 it is found that social investments in neighbourhoods are not significantly improving the neighbourhood, but physical investments, like new housing are. (Marlet, n.d.) Given this finding, combined with the initial statements that the effects of the policy would only become visible after five years, I hypothesis the following:

Hypothesis 2.2:   *Vogelaar neighbourhoods experienced more socio-economic growth than in 2007 socio-economically comparable neighbourhoods.*

3. DATA

The data used in this research has been drawn from two main sources: *Statistics Netherlands* (*CBS*) and the Dutch employment register *LISA*. All data has been measured on the neighbourhood level, comprising all neighbourhoods in the Netherlands. The data has been retrieved on an annual base, ranging from 2005 up and until 2013. The *CBS* data has been drawn from the annual database *Kerncijfers Wijken en Buurten* and has been used to create an index of socio-economic development of neighbourhoods through principal component analysis. The *LISA* data has been used to gain insight in the employment and entrepreneurial developments in neighbourhoods.

3.1   UNIT OF ANALYSIS

The unit of analysis in this research is the neighbourhood level, which is defined by a four-digit postcode number (pc4). The *LISA* data is measured on the pc4-level originally, but the *CBS*-data is not. The *CBS* defines neighbourhoods as a part of the municipality which is homogeneously demarcated by clusters of housing and socio-economic structure. (CBS, 2017) These neighbourhoods are marked with the most occurring pc4-code, which allows to restructure the data to the pc4-level. In this research, absolute figures are summed over the neighbourhoods with the same most occurring pc4-code and percentages are averaged over the neighbourhoods with the same most occurring pc4-code. This allows to make the *CBS*-data and the *LISA*-data comparable in a panel setting. In this research, it is assumed that the pc4-level is depicted sufficiently by making use of the most occurring pc4-code in a certain neighbourhood.

3.2   GEOGRAPHIC SCOPE

Since the research focusses on the development of urban neighbourhoods, the data has been cleansed in several ways. First, only neighbourhoods which are marked *very urban or very strongly urban* by *CBS* are taken into consideration. This restricts the scope top to neighbourhoods with more than 1,500 inhabitants per km^2. (CBS, 2017) Other neighbourhoods have been dropped from the set. Secondly, regarding the scope of the research, only neighbourhoods in so-called G4 or G32-municipalities have been left in the set. The G4 and G32-municipalities make up the largest municipalities in the Netherlands, including the largest cities. These modifications leave a geographic scope of 491 neighbourhoods.

3.3 DEMOGRAPHIC AND SOCIO-ECONOMIC DATA

Since Duncan and Duncan created a segregation index in 1955 (Duncan & Duncan, 1955), several different methods and indices have been constructed to measure segregation. A consensus definition on how to measure this has not been reached. It is even argued that a consensus definition is not desirable, since the social construct of segregation should be seen from as much different viewpoints as possible. (Massey & Denton, 1988) In this research, segregation is measured in an indirect way by measuring the socio-economic level of urban neighbourhoods through the construction of an index, which is a common method to measure segregation and is used by the before mentioned *PBL* as well. (Leefomgeving, 2016) The difference in this research is that the index is created from multiple variables, using principal component analysis including income levels, housing values and level of application for social security. This multivariable approach adds information to the socio-economic status apart from income level and is made workable through the principal component analysis.

An issue regarding the *CBS* data is that not all data is measured consistently over time. For example, ethnicity variables are measured as a percentage of the total amount of inhabitants in neighbourhoods up to 2014 and as absolute values in 2015. All variables subject to this inconsistence are adjusted to the absolute value. Another issue is that not all variables are measured throughout the whole period. This leaves missing values in the dataset.

Since it is likely that socio-economic variables as income and social security status move simultaneously, it is relevant to check for the correlation between them. The correlation coefficients between the variables turn out to be quite high, (see Appendix) which leads to the problem of multicollinearity when conducting regressions. To move beyond this issue, an index is constructed out of the relevant variables, using principal component analysis (PCA). This method is used to create an overall index, capturing the most important variation between the variables and mitigating the variation down to 1 dimension. The PCA is conducted between the following variables:

- Average housing price in neighbourhoods
- Percentage of households classified as high income (top 20% in the Netherlands)
- Percentage of households classified as low income (bottom 40% in the Netherlands)
- Percentage of inhabitants receiving social security benefit

The first component of the PCA, displaying most of the variation between the four variables into one dimension is used as a socio-economic development index for neighbourhoods. The eigenvalue of the first component, as shown in table 4.1 indicates that this component captures most of the variance between the variables. The average housing price and the percentage of high-income households have a positive effect on the index, while the other two variables have a negative impact on the index. The

index roughly ranges from -5 to 5, in which -5 is the score indicating the 'least developed' and 5 is the score indicating the 'most developed' neighbourhoods on the socio-economic scale. The effects each variable has on the different components is shown in table 4.2

```
Principal components/correlation              Number of obs     =       3,467
                                              Number of comp.   =           4
                                              Trace             =           4
     Rotation: (unrotated = principal)        Rho               =      1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.12879	2.64604	0.7822	0.7822
Comp2	.48275	.174281	0.1207	0.9029
Comp3	.308469	.22848	0.0771	0.9800
Comp4	.0799893	.	0.0200	1.0000

Table 4.1

Variable	Comp1	Comp2	Comp3	Comp4
g_woz	0.4864	0.6069	0.4698	−0.4175
p_ink_hi	0.5348	0.2870	−0.2556	0.7525
p_ink_li	−0.5114	0.2404	0.6595	0.4957
p_soz_wb	−0.4647	0.7010	−0.5282	−0.1166

Table 4.2

The graphical depiction of the PCA index, as depicted in the Appendix, shows an approximately normal distribution. However, both the Skewness-Kurtosis test and the Shapiro Wilk W test reject the null hypothesis that the index is normally distributed. Despite these results, the variable is assumed to be approximately normally distributed, following the Central Limit Theory and the quite high W-score of 0.98 in the Shapiro Wilk W test.

Since, as pointed out before, the data is not complete, some years must be dropped from the scope of analysis. The data points for 2004, 2008, 2014 and 2015 are not sufficient to generate the PCA-index, leaving a range from 2005 up and until 2013, in which 2008 is missing.

The outcomes of the PCA index itself does not hold any value, since the unit is a number no real phenomenon can be related to. It should be noted that only the relative values of the index gain insight in the classification of neighbourhoods to each other. The index can show mobility on the socio-economic scale of neighbourhoods as well since the information is available over multiple years. In other

words: are differences growing or are they declining? To measure this effect, the continuous variable *DEV* indicating the annual development in PCA-index has been created.

Apart from the continuous variables, the PCA index is used to make a categorization of neighbourhoods by socio-economic development level in the form of a category variable. Neighbourhoods finding themselves in the lowest quartile of the PCA-index are assigned a value 1, in the second quartile a value 2, in the third quartile a value 3 and in the highest quartile a value 4. The quartiles are divided as follows:
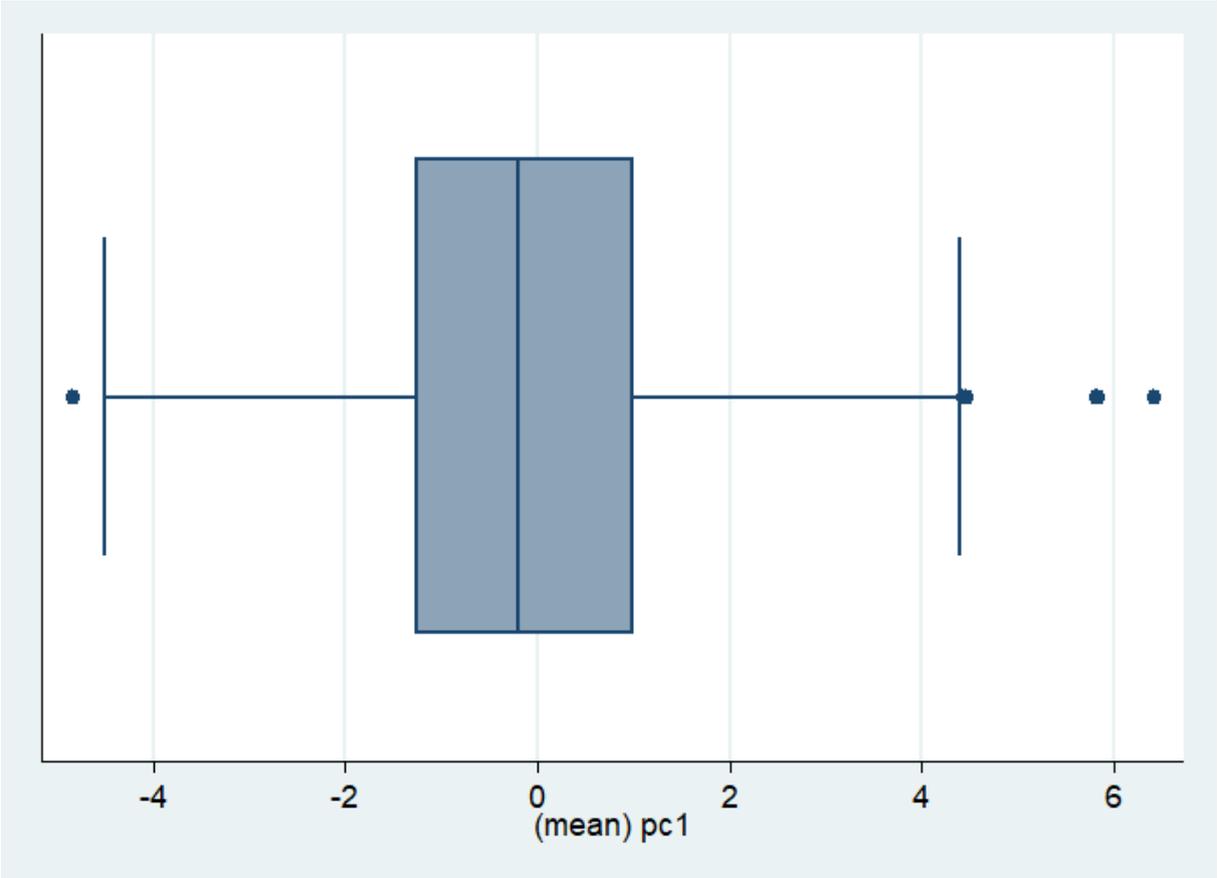

Table 4.3

Finally, a dummy variable is created that categorizes neighbourhoods that were under the *Vogelaar* policy between 2007 and 2011 (*VOG)* to measure policy effects.

3.4 COMPANY, EMPLOYMENT AND ENTREPRENEURIAL DATA

To indicate economic and entrepreneurial activity in neighbourhoods data is used obtained from *LISA*. This dataset consists of all companies registered in the Dutch chamber of commerce in the selected geographic scope of this research. All companies in the set are marked with the following characteristics:

1. Company specific characteristics
2. SBI-classification, categorizing what kind of activity the company conducts
3. Employment characteristics. The data shows the number of jobs that are created in each company, broken down into male and female employees and part-time and full-time jobs.

To make the data suitable for this research, the following steps have been taken. First, only companies with 1 location are left in the data. Companies registered in a certain area, but with more than 1 location are left out of the scope of this research, since it is assumed that these companies are too large to be classified as a start-up and therefore as new economic activity. (Monte & Scalera, 2001) Second, given the research scope, only companies employing 20 people or less are left in the data. Having retained the companies with the relevant size, these companies are categorized by the 4-digit SBI-code into 3 categories:

1. Companies in the creative sector. The creative sector is defined by SBI-code, following the definition of creative industries employed in former research. (Stam, Jong, & Marlet, 2008)
2. Restaurants or cafés. Again, an overview of the relevant SBI-codes can be found in the Appendix.
3. Companies which are neither creative businesses nor restaurants or cafes.

Accordingly, the employment and economic activity variables are classified per industry. Summing the number of companies and jobs by industry classification and by pc4-code in which the companies are located leaves the number of companies and the number of jobs classified by category. Following, variables are created indicating new entrepreneurial activity in neighbourhoods. To capture this information, a dummy variable is given the value 0 if the company was already established in 2003. The dummy is given the value 1 in the first year the company occurs in the set, if the company has not been established yet in 2003. So, the dummy is given the value 1 in the year it is established. Again, the variable is separated by industry classification.

To capture the success of these newly established companies another dummy variable is created giving the value 1 if the start-up is still in business three years after it was established and 0 otherwise. This categorization, again separated by industry classification, is used as a measure of successful entrepreneurship, following the scale-up classification. (Monte & Scalera, 2001) The modifications leave the following variables as depicted below.

Number of companies	Number of start-ups

In creative industries *(COM_CRE)*

In non-creative industries *(COM_N_CRE)*

In restaurants and cafés *(COM_R_C)*

In creative industries *(SU_CRE)*

In non-creative industries *(SU_N_CRE)*

In restaurants and cafés *(SU_R_C)*

Number of jobs	Number of successful start-ups

In creative industries *(JOB_CRE)*

In non-creative industries *(JOB_N_CRE)*

In restaurants and cafés *(JOB_R_C)*

In creative industries *(S_SU_CRE)*

In non-creative industries *(S_SU_N_CRE)*

In restaurants and cafés *(S_SU_R_C)*

A skewness and kurtosis test shows the hypothesis that the variable is normally distributed can be rejected for all 12 variables at a 1%-significance level. (see Appendix). The high level of skewness is well shown in the graphic representation, which is shown in the Appendix as well.

4. METHODOLOGY

Given the characteristics of the dataset, all regressions are in a panel set up over pc4-code and year. The hypotheses as depicted in chapter 2 are all tested using more than one regression set up. The setup is made in the following way.

4.1 SOCIO-ECONOMIC URBAN NEIGHBOURHOOD DEVELOPMENT AND ECONOMIC ACTIVITY

To test hypothesis 1.1 and hypothesis 1.2 the socio-economic index is taken as independent variable of the number of companies, jobs, start-ups and successful start-ups categorized by the three types of activity. The dependent variable is interchangeably related to the creative industries _CRE, the non-creative industries _N_CRE and cafés and restaurants _R_C. The dependent variable is *SEI* throughout the testing of the hypotheses.

The outcomes of all 12 regressions are used to formulate an answer to hypothesis 1.1. Hypothesis 1.2 is addressed by the regressions 1, 4, 7 and 10, in which the _CRE is the independent variable and by regressions 3, 6, 9 and 12, in which the independent variable is restricted to restaurants and cafés _R_C to measure trickle-down effect.

The regressions 1 to 6 display the effect on economic activity in the form of the number of companies and the number of jobs and are specified in the following way.

Number of companies   **Number of jobs**

(1) $COM\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (4) $JOB\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

(2) $COM\_N\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (5) $JOB\_N\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

(3) $COM\_R\_C_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (6) $JOB\_R\_C_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

To measure the effect on entrepreneurial activity the same regressions are rerun in regression 7 up and until 12, but now having the number of start-ups and the number of successful start-ups as independent variable.

Number of start-ups   **Number of successful start-ups**

(7) $SU\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (10) $S\_SU\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

(8) $SU\_N\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (11) $S\_SU\_N\_CRE_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

(9) $SU\_R\_C_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$ (12) $S\_SU\_R\_C_{it} = \beta_0 + \beta_1\, SEI_{it} + \epsilon$

The subscripts *i* and *t* indicate the panel characteristics of pc4-code and year. Given that all independent variables in regression 1 up to 12 are highly skewed to the left and that they are count data, a negative

binomial regression method is employed. The significant values of the chi-square test indicate that the Possoin distribution is inappropriate. All regressions are estimated using a fixed-effects regression to control for drivers that influence entrepreneurial environment for all neighbourhoods in the country, like GDP evolvement, overall changes in preferences and government policy that affects all neighbourhoods. In addition to these time-fixed effects, neighbourhoods characteristics that do not change are fixed, for example the accessibility to public services.

4.2   SOCIO-ECONOMIC DEVELOPMENT AND SEGREGATION

To test the socio-economic hypothesis 2.1 that lower developed neighbourhoods at the beginning of the period see their gap to the better developed neighbourhoods rising, it is tested whether the initial starting point in 2005 is indicative for the development level over the years, depicted in the following regression set up:

$$(13) \quad DEVI_{it} = \beta_0 + \beta_1\, INI_{it} + \epsilon$$

In regression 13 the dependent variable *DEV* is the change in PCA-index of socio-economic activity since 2005 and the independent variable *INI* is the categorical variable indicating the initial development category of neighbourhoods in 2005. To gain insight in pre-crisis and post-crisis development the regression is re-run on subsets of the relevant years.

Hypothesis 1.2 is tested in regression 14, in which *DEV* is again the dependent variable and the independent variable *VOG* is the dummy indicating whether the neighbourhood is a *Vogelaar* neighbourhood.

$$(14) \quad DEV_{it} = \beta_0 + \beta_1\, VOG_{it} + \epsilon$$

Both regression 13 and 14 are OLS panel data regressions. The OLS is conducted under the normality assumption of the PCA index of socio-economic development. The subscripts *i* and *t* indicate the panel characteristics of pc4-code and year. Both regressions are estimated with the variable *YEAR* included, to address time fixed-effects regression to control for developments that influence the socio-economic status of a neighbourhood for all neighbourhoods in the country, as growing national income, overall growing housing prices or overall changes in social security levels.

5. RESULTS

5.1 SOCIO-ECONOMIC URBAN NEIGHBOURHOOD DEVELOPMENT AND ECONOMIC ACTIVITY

The core results of this research are listed in table 5.1 and table 5.2. The tables show the effect of the constructed socio-economic development index to economic activity in neighbourhoods in table 5.1 and to entrepreneurial activity in table 5.2. Despite the separation in industry type and in number of companies, jobs start-ups and successful start-ups, the results show a strong positive relationship between socio-economic development and economic activity in neighbourhoods, giving strong reason to believe that the two factors exist in a relationship of co-evolution. Therefore, the results give strong support to the core research question of this research.

VARIABLES	COM_CRE	COM_N_CRE	COM_R_C	JOB_CRE	JOB_N_CRE	JOB_R_C
SEI	0.26***	0.15***	-0.00	0.22***	0.08***	0.04***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Constant	2.55***	3.89***	20.58	2.88***	4.64***	4.31***
	[0.03]	[0.03]	[104.84]	[0.03]	[0.03]	[0.06]
Observations	3,453	3,453	3,434	3,453	3,453	3,434
Number of Postcode4	450	450	449	450	450	449
Year FE	YES	YES	YES	YES	YES	YES
Postcode4 FE	YES	YES	YES	YES	YES	YES

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Table 5.1

VARIABLES	SU_CRE	SU_N_CRE	SU_R_C	S_SU_CRE	S_SU_N_CRE	S_SU_R_C
SEI	0.30***	0.17***	-0.06*	0.28***	0.15***	-0.06
	[0.02]	[0.01]	[0.03]	[0.02]	[0.01]	[0.04]
Constant	1.87***	2.89***	3.36***	1.75***	2.98***	3.47***
	[0.04]	[0.04]	[0.21]	[0.04]	[0.04]	[0.31]
Observations	3,436	3,453	3,253	3,436	3,453	3,226
Number of Postcode4	450	450	438	450	450	433
Year FE	YES	YES	YES	YES	YES	YES
Postcode4 FE	YES	YES	YES	YES	YES	YES

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Table 5.2

As shown in table 5.1, all independent variables have a significant effect of more than 99% on the number of jobs and companies, except for the separation to cafés and restaurants. The outcomes in

table 5.2 show that the results of the entrepreneurial activity correspond with the results of the economic activity, again except for the separation to restaurants and cafés. Therefore, the results point in the direction of a significant impact of socio-economic development on economic activity in neighbourhoods in general.

Despite the similarity in sign and significance level, the size of all estimated outcomes related to the creative industries is more than a factor 1,5 as large as the estimated outcomes related to the non-creative industries. Based on these results, it can be argued that, despite positive effects for all, the effect on creative industries is larger than average, indicating that socio-economic development has a stronger effect on economic and entrepreneurial activity in creative industries than in other industries, giving reason to accept hypothesis 1.1.

The outcomes separated to the category cafés and restaurants show interesting differences. Differences emerge between the number of companies and the number of jobs that are created because of socio-economic development. While the number of restaurants and cafés is not significantly affected by socio-economic growth in urban neighbourhoods, the number of jobs is. This is an indication that the trickle-down theory only holds in the sense that the size of the restaurants and cafés grows, but it is not a complete affirmation. Therefore, hypothesis 1.2 is only partly confirmed.

5.2 SOCIO ECONOMIC DEVELOPMENT AND SEGREGATION

The results of regression 13 are listed in table 5.3. The regressions reveal several interesting results.

VARIABLES	DEV (2005-2013)	DEV (2005-2008)	DEV (2009-2013)
INI (2005)	0.01	-0.02**	0.02***
	[0.00]	[0.01]	[0.00]
YEAR	-0.02***	0.08***	-0.04***
	[0.00]	[0.02]	[0.00]
Constant	48.06***	-163.55***	86.06***
	[3.32]	[31.72]	[8.32]
Observations	2,573	837	1,736
Number of Postcode4	449	426	442

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Table 5.3

First, the overall regression, testing the effects from 2005 up and until 2013, shows that there is no significant effect between the initial level of development in 2005 and the development the neighbourhood has made since. So, in all categories neighbourhoods were equally likely to move up or

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down the socio-economic ladder. This result is remarkable, since it is in contrast with the results of *PBL* on which the hypothesis is formed. What is remarkable as well, is that the time-fixed effects control variable *YEAR* is negative and significant on the 1%-level. This implicates that since 2005 annual development levels have deaccelerated both for 'rich' and 'poor' neighbourhoods.

Separating between pre-crisis and post-crisis years does lead to, quite interesting, significant results. The results show that the variable *INI* has a 5%-significant negative effect on the development level in the years prior to the crisis. This indicates that neighbourhoods in the lowest category of socio-economic status experienced significantly less development than socio-economically more developed neighbourhoods. It is interesting to note that in these three years, neighbourhoods development accelerated as a whole, which is revealed by the highly significant effect on development from the control variable *YEAR* including time-fixed effect. So, the results do not mean that living standards in the lowest category neighbourhoods worsened, but they do give a strong indication that neighbourhoods have diverged in socio-economic status in the few years prior to the crisis. In other words: differences increased.

After the crisis, the results are the other way around and significant on the 1%-level. The positive and significant coefficient of *INI* indicates that neighbourhoods in the lowest category of socio-economic status experienced significantly more development than neighbourhoods in the higher categories of socio-economic status. This gives a strong indication that neighbourhoods have converged in socio-economic status after the crisis, while neighbourhood development as a whole deaccelerated. In other words: the gap between the categories has narrowed after the crisis while development growth stagnated: differences decreased.

Combining the results of the regressions gives a strong indication that socio-economic development levels have accelerated in periods of economic growth and decelerated in periods of recession. This is not very remarkable in itself, given the economic crisis. The more remarkable result is that the results give support that segregation increased in periods of economic growth and decreased in periods of recession. The results therefore only give support to a partial confirmation of hypothesis 2.1.

To support these findings, in the next regression the *Vogelaar* neighbourhoods are taken as an indicator of lower developed areas. The results showing these outcomes are shown in table 5.4.

VARIABLES	DEV LEVEL	DEV (2005-2013) LEVEL = 1
VOG (2007)	-1.32***	-0.02
	[0.14]	[0.02]
YEAR		-0.03***
		[0.00]
Constant	2.57***	62.94***
	[0.06]	[8.07]
Observations	491	570
R-squared	0.156	
Number of Postcode4		101

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Table 5.4

The regressions show that *Vogelaar* neighbourhoods are significantly negatively correlated with the socio-economic index of neighbourhood status, revealing that *Vogelaar* neighbourhoods are predominantly low socio-economic status neighbourhoods. Based on these outcomes it can be stated that differences between *Vogelaar* neighbourhoods and the low-development peer group in the long run are more likely to come from policy effects than from selection effects. In the second regression however, it is shown that the fact that a neighbourhood is classified as *Vogelaar* neighbourhood does not have a significant effect on development when only the subset of the lowest level neighbourhoods (as measured in 2007, when the policy started) is taken into consideration. Therefore, the *Vogelaar* neighbourhoods have not developed differently from their socio-economically comparable peers in the level 1 category.

The effect of the *Vogelaar* policy on socio-economic development separated in pre- and post-crisis periods in is listed in table 5.5.

VARIABLES	DEV (2005-2013)	DEV (2008-2013)	DEV (2009-2013)	DEV (2005-2008)
VOG (2007)	-0.02*	-0.04***	-0.04***	0.02
	[0.01]	[0.01]	[0.01]	[0.02]
YEAR	-0.02***	-0.04***	-0.04***	0.08***
	[0.00]	[0.00]	[0.00]	[0.02]
Constant	48.15***	86.22***	86.22***	-163.70***
	[3.32]	[8.32]	[8.32]	[31.72]
Observations	2,573	1,736	1,736	837
R-squared				
Number of Postcode4	449	442	442	426

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Table 5.5

These results confirm the findings of the former regressions that lower developed neighbourhoods did not develop in a significantly different pace from other neighbourhoods. Again, the separation of time periods prior to and after the crisis show interesting results, as does the control variable year included to induce time-fixed effects.

The results give an indication that the *Vogelaar* neighbourhoods have seen their gap with high income neighbourhoods grow during the whole period. This effect is not significant though, only at the 10%-level. The effect after crisis is significant though, again giving an indication that low-income neighbourhoods and high-income neighbourhoods have segregated after the crisis.

As mentioned before, the results show that differences between *Vogelaar* neighbourhoods and their peers are more probably due to policy effects than due to selection effects. However, the results in table 5.5 show that these assumed policy effects are not visible. This gives a strong indication that the *Vogelaar* policy did not manage to let low-income neighbourhoods converge towards the high-income neighbourhoods. The results give strong reason to reject hypothesis 2.2.

6. CONCLUSION

6.1 DISCUSSION & POLICY IMPLICATIONS

This research shows several findings supporting the quest of answering the two research questions. First, the results show evidence that the socio-economic position of neighbourhoods, as defined by income levels, housing prices and degree to which people lean on social security, does influence the economic and entrepreneurial activity in neighbourhoods. Richard Florida's initial findings regarding the creative industries are backed by evidence in this research, since they are found to be induced in a similar way to other industries, but more strongly. The results give reason to support the *trickle-down* theory as well, but only in the number of jobs, not in the number of startups.

Secondly, the results show evidence that income segregation between urban neighbourhoods in the Netherlands has increased after the economic crisis. The outcome is not surprising given the trends in the Western world in urban areas, but should be regarded with concern given the social and political effects income segregation is believed to have. As follows from the results, the *Vogelaar* policy has not been able to alter this trend. There may be a selection effect in the composition of the 40 *Vogelaar* neighbourhoods, but the results suggest that the policy has not induced more economic activity in these neigbourhoods than it has in neighbourhoods that were initially comparable. It must be considered that economic activity has not been the only target of the policy.

Combining the results of the first and the second research question shows that the socio-economic position of urban neighbourhoods and economic activity in neighbourhoods seem to move in dynamics of co-evolution. This is of relevance to policy makers. Taking the reverse causality possibility into account, it is difficult to give direct advice where to start. Should policy makers construct policies that help neighbourhood inhabitants in a broader sense or should they construct policies that support economic and entrepreneurial activity directly? A safe policy advice is not to interfere in areas where both phenomena are taking place.

The finding that Dutch urban neighbourhoods have been subject to segregation after the economic crisis, supports the gentrification theory. Apart from the negative social and political effects described in the theoretic framework, this research adds another aspect why segregation should be regarded with caution by policy makers. Growing segregation also means growing differences in economic activity between neighborhoods, which may in turn make it more difficult for the low-income neighbourhoods to develop, turning the dynamics into a downward spiral.

Summing up, socio-economic development of neighbourhoods moves in co-evolution with economic and entrepreneurial activity. Especially creative industries seem to grow during the years, *trickling-down* to restaurants and cafés. However, these positive effects do not seem to occur for all neighborhoods. In the years after the crisis the low-income neighbourhoods see their gap towards high-income neighbourhoods widen, radically turning the pre-crisis trend. The *Vogelaar* policy does not seem to have been able to change this trend.

Altogether, the two most important factors policy makers should take into consideration are the following:

1) Neighbourhood development does matter: for social and political purposes, but also as an accelerator of economic activity.
2) Specific neighbourhood policies, in this case the *Vogelaar* policy, do not seem to have produced significant effects, while the control variable year does. Therefore, it seems that the general economic development affecting everyone is a much more important driver of neighbourhood development than specific policies.

Of course, the factors defining this economic growth are beyond the scope of this research, as are the specific conditions to which the Netherlands are subject. Perhaps the social security framework of the Netherlands is an important factor why segregation declines in periods of economic growth. Therefore, these findings cannot be extrapolated in general. Moreover, it should be taken into consideration that differences between neighbourhoods are relatively small in the Netherlands in the first place. Neighbourhood specific policies might be more effective should these differences be greater.

6.2 LIMITATIONS

There are methodological limitations to this research that should be considered as well. The most important issue is the before mentioned possibility of reverse causality between socio-economic development and economic activity. It may well be that inhabitants are attracted to a certain neighbourhood because of economic activity. If so, the assumption of exogenously developing socio-economic characteristics of neighbourhoods would not hold. This assumption is not tested significantly and could therefore be an issue in interpreting the data.

Another limitation is that the CBS data is measured using the most occurring pc-4 code, while the *LISA* data is measured by real pc4-code. This may lead to measurement errors. A third issue is that there may be other factors influencing economic activity. The regression setup accounts for time-fixed neighbourhood-specific characteristics, like the accessibility of services. There may be neighbourhood specific characteristics though that influence economic activity, for example investments in the area.

These are not controlled for in the regression setup due to a lack of data. This should be considered in interpreting the results.

6.3 FUTURE RESEARCH POSSIBILITIES

The contribution of this research lies in the construction of the socio-economic index through principal component analyses, which accounts for the problem of multicollinearity. Besides that, the construction of panel data and the combination of *CBS* data to the *LISA* data is a contribution which others can build upon in further research. The data issues of missing values and missing controls should be accounted for in that case, as well as the methodological issue of reverse causality. For example, 2SLS-regression may be set up in which an instrumental variable may be created to address the reverse causality problem.

Besides the methodological issues, several other future research possibilities occur. For one, it is interesting to assess if the measured effects continue to take place after 2013. Another possibility is to separate between different industry types. A third suggestion for future research is to include the effect of old houses and new housing projects into the research. As claimed by the creative class theory, the creative class is attracted by old buildings with 'character', while it is relevant for policy makers to assess whether new housing projects boost economic activity. Both effects have not been considered due to a lack of relevant data.

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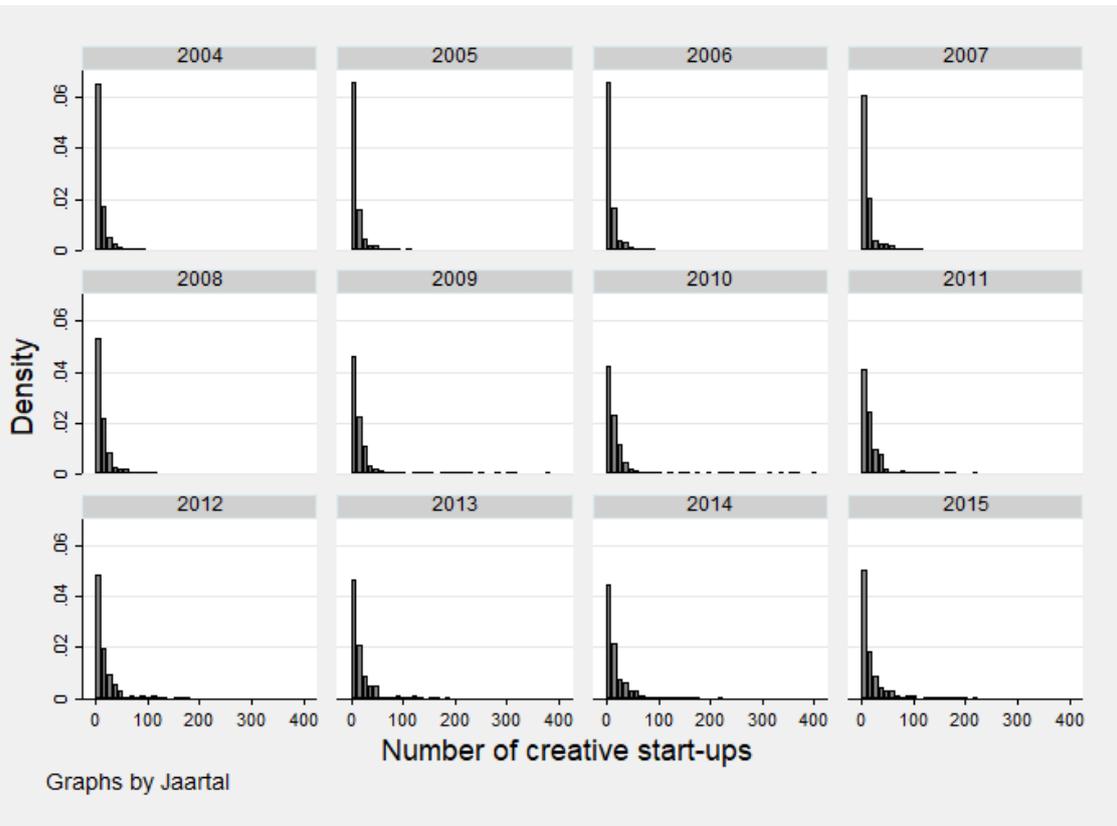
8. APPENDIX

Skewness / Kurtosis tests for normality of dependent economic and entrepreneurial variables

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            Skewness/Kurtosis tests for Normality
                                                ──────── joint ────────
   Variable        Obs  Pr(Skewness)  Pr(Kurtosis) adj chi2(2)   Prob>chi2
─────────────────────────────────────────────────────────────────────────
a_creatie~rs     42,052      0.0000        0.0000           .           .
a_niet_cr~rs     47,971      0.0000        0.0000           .           .
a_rest_ca~rs     32,502      0.0000        0.0000           .           .
a_creatie~ps     42,052      0.0000        0.0000           .           .
a_niet_cr~ps     47,971      0.0000        0.0000           .           .
a_rest_ca~ps     32,502      0.0000        0.0000           .           .
a_creati~ven     48,979      0.0000        0.0000           .           .
a_niet_c~ven     52,685      0.0000        0.0000           .           .
 a_rest_cafe     44,176      0.0000        0.0000           .           .
a_creati~nen     48,979      0.0000        0.0000           .           .
a_niet_c~nen     52,685      0.0000        0.0000           .           .
a_rest_caf~n     44,176      0.0000        0.0000           .           .
```

Graphical depiction of distribution of variables

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Number of non-creative companies

Graphs by Jaartal

Number of non-creative start-ups

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

Graphs by Jaartal

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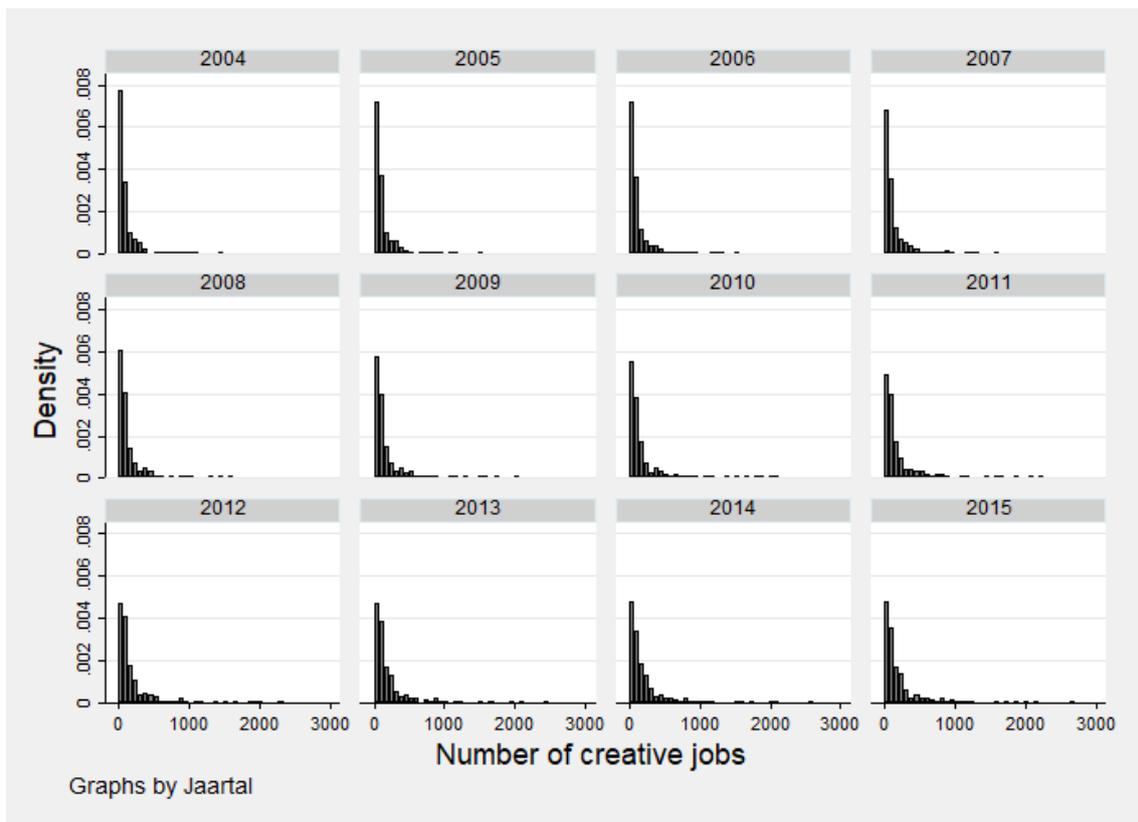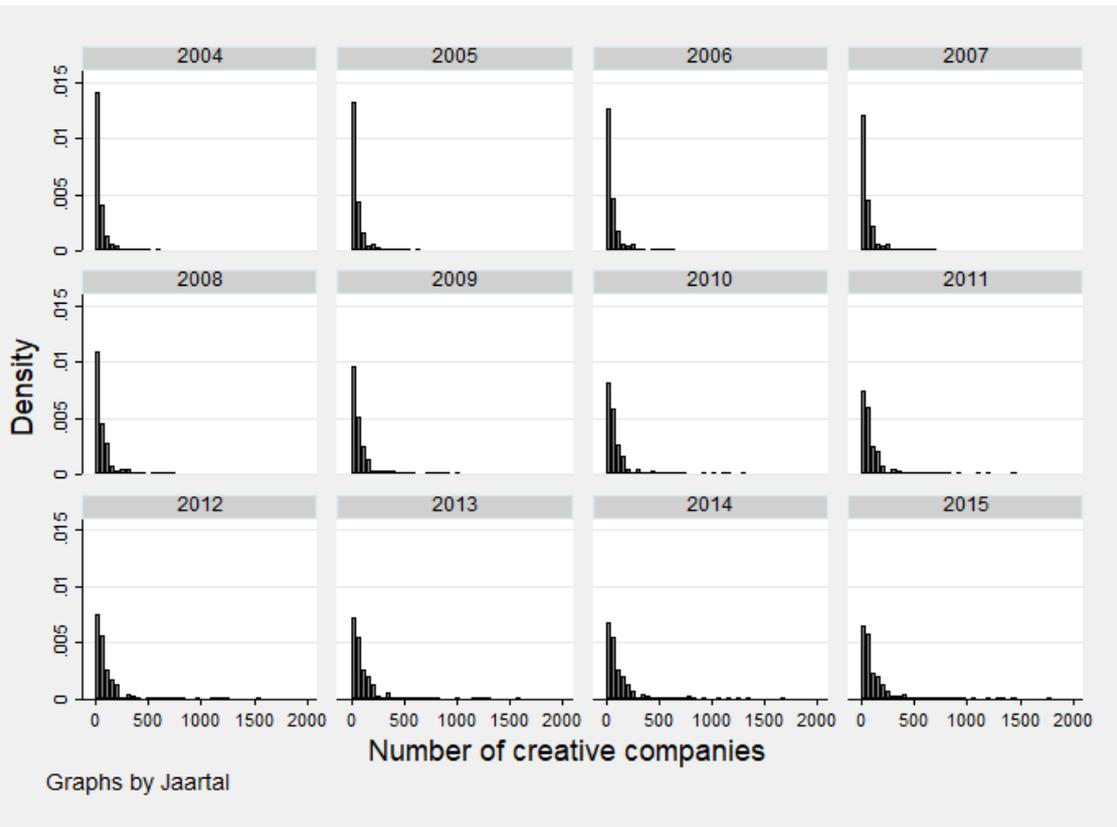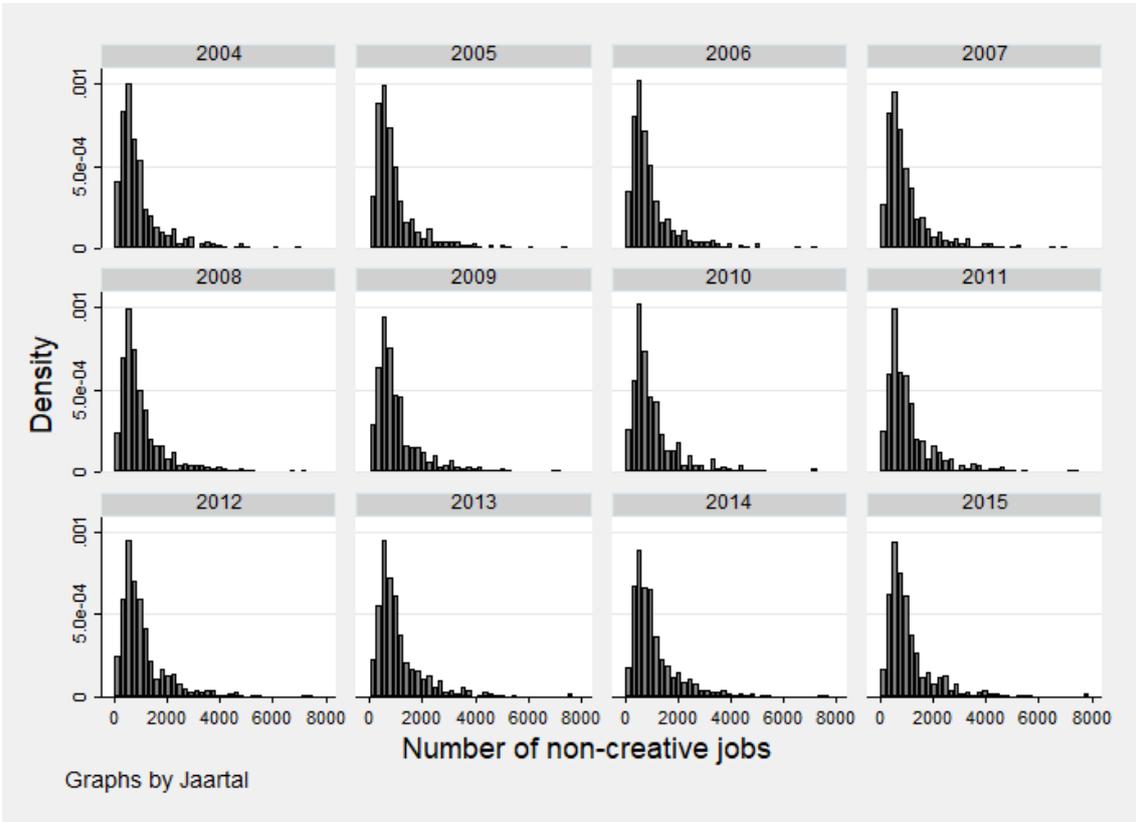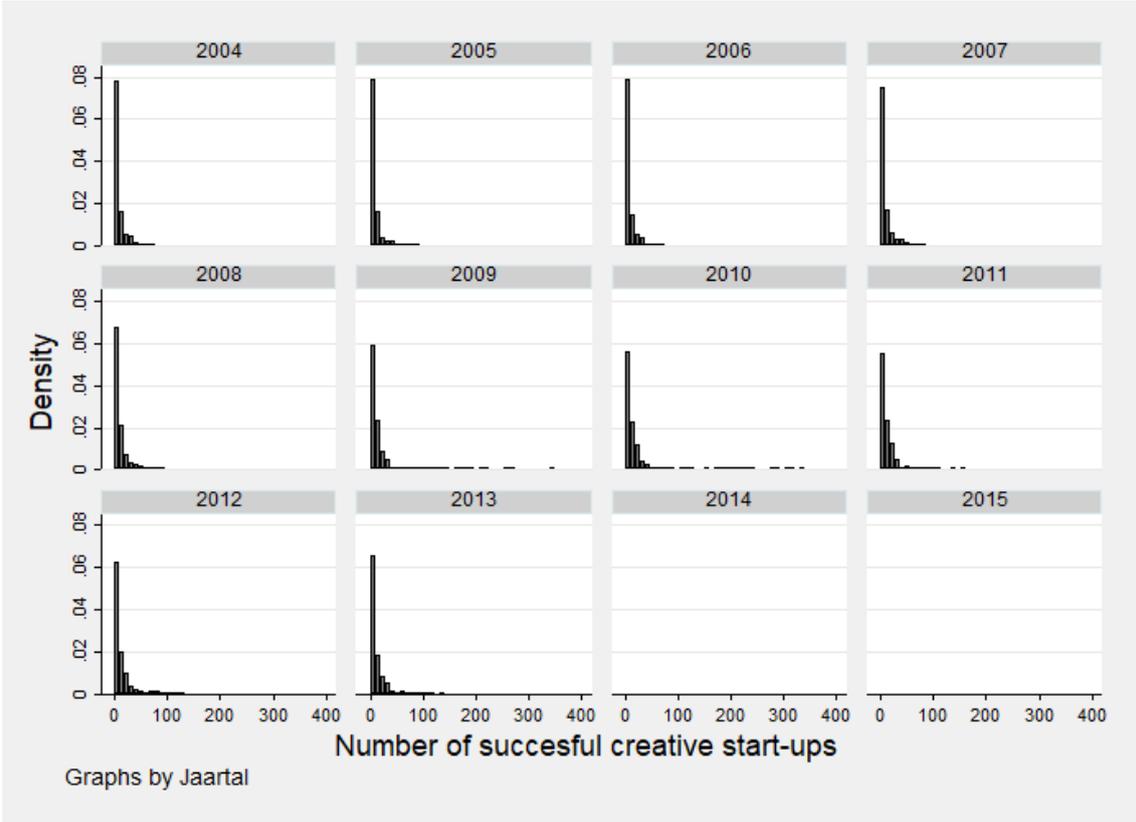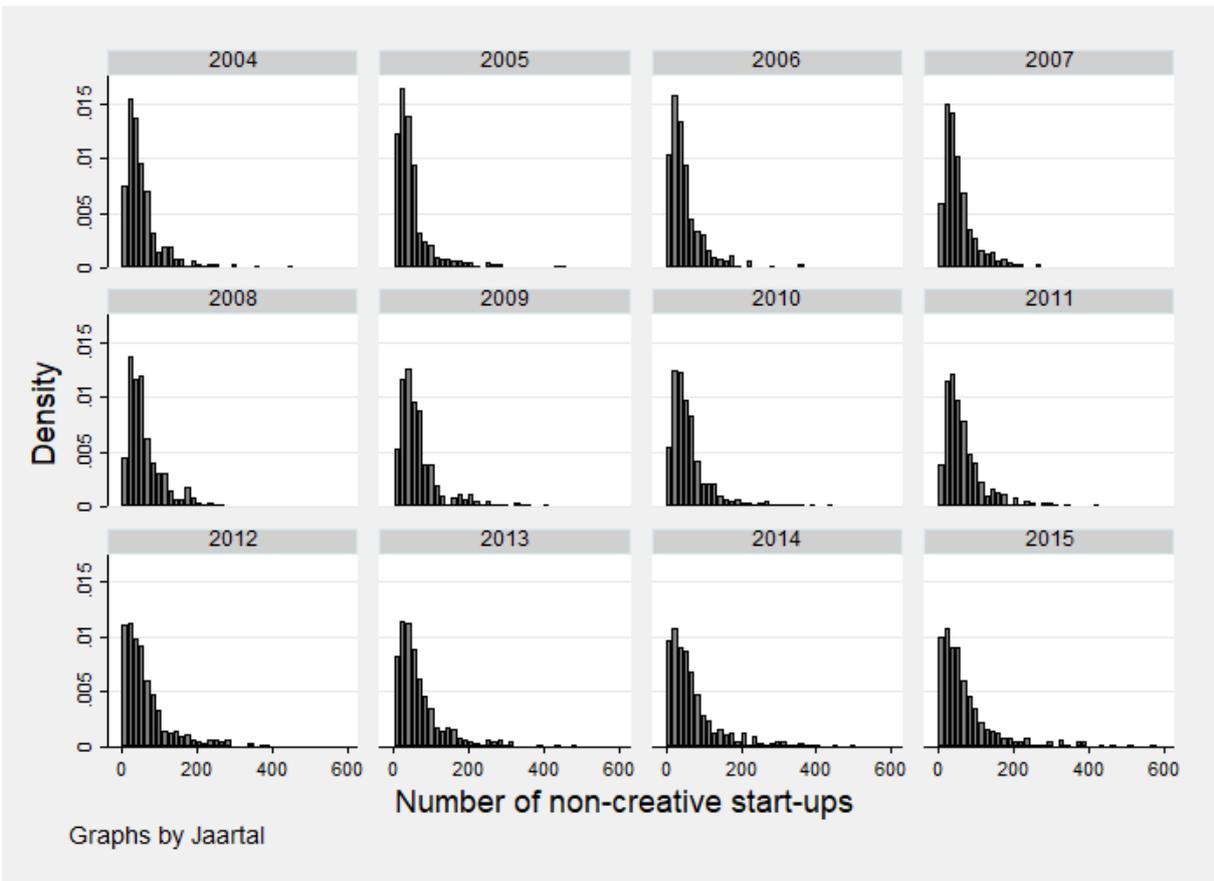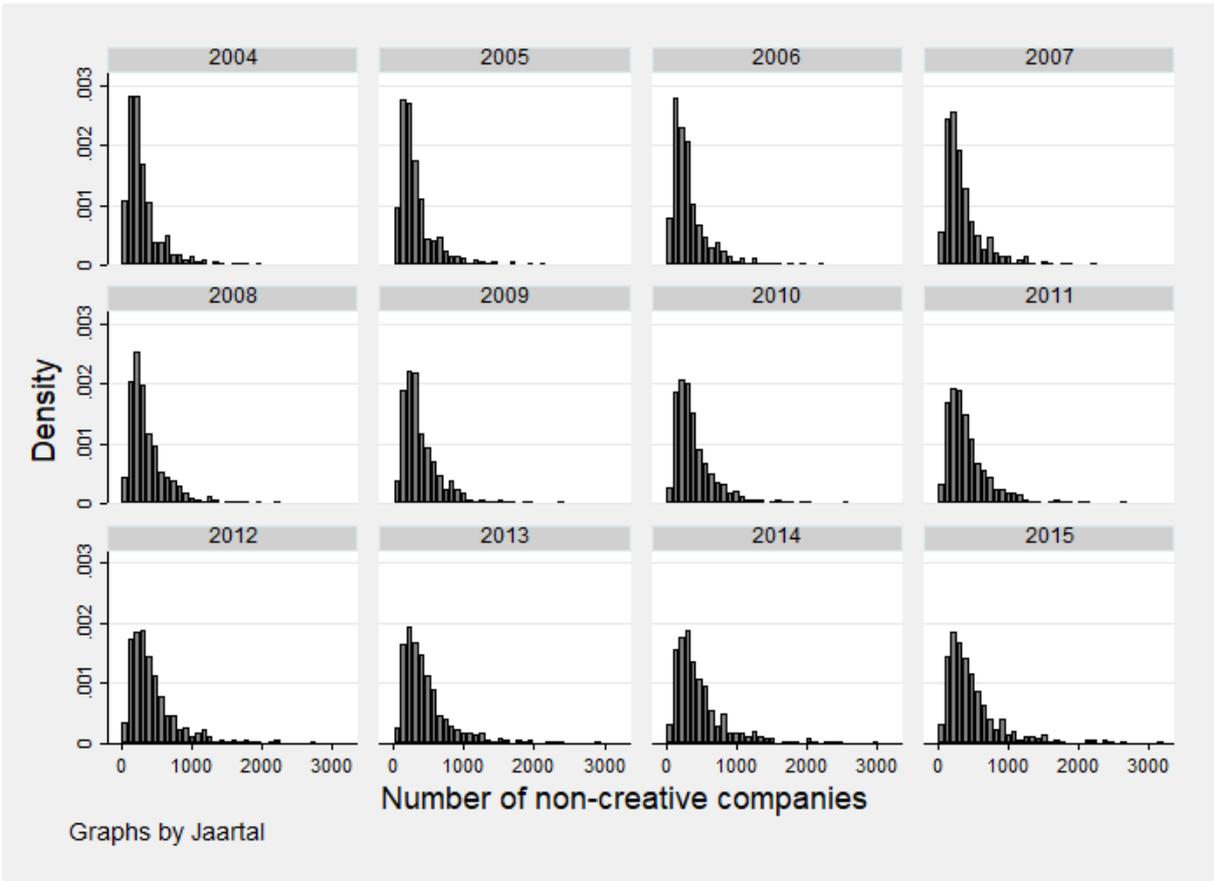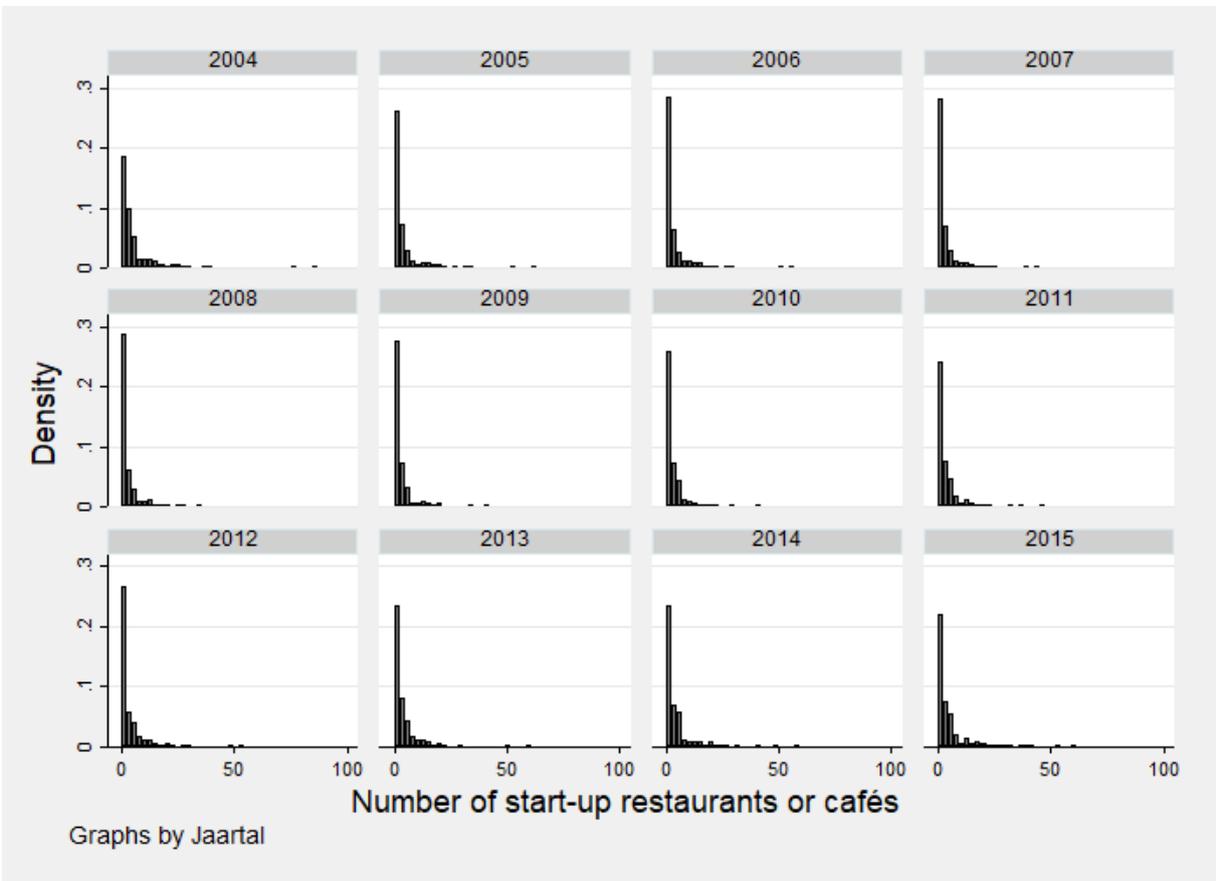
Correlation tables of socio-economic variables

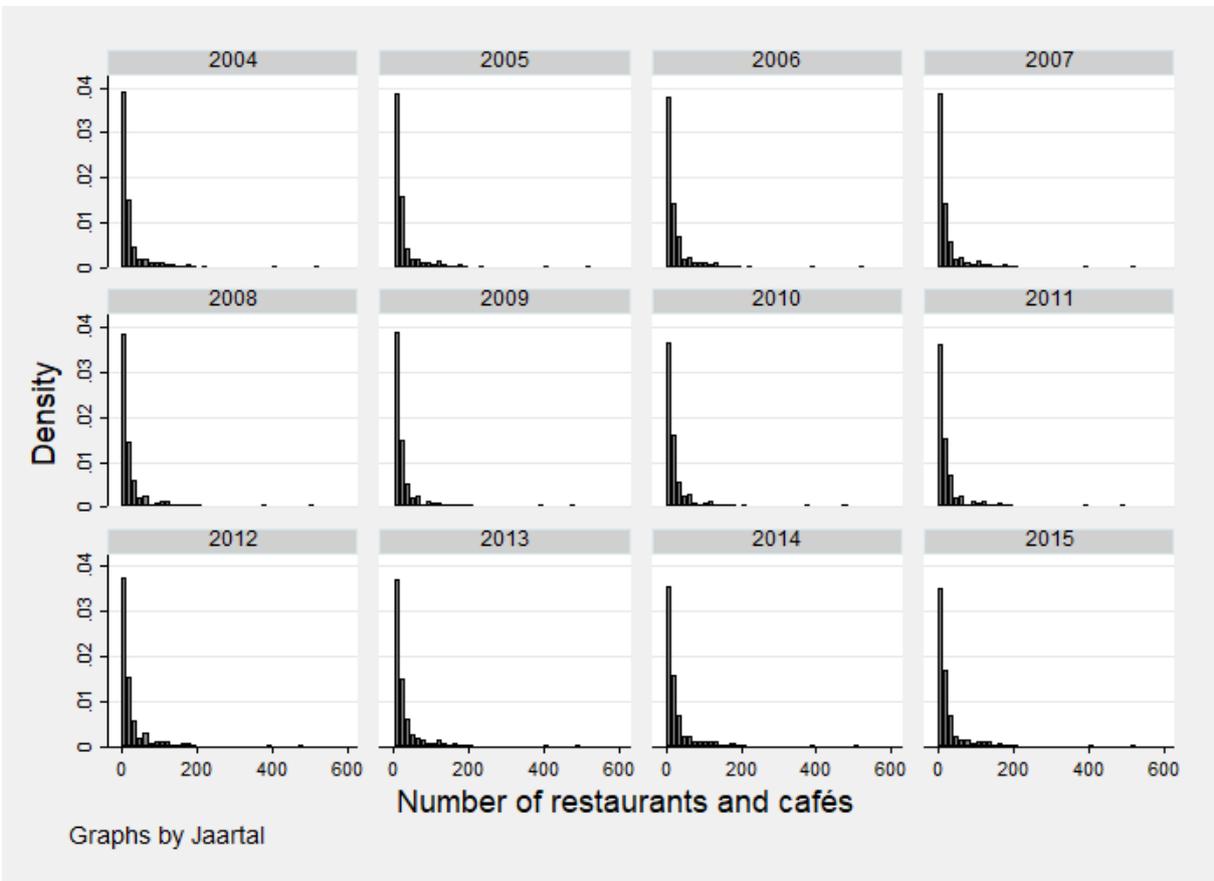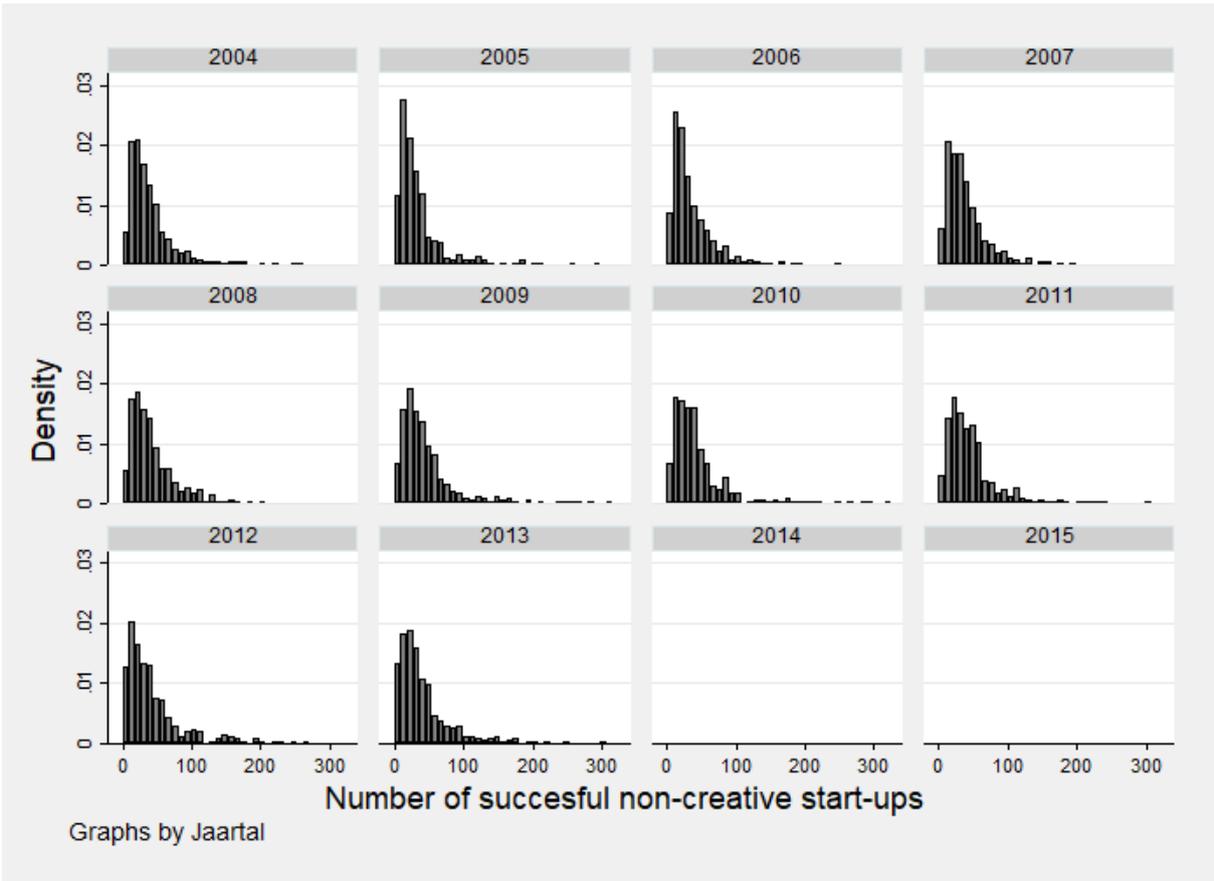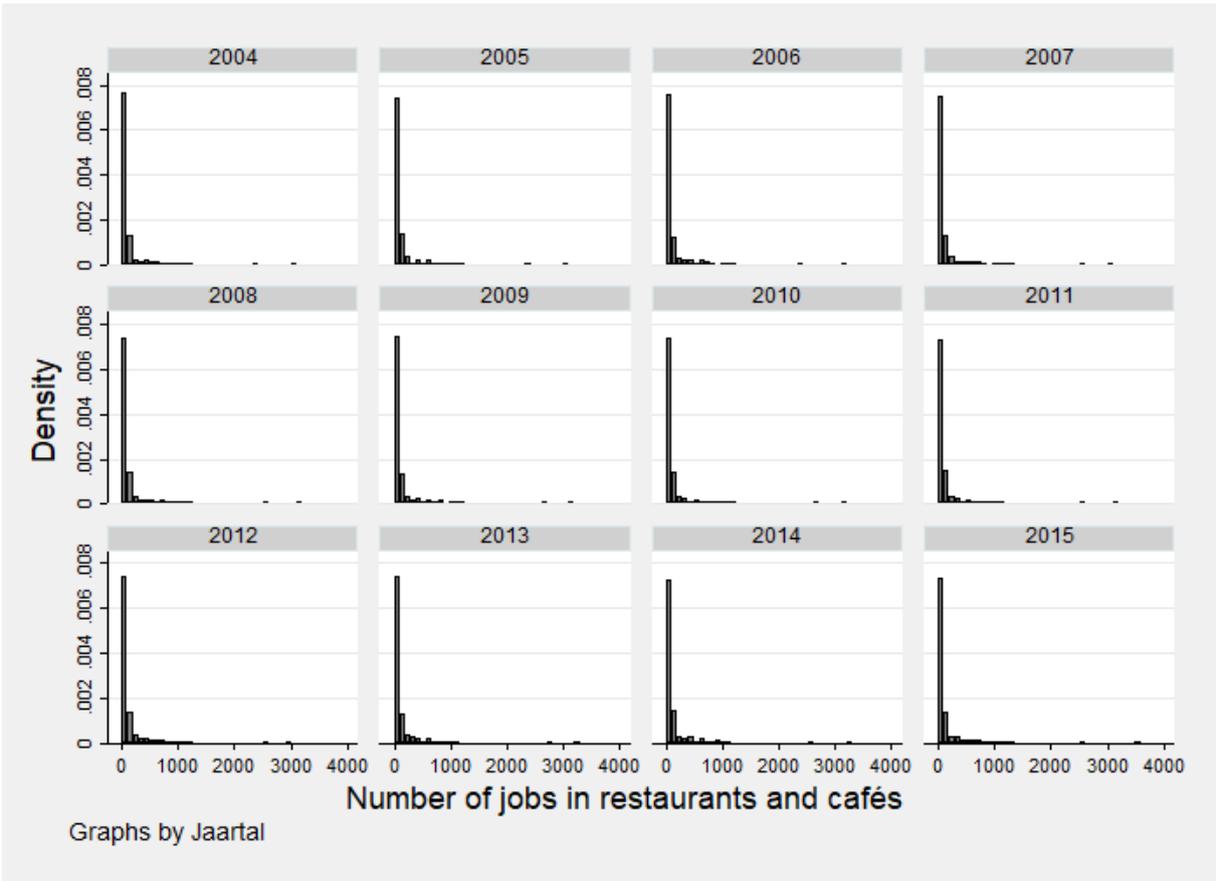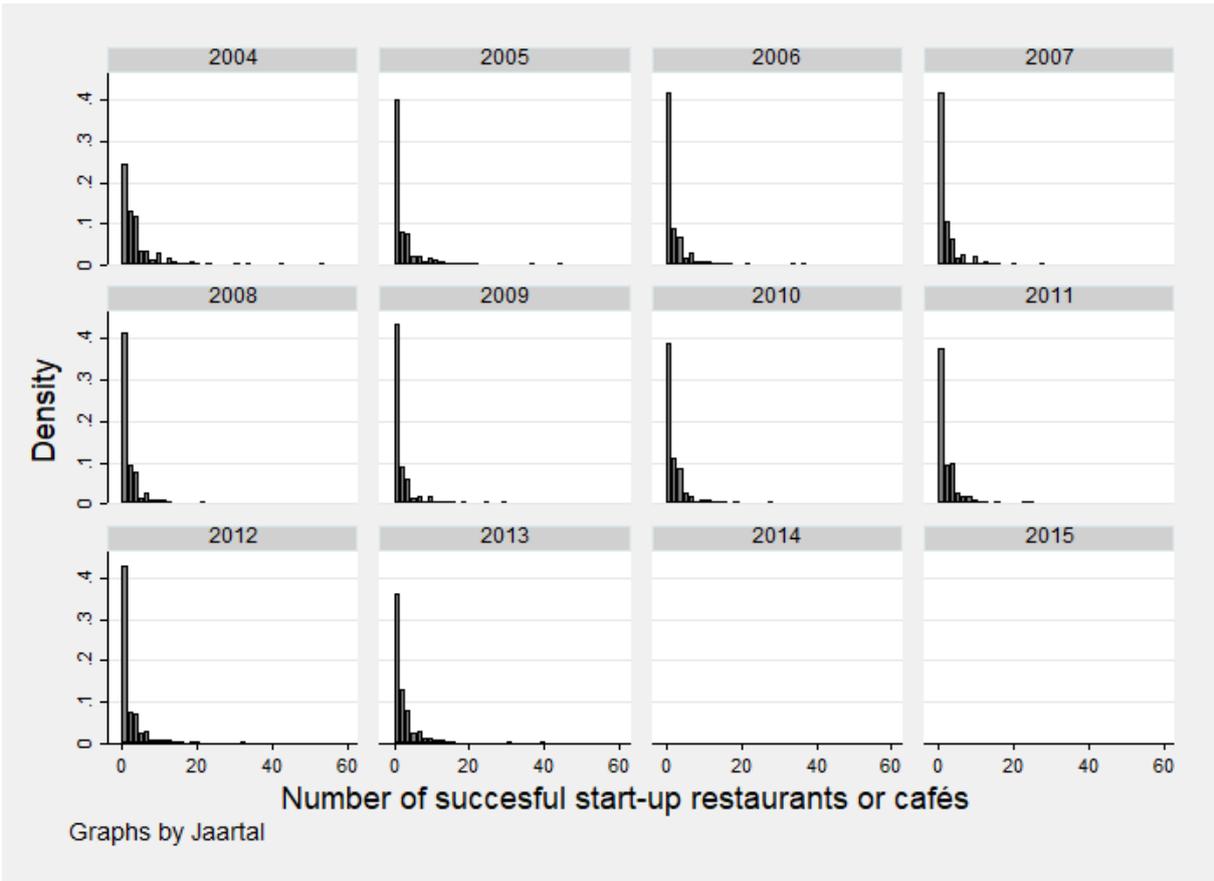|	p_geb	p_ste	g_hhgro	bev_dich	g_woz	p_1gezw	p_mgezw
p_geb	1.0000						
p_ste	-0.1476	1.0000					
g_hhgro	-0.0095	0.0129	1.0000				
bev_dich	0.3343	-0.1947	-0.0144	1.0000			
g_woz	-0.1461	-0.0208	0.0993	-0.1138	1.0000		
p_1gezw	-0.2118	0.0200	.	-0.5192	0.1100	1.0000	
p_mgezw	0.2118	-0.0200	.	0.5192	-0.1099	-1.0000	1.0000
p_koopw	-0.1648	-0.0135	0.1457	-0.3220	0.3947	0.6586	-0.6586
p_huurw	0.1711	0.0116	-0.1394	0.3095	-0.4229	-0.6380	0.6380
p_ov_hw	-0.0322	-0.0663	-0.0660	0.2267	0.2927	-0.5059	0.5059
p_wcorpw	0.1682	0.0504	-0.0819	0.1282	-0.5469	-0.2252	0.2252
p_wont2000	-0.1176	0.0543	-0.3564	0.1299	-0.0408	-0.0662	0.0662
p_wonv2000	0.1176	-0.0543	0.3565	-0.1298	0.0409	0.0662	-0.0662
g_ink_po	-0.0772	-0.0531	0.3092	0.0163	0.6826	.	.
g_ink_pi	-0.1729	0.1973	0.1378	-0.1770	0.7103	.	.
p_ink_li	0.0320	0.0199	-0.1307	0.1117	-0.6325	-0.1604	0.1604
p_ink_hi	-0.1187	-0.0244	0.1187	-0.1239	0.8357	0.0310	-0.0310
p_hh_li	0.1802	0.0457	-0.1971	0.2895	-0.6497	-0.4694	0.4694
p_hh_hi	-0.1808	-0.0364	0.1893	-0.2089	0.8380	0.2558	-0.2558
p_hh_lkk	0.2014	-0.0907	-0.1054	0.3776	-0.4584	-0.4049	0.4049
p_hh_osm	0.1817	-0.0395	-0.1058	0.3725	-0.4854	-0.4213	0.4213
p_n_act	0.0118	0.0099	-0.1467	0.1421	-0.5435	-0.2802	0.2802
g_pau_hh	-0.0657	0.0193	.	-0.0716	0.0222	.	.
g_pau_km	0.2482	-0.2076	0.0151	0.8758	-0.0583	-0.3689	0.3689

	p_koopw	p_huurw	p_ov_hw	p_wcorpw	p_wont~0	p_wonv~0	g_ink_po
p_koopw	1.0000						
p_huurw	-0.9926	1.0000					
p_ov_hw	-0.1549	0.1240	1.0000				
p_wcorpw	-0.7653	0.7907	-0.5091	1.0000			
p_wont2000	-0.0355	0.0407	0.0282	0.0180	1.0000		
p_wonv2000	0.0355	-0.0407	-0.0281	-0.0180	-1.0000	1.0000	
g_ink_po	.	.	.	.	.	.	1.0000
g_ink_pi	.	.	.	.	.	.	0.5446
p_ink_li	-0.6587	0.6680	-0.2566	0.7275	0.0553	-0.0553	-0.6550
p_ink_hi	0.5088	-0.5346	0.3879	-0.6907	-0.0859	0.0860	0.7675
p_hh_li	-0.7791	0.7816	-0.0228	0.6863	0.0940	-0.0941	.
p_hh_hi	0.6013	-0.6195	0.2002	-0.6520	-0.1013	0.1013	.
p_hh_lkk	-0.6616	0.6497	0.0118	0.5503	-0.0083	0.0083	.
p_hh_osm	-0.7156	0.7061	-0.0272	0.6230	0.0040	-0.0039	.
p_n_act	-0.6896	0.6924	-0.0896	0.6511	0.0242	-0.0241	-0.5391
g_pau_hh	.	.	.	.	.	.	.
g_pau_km	-0.0718	0.0639	0.1989	-0.0672	0.1291	-0.1290	0.1201

	g_ink_pi	p_ink_li	p_ink_hi	p_hh_li	p_hh_hi	p_hh_lkk	p_hh_osm

	g_ink_pi	p_ink_li	p_ink_hi	p_hh_li	p_hh_hi	p_hh_lkk	p_hh_osm
g_ink_pi	1.0000						
p_ink_li	-0.6927	1.0000					
p_ink_hi	0.7727	-0.8439	1.0000				
p_hh_li	.	0.8392	-0.7905	1.0000			
p_hh_hi	.	-0.7791	0.9270	-0.8689	1.0000		
p_hh_lkk	.	0.6995	-0.5413	0.7309	-0.5697	1.0000	
p_hh_osm	.	0.7400	-0.5752	0.7693	-0.6060	0.9628	1.0000
p_n_act	-0.5557	0.8641	-0.6818	0.7786	-0.6366	0.7246	0.7459
g_pau_hh	.	0.0474	-0.0625	.	.	.	.
g_pau_km	0.0092	-0.0896	-0.0022	0.0890	-0.0897	0.1415	0.1271

	p_n_act	g_pau_hh	g_pau_km
p_n_act	1.0000		
g_pau_hh	0.1459	1.0000	
g_pau_km	-0.1030	-0.1190	1.0000