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Resilient through change? Exploring the relationship between social network change and changes in firm performance of Dutch neighborhood firms

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Abstract

Title: "Resilient through change? Exploring the relationship between social network change and changes in firm performance of Dutch neighborhood firms". Name: Marianne de Beer MSc. Affiliation: Utrecht University, Geosciences - Economic Geography Start date: 12-2014 // Expected final date: 04-2018 Email: M.deBeer@uu.nl Supervisors: Prof. dr. F.G. van Oort, Prof. dr. V.A.J.M. Schutjens, dr. G.W. Mollenhorst. State of the art: Studies have shown that there is a positive relationship between a firm's network and firm performance (Stam et al. 2014). Nowadays, when studying firm performance over time, both firm internal (i.e. the resource-based view of the firm) and firm external resources accessed through a firm's network (i.e. the social capital view) are taken into account. For small and medium sized enterprises (SME's) networking can be of great importance as they often lack resources due to their firm size (i.e. 'liability of smallness') (Brüderl & Schussler 1990; Cooke, 2007). The growing number of SME's located in residential areas have a positive influence on the urban economy, especially if these firms manage to stay in business over time. Due to their limited firm size (they are often solo-entrepreneurs) these firms are more likely to depend on their networks than larger firms. Research Gap: In studies on the relationship between firm networks and firm performance, it is often assumed that social capital accessed through social networks influences firm performance positively. Networks are seen as strategic instruments, which can be used and changed in order to improve firm resilience and firm performance. However, many of these studies primarily build on cross-sectional data in order to explain the link between social networks and performance, and therefore cannot control for reversed causality issues (Stam et al. 2014). Therefore, several authors have called for additional longitudinal research on the relationship between (changes in) firm networks and firm performance. This paper adds to the literature, by using data on the social networks and firm performance of Dutch neighborhood entrepreneurs measured on two time points (2008 and 2013). We try to give additional insights in the causal relationship between social network changes and changes in firm performance by using different statistical models. Theoretical arguments: On the one hand, changes in the entrepreneurial networks can strengthen firm resilience and even enhance firm performance over time, as new or additional network contacts can be used to acquire new or additional resources. This notion is especially relevant in times of economic downturn, for example in period between 2008 and 2013 when the data was gathered. On the other hand, changes in firm performance might lead to network changes,

as a decrease in performance may prompt the need to enlarge one's network or look for new network contacts in order to access new or different resources. Again, it is interesting to study these changes against a backdrop of changing economic conditions in the 2008-2013 period. Method: Panel data from two waves of the Survey on the Social Networks of Entrepreneurs (SSNE1 in 2008 and SSNE2 in 2013) is used. The panel consists of 180 entrepreneurs that were questioned in both years on their social networks and firm performance. The network size is defined as network contacts offering support on business issues and inter-firm cooperation on a regular basis. For example in 2013, around 500 network contacts (alters) were mentioned. Firm performance is measured using firm turnover (sales). Fixed-effects models are used to look at the influence of the changes in network size (2008-2013) on firm performance (2013) and changes in firm performance (2008-2013) on network size (2013). This type of model is often used when studying causality. However, many cases have to be dropped in the fixed effect model as a large part of the respondents report no change in performance (N=93) or in network size (N=35). Therefore, mixed-effects multilevel modelling will also be used in order to look at the causal relation between network size and performance for the entire panel of entrepreneurs. Results: Our results show that the firm performance is positively influenced by the size of the entrepreneurial network, as well as by the amount of hours an entrepreneurs works on his firm per week and the presence of a business partner. The entrepreneurial network however is found to be influenced by firm performance only. So the relationship between the two seems to go both ways, which still leaves the causality question unanswered. In order to solve this problem additional data collection (a third wave of the SSNE) or alternative estimations and techniques are needed. Comparing the outcomes of the fixed-effects and multilevel models, we find quite similar results. We therefore conclude that a large part of the effect of network size on performance (and vice versa) can be attributed to changes in network size having an positive impact on firm performance (and again, vice versa). Hence, we argue that by looking at the relationship between entrepreneurial networks and firm performance from a dynamic perspective renders us with a more detailed insight in this complex and multifaceted relationship. But it also brings about new questions on both the causality in this relationship and on ways to explore this causality in future research. References: Brüderl, J., & Schussler, R. (1990). Organizational Mortality: The Liabilities of Newness and Adolescence. Administrative Science Quarterly, 35(3), 530–547. Cooke, P. (2007). Social capital, embeddedness, and market interactions: An analysis of firm performance in UK regions. Review of Social Economy, 65(1), 79–106. Stam, W., Arzlanian, S., & Elfring, T. (2014). Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators. Journal of Business Venturing, 29(1), 152–173.

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1. Introduction

Nowadays, networking appears to be essential in many domains of society, and it seems to be particularly important in doing business. For firms, being connected to others can be vital for survival as through their networks firms can bring in resources to build up and improve their competitiveness. Therefore, in order to get the full picture of factors that drive firm competitiveness both firm internal resources and external resources that can accessed through a firm's network should be taken into account in order to get the full picture of factors that drive firm competitiveness.

Networking and social networks have already received a lot of attention in research, with many studies being dedicated to uncover the relationship between the network of a firm and firm competitiveness. Several studies have shown that there is a positive relationship between these two (Westlund&Adam 2010; Stam et al. 2014). It is often assumed that social capital, which is accessed through social networks, influences firm performance positively. Networks are seen as strategic instruments, that can be used and changed in order to improve firm resilience and firm performance. But the notion that the relationship might also work the other way around, in the sense that firm performance has an impact on the network of a firm, is not often taken into account.

Furthermore, much of the research on this topic primarily builds on cross-sectional data in order to explain the link between firm networks and performance, and therefore cannot control for reversed causality issues (Stam et al. 2014). This has led several authors to call for additional longitudinal research on the relationship between (changes in) firm networks and firm performance (Hoang&Yi 2015; Jack 2010). This paper strives to add to the literature by using data on the social networks and firm performance of Dutch neighbourhood entrepreneurs measured on two time points (2008 and 2013). We try to give additional insights in the causal relationship between the network of an entrepreneur and firm performance by comparing the outcomes of both fixed-effects regression models and mixed-effects multilevel models. By doing so, changes in the entrepreneurial network and changes in firm performance can also be taken into account.

Advancements in communication technologies and the shift towards a more service driven economy has led to a rise in the number of entrepreneurs working from or in close proximity to their own homes (Mason et al. 2011). These growing numbers of small- and medium-sized enterprises (SME's) located in residential areas have a positive influence on the urban economy, especially if these firms manage to stay in business over time. Due to their limited firm size (they are often solo-entrepreneurs) these firms are more likely to depend on their networks than would larger firms. Through networking the entrepreneurs can gain access to resources they themselves lack and this can be of particular importance in times of economic downturn, like during the recent economic and financial crisis. The entrepreneurial network might in this sense be thought of as a source of resilience and even increased firm performance over time.

The data used in this paper allows us to get more insights in the way the networks of SME's influence firm performance and also explore if this relationship might work the other way around, with firm performance influencing the entrepreneurial network. By also looking at the relationship between the entrepreneurial network and firm performance from a dynamic perspective we hope to learn more about the causal direction of this relationship.

This paper is structured as follows. In the next paragraph the theoretical perspectives underlying our research are discussed. In paragraph 2.2 some assumptions regarding factors influencing firm performance and the network of an entrepreneur are given. In the third paragraph attention is being paid to the data used in the analyses as well as to the different analytical models and techniques. The preliminary findings are reported in paragraph four. Finally a brief conclusion and discussion can be found in the fifth and final paragraph.

2. Theoretical Perspective

The questions of why some firms perform better than others and where these differences originate from, have been asked many times before. Different theoretical strands of thought exist concerning the sources of firm performance and changes in firm performance over time. In this paper, we will focus on micro-level explanations of firm performance by looking at different characteristics of firms and entrepreneurs, as well as the changes in these characteristics. Two influential theoretical perspectives trying to explain sources of firm development and firm performance are briefly mentioned here; the resource-based view and the social capital theory.

Differences in the internal resources of firms lie at the heart of the resource-based view of the firm. Firms differ in their development and performance outcomes as a result of differences in their internal resource base, whereby firms will gain a competitive advantage over others when they have resources that are rare, difficult to imitate, valuable and not interchangeable (Barney 1991; Dyer&Singh 1998). By using these unique and strong internal resources a firm will be able to survive over time and outrun the competition. This view on firm development has received a lot of (theoretical) support, but in recent years several authors have proposed to expand this perspective by also including firm external resources that can be accessed through social networks (Dyer&Singh 1998; Zaheer&Bell 2006). As Granovetter already stated in 1985, economic action cannot be studied without taking the social structures in which these activities are embedded into account (Granovetter 1985). Firms do not operate in social exclusion, they are connected with the firm external environment through their (economic) actions. Being embedded in social relationships can bring benefits to a firm, as through their social connections firms can access resources possessed by or available to external parties. These resources, accessed through the firm's social network, form the basis of the social capital theory (Gedajlovic et al. 2013). Social capital is seen as a network construct, as it originates from social interactions and is accessible through networking (Anderson et al. 2007). Nahapiet & Ghoshal (1998, p. 243) describe social capital as: "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit". These resources can be intangible, such as information or advice, but also more tangible resources, like financial capital or practical help, can be exchanged in social networks. Social capital can therefore been seen as an addition to the internal resources a firm already has. As SME's, and this especially holds for solo-entrepreneurs, have a limited internal resource base due to their firm size, social capital can be of the utmost importance as it allows them to gain access to resources they do not possess themselves. Social capital can therefore be seen as a counterweight to the so-called 'liability of smallness' (Brüderl&Schussler 1990).

In this paper we follow the argument that the network of a firm plays an important role in firm development and firm performance, thereby linking social capital and networking to firm competitiveness (Dyer&Singh 1998; Zaheer&Bell 2006). But this relationship between networking and firm performance is debated in the literature, for instance with concern to the causal direction of the relationship. Often it is assumed that networking benefits firm performance, but there has been little attention for the relation working the other way around. With this paper we hope to shed more light on this issue.

2.1 On entrepreneurial networks and firm performance

As stated by Hoang & Antoncic (2003), and also in the recent revision of this paper by Hoang & Yi (2015), much of the research concerning the role of networks in entrepreneurship can be divided in one of two categories. In the first line of research networks are seen as independent variables, influencing outcomes related to the firm and entrepreneurial activities. The second category consists of research focused on variables that shape and develop networks over time, thereby using network as the dependent variable (Hoang&Antoncic 2003; Hoang&Yi 2015). The first line of research has

received much attention in research, but the outcomes are far from consistent.

In their overview article summarizing 15 years of empirical research on the link between social capital and firm performance, Westlund & Adam (2010) show that previous research has pointed out that on the level of the individual firm social capital has a strong impact on firm performance and that this is a positive association, although they cannot control for causality. Yet other authors present more mixed outcomes. Cooke (2007, p.100) calls social capital "a key ingredient of successful SME performance", but it seems to be embedded in the "very nature of most businesses". Firms cannot do business without the use of social capital and firms who know how to exploit their social capital can also benefit from it. This doesn't necessarily mean that every firm will benefit (Cooke 2007). Watson (2007) finds that the social networks are to some extent beneficial for firm survival and growth, but not for firm profitability. He therefore goes on to conclude that networking does have benefits, but also costs which shouldn't be overlooked. He argues that entrepreneurs need to network strategically, balancing their time investment with the expected gains from networking (Watson 2007). For entrepreneurs, the costs of maintaining their network might outweigh the benefits at a certain point, for instance when one's social network grows too larger or too diverse.

There is also evidence that networking can be 'too much of a good thing' as an entrepreneur can become 'trapped' or overembedded in his own network (Uzzi 1996; Hoang&Antoncic 2003). With strong social relationships also come obligations which could make the entrepreneur unwilling or unable to pursue new paths or opportunities (Batjargal 2003). Another risk is that the entrepreneur becomes locked-in certain information channels and therefore might miss new information and opportunities. These and other negative implications of social capital have not received a lot of attention in entrepreneurial research (Gedajlovic et al. 2013). So it is important to keep in mind that although many studies show the importance of networks with respect to firm performance, it is not as clear cut as it might seem at first glance.

Apart from studying networks as an independent variable Hoang & Antoncic (2003) and Hoang & Yi (2015) also discuss research in which networks as seen as the dependent variable. They found that these studies are often focused on the evolution of networks, linking network development to different phases in the firm life-cycle. Interestingly, in both papers the authors don't discuss the influence of firm performance on firm networks, as this relationship hasn't been studied often (Hoang&Antoncic 2003; Hoang&Yi 2015). But one could argue that firm performance is to some extent already incorporated in the analysis of network evolution, for example in the firm life-cycle approach. Firm development is thought to resemble a path consisting of different phases (Garnsey 1998). For firms to be able to progress through different phases of the firm life-cycle they need to perform well in order to survive the first phase. In this first phase, their internal resource base, but also their ability to get access to other resources, will lead to firm survival and growth (Garnsey 1998). Then, as they manage to grow, their resources need to change as they move to a different stage in the life-cycle, leading to changes in their networks (Butler&Hansen 1991; Garnsey 1998; Gedajlovic et al. 2013). So through increased performance firms can progress on the path of firm development, bringing about new resource needs and therefore leading in changes in their networks.

But network changes can also be brought on by negative firm performance, for instance when a firm is struggling to stay in business. In this case the entrepreneur can try to turn the tide by enlarging or changing his social network, in order to bring in new or additional resources to the firm as a means of preventing business failure.

Both the positive and negative examples concerning the impact of firm performance on the network of an entrepreneur give rise to the assumption that the relationship between social capital and firm performance could work both ways; whereas in research it is often (albeit implicitly) assumed that networks influence firm performance.

The discussion on forces driving network change brings us on another argument we would like to make in this paper. As the literature on firm life-cycle and the different stages of firm development makes clear, firms change over time. Firm change is driven by internal developments, as in the example of firm growth, and developments that are firm-external, for example economic conditions. In times of economic crisis, firms of all sizes need to react and adapt in order to stay in business. In those times, the firm's social network can be a source of resilience, if firms strategically use and sometimes even change their network in order to fit their needs during a period of economic downturn. This strategy can be of particular importance for SME's, which already have a smaller resource base to fall back on in times of need.

Taken all of the above mentioned examples into account, we argue that it is interesting to study the relationship between (entrepreneurial) networks and firm performance from a dynamic perspective. Such a perspective is still lacking in the current literature, as stated by several authors (Gedajlovic et al. 2013; Stam et al. 2014). By using a dynamic perspective, we hope to add to the existing knowledge base with this paper.

2.2 Factors influencing change in firm performance and network size over time

Moving on, we use the above mentioned insights in combination with other notions from the literature to formulate some assumptions with respect to factors that influence firm performance and network size and, very importantly, that lead to changes in those variables over time.

First and foremost, we want to explore the relationship between the entrepreneurial (or firm) network and firm performance in this paper. As explained in paragraph 2.1, social capital exists in many forms, both tangible and intangible. In this paper we focus on social capital used by the entrepreneur for firm purposes only, so the social network used for private purposes is not taken into account. Here we define the social network of the entrepreneur as consisting of 1) network contacts used for emotional support on business purposes, for instance advice on firm matters, and 2) other firms with which the entrepreneur cooperates. Through cooperation an entrepreneur can gain access to the resources possessed by cooperation contacts, like information or advice. In the next paragraph a further explanation of the network delineation is given. Social capital accessed through networking is thought to lead to an increase in firm performance (Westlund&Adam 2010). Therefore, we assume that an increase in network size will result in an increase in firm performance over time as well. But we do not expect that this effect will go on indefinitely, as the costs of maintaining an ever enlarging network might at some point outweigh the gains received from networking (Gedajlovic et al. 2013). In this paper only network size is taken into account when talking about networks. In future research it would be very interesting to also look at network composition and changes there within.

Next to the network size, the time investment of an entrepreneur might also play a role in firm performance. A quite intuitive assumption is that an increase in the number of hours an entrepreneurs spends on his firm per week will lead to an increase in firm performance. Here also, this effect is expected to diminish as more hours per week are devoted to business activities. Entrepreneurs have to make a trade-off between investing time and energy into their firms or into other activities, for instance family or personal care. So we expect that there will be a certain threshold after which an increase in time investment towards firm activities will not benefit firm performance any more.

The presence of a business partner is also taken into account. We assume that working together with a business partner on firm activities will lead to an increase of firm performance over time, as the business partner brings in knowledge and skills of his own that can positively affect firm performance (Sleutjes et al. 2012).

Several characteristics of the entrepreneur and the firm are expected to influence firm performance as well and there should be controlled for these characteristics. As age is often seen as an indication of human capital, we believe that entrepreneurs who are older might have gathered more knowledge on how to successfully do business and cooperate with other firms. This in turn will

have a positive impact on firm performance. The same positive relation is expected in regard to the level of education; the firms of higher educated entrepreneurs are expected to perform better. Looking at firm characteristics, firm age can be seen as a sign of survival over time and stability in business activities. After the start-up phase in which the firm can grow rapidly, the firm enters a more stable phase. So it is assumed that younger firms will experience higher growth in their performance than older firms (Butler&Hansen 1991; Garnsey 1998).

As we have argued in the previous paragraph, firm performance might also have an influence on (the size of) the network of an entrepreneur and changes there within over time. As this paper is on SME's, who are characterized by their small firm size, we assume that these firms will to need to tap into resources accessed through their network to be able to cope with either firm growth originating from an increase in firm performance or negative firm developments due to a decline in firm performance. Either way, the assumption is that firm performance drives changes in the entrepreneurial networks, in this case changes in the size of the network of an entrepreneur.

Time investment by the entrepreneur is assumed to have a positive influence on the size of the entrepreneurial network. Spending more time on entrepreneurial activities will increase network size, as entrepreneurs will be more active within their business environment and therefore have the chance to meet more people. Also here, we expect there to be a maximum number of hours an entrepreneur can spend per week after which an additional time investment is not beneficial to the network size anymore.

In regard to working together with a business partner, we think that entrepreneurs that team up with a business partner will be able to also get access to the network contacts of this partner, thereby enlarging the network of the firm as a whole.

The age of the entrepreneur and level of education also influence (changes in) network size over time. Based on the literature regarding the influence of personal characteristics on social networks, we assume that network size decreases with age, as older people are found to have smaller networks compared to young and middle-aged persons (Marsden 1987). With respect to the effect of education on the size of social networks, we expect there to be a positive relation between education and network size, meaning that higher educated people have larger networks (Marsden 1987). And looking at the years of existence of the firm, we believe that as older firms have had more time to accumulated resources, like for instance social capital, their network size will be larger.

Finally, we take three other factors into account that can be thought of as being particularly important for the specific group of entrepreneurs we study in this paper, but for which we can't formulate any assumptions based on the literature. As will be explained in more depth in the next paragraph, the entrepreneurs studied here are assumed to be very locally orientated as they both work and live in a certain neighbourhood. The local environment is therefore thought to matter greatly for these firms as a source of, for example, clientele, cooperation partners and network contacts. Therefore three additional firm characteristics are added that could play a role in firm performance and network change of these specific entrepreneurs. The first characteristic is whether a firm is home-based or not. Secondly, we compare entrepreneurs who have relocated, by which we mean either moving home privately or a relocation of the firm. As we assume these entrepreneurs to be closely connected to their local environment, we are interested to see how a relocation (albeit private or business related) influences their social network and firm performance. The third and final characteristic is the spatial market orientation of the firm, where we between locally and non-locally oriented firms. We wonder if firms that are more locally oriented will also perform better or have larger networks over time.

3. Data and methods

In this paper data from the Survey on the Social Networks of Entrepreneurs (SSNE) is used. This survey focuses on local entrepreneurs located in residential neighbourhoods and is an addition to a larger survey on the social networks of inhabitants of Dutch neighbourhoods, the Survey on the Social Networks of the Dutch (SSND) (Völker&Flap 2002). In the SSNE local entrepreneurs were questioned on their social- and firm networks, firm performance and their involvement with the local environment. A local entrepreneur was defined as someone living at either the same address as his firm or living within a range of ten minutes walking distance from the firm. In order to determine whether an entrepreneur could truly be called a local entrepreneur, firms located in the residential neighbourhoods were first contacted by telephone.

We have data from two waves of the SSNE, the first wave was held in 2008 (SSNE1) and the second in 2013 (SSNE2). The first wave of the SSNE was conducted in 161 neighbourhoods in 40 municipalities all over the Netherlands that were sampled for the SSND[1].

In 2008 a total number of 1031 firms was defined as local, corresponding to 67% of the total number of firms present. It proved difficult to find entrepreneurs in every residential neighbourhood in the sample who were willing to cooperate and in some neighbourhoods no entrepreneurs were present. Finally in the SSNE1 385 entrepreneurs were interviewed (a response rate of 37.3%) in a total of 141 neighbourhoods. For the second wave these respondents were again contacted and 214 of them participated in the SSNE2, forming our panel of entrepreneurs. Of this group of 214 entrepreneurs, 14 weren't in business anymore in 2013 and for an additional 20 entrepreneurs no data was available on one of the dependent variables of this paper (either performance or network size). This leads to a remaining group of 180 entrepreneurs (i.e. the panel of entrepreneurs) for which we have information on their performance and their network size for both 2008 and 2013[2].

3.1 Dependent variables

The main focus of the paper is on the relationship between the size of the entrepreneurial network and firm performance and, from a dynamic perspective, on changes in network size and changes in firm performance over time. To explore the direction of this relationship, both network size and firm performance are used as dependent variables in the analyses.

Different methods can be used as means to collect data on the size of an individual's network. The affective method, role relational method and position generator are well known examples (Schutjens et al., 2015). For this study another established measure was used; the name generating method. The questionnaire of the SSNE contains a number of name generating questions in which the respondents had to name specific people or firms who are part of their network. In this paper the network of an entrepreneur is defined as the number of contacts used for emotional support on business matters and the number of firms with whom the entrepreneur cooperates. However, it is important to keep in mind that the complete network of an entrepreneur will generally be much larger, as network contacts used for private and more practical matters are also part of the entrepreneurial network, although these contacts are not taken into account in this paper.

The input from two name generating questions is used in order to construct the business network of an entrepreneur. The first question addresses the core discussion network in regard to

[1] The first wave of the SSND was conducted in 1999/2000 and is based on a stratified random sample of 40 urban and rural municipalities. These areas are representative of the approximately 500 municipalities that were present in the Netherlands at that time. The sample also took population density and the density of the build environment into account.
Within the 40 municipalities that were sampled, four (and in 1 case five) neighbourhoods were selected randomly, yielding a selection of 161 neighbourhoods. The neighbourhoods were selected with use of the Dutch postal code system, in this case the five-digit districts were selected which can be seen as an approximation of the local environment of the residents. On average, these neighbourhoods include 230 addresses and no significant physical barriers are present (Sleutjes et al. 2012; Völker&Flap, 2002).

[2] In order to check whether the panel is representative for the entire group of entrepreneurs that participated in wave 1 and rule out the possibility that certain types of entrepreneurs were more likely to remain in the panel, we compared the data on the two groups. Based on this comparison we couldn't find any indications of differences between the entrepreneurs in the first wave and the panel of entrepreneurs.

business related matters. This question reads: "*With whom did you discuss important matters regarding your firm and its development during the last six months?"* (see Burt 1984; Bailey&Marsden 1999). In answer the entrepreneurs could name persons they had already mentioned on a previous question and they could add up to five new names. They could not mention firms in answer to this question. The part of the network that consists of firm cooperation contacts is captured using the question: "*With which firm does your firm cooperate formally on a regular basis?"* Here, the respondents could name up to three firms with whom they have a cooperation.

The number of individuals and firms mentioned by the entrepreneurs form the measure of network size in our analyses. When adding network size as an independent variable, we also considered adding a squared term of the network size, in order to see whether there is something like an optimum network size after which an increase in the number of network contacts will have a negative impact on firm performance, for instance because the network has grown too large and not all the contacts can be maintained. The addition of the squared term of network size didn't improve the analysis and we decided to leave this variable out of the model.

Next network size we use performance as a dependent variable in our analyses. To measure firm performance we use an indicator commonly used in performance research; firm sales (Batjargal 2003; Lechner&Dowling 2003; Watson 2007). Our dataset holds self-reported information on firm sales in euros for both 2008 and 2013. The entrepreneurs were asked to choose from seven categories to report on their firm sales over the previous year. The seven categories are ordered from low to high, but not equally spaced. The following categories are discerned; 1)less than €10,000, 2)€10,000-€20,000, 3)€20,000-€50,000, 4)€50,000-€100,000, 5)€100,000-€250,000, 6)€250,000-€500,000, 7)More than €500,000. In this paper we only use firm sales as an indicator for firm performance, whereas other studies also include variables measuring firm survival as a way to assess firm performance. As we use data on a panel of entrepreneurs, this already implies that these firms have survived over time otherwise they would not have been in the panel. We therefore have not added variables to measure firm survival.

3.2 Independent and control variables

Our dataset contains rich information on both the entrepreneurs and their firms, as well as information on different characteristics of both entrepreneur and firm. The theoretical underpinning for choosing these variables has already been discussed in the previous paragraph, here the measurement of the different variables will be briefly explained.

For every entrepreneur, we have data on the self-reported number of hours he works per week on activities related to the firm ('hours worked') in both 2008 and 2013. This variable is an indication for the time investment of the entrepreneur; spending more hours per week on the firm is thought to have a positive influence on both firm performance and the size of the entrepreneurial network. As explained in the previous paragraph, we expect that there is limit to the added value of spending more hours per week on firm activities. The relations between 'hours worked' and performance is expected to mirror an inversed u-shape, by which we mean that the addition of more hours spend on the firm per week will not lead to an increase in performance after a certain threshold and might even become a negative relationship. In order to control for this expected effect of the hours spend per week, we add the quadratic term of the 'hours worked' as an independent variable.

The final independent variable added is a dummy variable, measuring the presence of a business partner. Having a business partner can influence both the size of the business related discussion network and firm performance. Discerning between entrepreneurs who have a business partner or entrepreneurs who don't, allows us to explore the influence of having a business partner to share information and network contacts with.

Control variables

Time variant

The variable time ('time') is added to the model as a control variable for trends over time. It could be the case that all firms grow over time and the addition of time is added to control for trends like these. In this case 'time' can also be thought of to serve as a control variable for the economic climate in the 2008-2013 period.

For the research period, we know if entrepreneurs moved house privately and/or relocated their firm. This information is added to the analyses using a dummy variable ('move'), where '1' means that a move has taken place in the research period and '0' means that the entrepreneur hasn't had a locational change of either house or firm.

Some entrepreneurs live and work at the same address, making them so-called home-based entrepreneurs. We want to explore whether being home-based or becoming home-based over time influence the network size and firm performance. Therefore this variable ('home-based') is also used in the analysis, assigning '1' to home-based firms and '0' to the non-home-based ones.

Time invariant

We also added some time invariant variables as control variables to the analyses. As these variables cannot be added in fixed effects models, we have added them to the multilevel analyses and those models will be used as a comparison to the models with only time variant variables. The age of the entrepreneur is measured in 2008 ('age of the entrepreneur') and this also goes for the years of existence of the firm ('years of existence of the firm'). The level of education of the entrepreneur ('education') serves as an indicator of the level of human capital an entrepreneur possessed. It is an ordinal variable with three categories for the highest level of education finished by the respondent; 1)no tertiary education, 2)lower tertiary education, 3)higher tertiary education. Finally, we added a variable indicating whether a firm's market orientation is local or non-local ('market orientation'). Firms active in retail & catering industry, personal services and private education are considered locally oriented firms.

3.3 Methodology

As explained in the introduction, the relationship between the network of an entrepreneur and firm performance is the central theme of this paper. With the use of the panel data derived from the SSNE1 and SSNE2 we hope to add to the existing literature base.

Multilevel versus fixed-effects models

Longitudinal data can be thought of as multilevel data, with measurement occasions at the first level and the subject at the second level (Rabe-Hesketh&Skondral 2012). In this paper, the two measurement points of the SSNE, SSNE1 and SSNE2, form the data at the first level, and the individual entrepreneurs who participated in both waves form the second level. This type of panel data can be studied with the use of a variety of different models (Rabe-Hesketh&Skondral 2012). We use both random-effects and fixed-effects models in order to compare the outcomes of the two types of models. Both types of models hold advantages but also disadvantages in their use. Fixed-effects models can be used to "estimate average within-subject relationships between time-varying covariates and the response variable, where every subject acts as its own control" (Rabe-Hesketh&Skondral 2012, p. 228). This means that between-subject variation (variation at the second level) is eliminated thereby allowing for causal inference. This is often considered as one of the benefits of using a fixed effects approach. But as fixed-effects models only look at within-subject variability only variables that explain within-subject variation can be added. In the case of longitudinal data, this means only time-variant independent variables can be added to the fixed-effect model, as the dependent variable is always time varying (Rabe-Hesketh&Skondral 2012, p.234; Snijders&Bosker 2012).

Random-effects models, also called multilevel models, do leave room for unexplained between-subject variation. Snijders & Bosker (2012) state that the random-effects model is the preferred model if the researcher is interested in between-subject (so second level) differences. Both time-variant and time-invariant variables can be added to a multilevel analysis. This yields benefits in comparison to the fixed-effect model, as the fixed-effects model only looks at changes in the variables used in the analysis. For our data this means that all the respondents who do not have a change in firm performance between 2008-2013 (N=93) or do not have a change in network size (N=33) cannot be taken into account in the fixed-effects model, but they can be added in the random-effects model. We therefore want to compare the outcomes of both models in this paper and explore which type of models renders us with the best fitting estimations. There is no consensus in the literature which of the two types of models 'works' better and it is often the case that it depends on the discipline which of the model types is favoured (Rabe-Hesketh&Skondral 2012).

At the start of our analyses, we estimated a regular OLS model for panel data as a baseline model. Although we are aware of the potential problems concerning the violations of the assumptions of OLS with respect to the use of an ordinal dependent variable (in the case of performance change) we decided to keep the models as benchmarks in comparison to the fixed-effects and multilevel models.

As explained above, the fixed-effects models do not take respondents without performance and/or network change into account. As a first step, we wanted to control for selection bias concerning the group of entrepreneurs without changes in their network size or performance with the use of the Heckman estimation procedure. As it turned out, this procedure proved too complex in combination with the models we have estimated and we therefore decided not to add the procedure in this paper[3].

Models with performance change as dependent

In the first set of models, performance in 2008-2013 was used as the response variable. Performance is an ordinal variable, which forces us to use a multilevel ordinal logistic regression model. When comparing the outcomes of the 'xtologit' and 'gllamm' commands in STATA they turned out to be virtually similar, we therefore chose to follow the suggestion of Rabe-Hesketh & Skondral to use 'gllamm' (generalized linear latent and mixed models) command (Rabe-Hesketh&Skondral 2012). Random-effects modelling allows for the use of both time-variant and time-invariant independent variables, so we estimated two multilevel models, one with only time-variant variables and one with both types of independent variables in order to control for certain characteristics of the entrepreneur and the firm.

We encountered some difficulties in estimating the fixed-effects ordered logit model variable regarding the consistency of the estimator (the so called 'incidental parameters problem'). Several estimators have been proposed in the literature offering solutions to this inconsistency. We decided to use the 'BUC'-estimator as proposed by Baetschmann et al. (2015) as an addition to a regular fixed-effects ordered logit model. The BUC-estimator is a conditional maximum likelihood estimator constructed by replacing "every observation in the sample by K−1 copies of itself ('blow up' the sample size), and dichotomizing each of the K−1 copies of the individual at a different cut-off point" (Baetschmann et al., 2015, p. 690). It would go beyond the scope of this paper to explain the mathematical procedure behind the BUC-estimator, so for further references we refer to Baetschmann et al., 2015. In the discussion attention is paid to these and other difficulties encountered during the analyses of the data and possible steps we would propose in order to improve the analyses for future research.

[3] We did try to control for the 'non-changers' ourselves, by estimating a model with performance as dependent without the entrepreneurs who didn't have performance change and applying the same procedure with network size as dependent. We found that the size of the coefficient changed, but the signs and significances didn't.

Models with network size as dependent

The models for network size are more straightforward, as the dependent variable in these models is a count variable. We estimated multilevel models with fixed-effects and with random-effects, and for the latter we also made a model with the addition of time-invariant variables.

4. Preliminary findings

Before moving to the analyses, some descriptive statistics are briefly discussed which can also be found in appendices I and II. Performance in 2008 and 2013 is measured as an ordinal category with seven categories, as portrayed in figure 4.1. In 2008 the largest group of entrepreneurs was found in the €100,000-€200,000 category, whereas in 2013 most entrepreneurs reported a performance in the €20.000-€50.000 category.

In both waves of the survey around 500 network contacts in total were mentioned by the entrepreneurs. The average network size is 2.79 in 2008, with a slight increase in 2013 (average 2.81). The entrepreneurs report to work less hours per week on average in 2013 compared to 2008, but still an average workweek of the entrepreneurs is at least 40 hours. The share of entrepreneurs with a business partner decreases slightly in the 2008-2013 period, with around 30% of the entrepreneurs having a business partner in 2013. The majority of the entrepreneurs are home-based, around 83% in both years.

The time-invariant variables are measured in 2008. The entrepreneurs in the panel are around 50 years of age on average and their firms have existed for 18 years, although there are large differences between the firms.

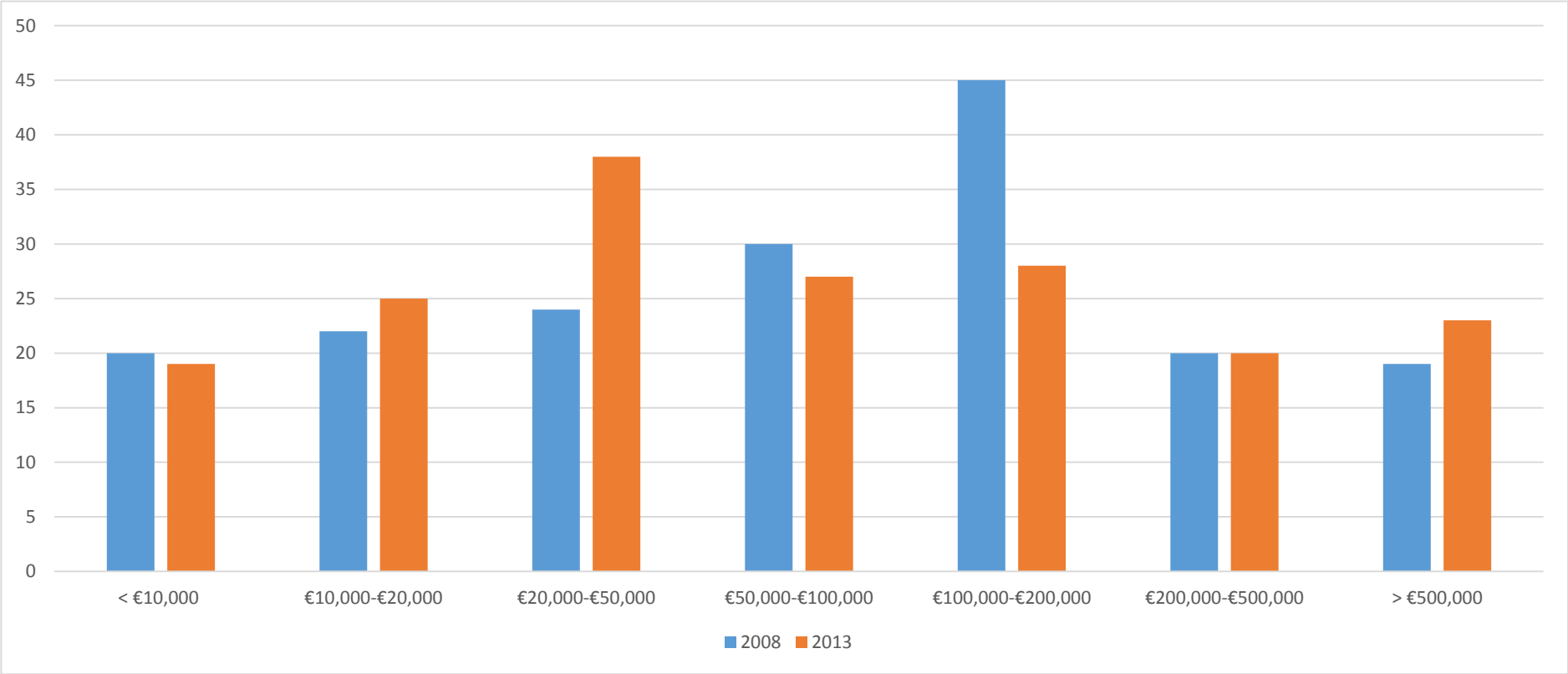
4.1 Models on firm performance

A number of different models has been estimated with firm performance as the dependent variable. Although the OLS benchmark model isn't very informative, as performance is an ordinal variable, the model does render a first glance on the relations between firm performance and the independent and control variables. When comparing the outcomes of the OLS models with the other models in table 4.2, it is clear that the signs of the coefficients remain the same for the multilevel models (I and II), but differ somewhat in the fixed-effects models (IIIa en IIIb).

Two multilevel models were estimated, model I is the model with only time-variant variables and model II also includes time-invariant variables. The log-likelihood of both models indicates that model II is the better fitting model. Comparing these models further, the most important explanatory variable, network size, is found to significantly influence performance. An increase in the size of the business related network leads to an increase in performance (or in this case: leads firms to move to a higher performance category) and this is in line with our assumption about the effect of networking of firm performance. The same positive association is found for the number of hours an entrepreneurs spends on firm activities per week, but this positive effect becomes smaller, the higher the number of hours worked. There seems to be a maximum to the hours an entrepreneur can spend on his firm per week in order to increase performance. The effect of having a business partner differs between models I and II. Model I shows that teaming up with a business partner has a significant positive influence on performance ,as we expected from the literature, whereas in model II the coefficient isn't significant anymore. This shift from a significant to a non-significant outcome is also found for the home-based variable. When an entrepreneur is home-based, this influences firm performance negatively, but this effect disappears when time-invariant variables are added. The addition of the age of the entrepreneur or the years of existence of the firm might bring about this change.

Considering the time-invariant control variables, the age of the entrepreneur and the years of existence of the firm have a significant influence on changes in firm performance. Older entrepreneurs seem to experience a negative change in their firm performance over time, which goes against our assumption concerning this variable. v. And where we expected firm age to have a negative influence on performance, we find that for firms which have been in business longer, the performance increases slightly.

Figure 4.1: Performance per category in 2008 and 2013 (in number of entrepreneurs)



Source: SSNE1, 2008 & SSNE2, 2013

Table 4.1: Models with firm performance as dependent variable

Model name	**Benchmark**	**I**	**II**	**IIIa**	**IIIb**
Technique	OLS	Multilevel	Multilevel	Fixed-effects	Fixed-effects BUC estimator
Network size	0.103**	0.278**	0.282**	0.159**	0.519**
Hours worked	0.064***	0.183***	0.192***	0.132***	0.164
Hours worked squared	-0.0003*	-0.001*	-0.001**	-0.001*	-0.001
Business partner (yes/no)	0.315*	0.915*	0.659	1.069***	-0.563
Time	-0.002	-0.008	-0.061	0.098	-0.131
Home-based (yes/no)	-0.356	-1.141*	-0.972	-0.793*	1.072
Move (yes/no)	-0.027	-0.174	-0.086	-0.189	0.517
Age of entrepreneur	-	-	-0.081**	-	-
Years of existence firm	-	-	0.065***	-	-
Education	-	-	0.224	-	-
Market Orientation (local/non-local)	-	-	-0.716	-	-
Constant	1.928***	-	-	-	-
Log likelihood		-524.918	-514.21	-577.886	-625.603
R2 (overall)	0.462				
N	180	180	180	180	180

Source: SSNE1, 2008 & SSNE2, 2013

Significance levels: *p<0.05 **p<0.01 ***p<0.001

Table 4.2: Models with network size as dependent variable

Model name	**Benchmark**	**I**	**II**	**III**
Technique	OLS	Multilevel	Multilevel	Fixed-effects
Performance	0.204**	0.203**	0.193**	0.463**
Hours worked	0.011	0.011	0.011	0.003
Hours worked squared	-0.0002	-0.0002	-0.0001	-0.00001
Business partner (yes/no)	-0.012	-0.011	-0.005	0.042
Time	0.037	0.036	0.063	0.093
Home-based (yes/no)	-0.262	-0.26	-0.202	-0.839
Move (yes/no)	-0.177	-0.174	-0.318	-0.448
Age of entrepreneur	-	-	-0.025*	-
Years of existence firm	-	-	-0.013*	-
Education	-	-	0.071	-
Market Orientation (local/non-local)	-	-	-0.264	-
Constant	2.181***	2.18***	3.507***	1.715
Log likelihood		-692.564	-684.255	
R2 (overall)	0.045			0.039
N	180	180	180	180

Source: SSNE1, 2008 & SSNE2, 2013
Significance levels: *p<0.05 **p<0.01 ***p<0.001

Turning to the fixed-effects models in table 4.2 both the regular fixed-effects ordered logit model (model IIIa) and the model with the BUC-estimator (model IIIb) are shown. It is important to keep in mind that the outcomes of the fixed-effects models should be interpreted as the effect of changes in an independent variable on changes in the dependent variable.

The outcomes between models IIIa and IIIb differ quite extensively. When looking at model IIIa, an increase in the network size is found to lead to an increase in firm performance over time. The other independent variables also have a significant influence on changes in firm performance. Of the control variables, only the coefficient for becoming a home-based firm is found to have a significant association. The picture changes when considering model IIIb, where the significant influence of network size is still found, but the coefficient is much larger than in the regular fixed-effects model (model IIIa). The other independent and control variables all fail to be significant and the signs for the coefficients of the variables 'business partner', 'time', 'home-based' and 'move' change. We suspect this is caused by the way the BUC-estimator enlarges the sample size, but at this time we are not sure what causes these differences. This is something we hope to figure out in future research. At this point, we wanted to show the outcomes of one of the estimations discussed in the literature, as many studies how shown that regular fixed-effects ordered logistic models render inconsistent outcomes. Nonetheless and due to the complications with the BUC-estimations, we will use the regular fixed-effects model (model IIIa), which also has a higher log-likelihood than model IIIb, in the comparison with the mixed effects multilevel models.

One of the main goals of this paper is to explore whether random-effects (multilevel) or fixed-effects models would render different outcomes concerning the relationship between (changes in) network size and firm performance. Turning to this question, models I and IIIa are compared. As explained before, the coefficients of model IIIa are interpreted as the effect of changes in the independent variables on changes in performance. The multilevel model does the same, but it also takes the 'regular effect' of an independent variable on performance into account and those two effects cannot

be separated when looking at the outcomes. However, the outcomes of the fixed-effects model can be used to solve part of this puzzle. To take the independent variable network size as an example; the coefficient for network is 0.278 in the multilevel model, and we don't know whether this is the effect of network size on performance or the effect of change in the network size on change in performance. But, looking at the coefficient of network in the fixed-effect model (0.159) we find a significant positive effect of change in network size on the change of performance. Therefore, we can conclude that some part of the effect of network size found in the multilevel model can be attributed to the effect of changes in network size.

We also see that, although differences in the size of the coefficients are found, the same variables are significant in both models and the coefficients all have the same signs with the exception of the variable 'time'. This leads us to conclude that the outcomes remain more or less the same, whether we only look at within-subject variability or whether also between-subject variability is taken into account. Both models show that an increase in network size relates positively to an increase in performance change over time. Enlarging one's network can therefore be seen as a profitable strategy for entrepreneurs, as well as increasing the number of hours they work on firm activities per week and teaming up with a business partner.

4.3 Models on network size

The analyses with network size as the dependent variable can be found in table 4.3. The benchmark model seems to be a good first estimation of the sign and direction of the different coefficients. In both multilevel models the variable performance is found to have a significant positive relationship on network size, which is in line with our expectations. Whether this effect is caused by performance at a certain point in time or changes in performance over time cannot be gathered from the outcomes of the multilevel models. For this we need to look at the fixed-effects model also. In model III the coefficient for performance is also positive and significant, meaning that firms that move to a higher performance category between 2008-2013 will also experience an increase in their network size. So some part of the effect of performance on network size found in models I and II can be attributed to positive changes in performance over time.

Interestingly, as it doesn't correspond with our assumptions posed in paragraph 2.2, firm performance is the only significant variable in the models using only time-variant variables. When time-invariant variables are added (model II) we find that the age of the entrepreneur and the years of existence of the firm have a significant influence on network size. Both relationships are negative, so older entrepreneurs will have a smaller network than younger ones. And the same can be said for older firms. The effect of the age of the entrepreneur doesn't come unexpected, but the effect of years of firm existence does. One explanation may lie in the different phases of firm development, as mentioned in the firm life-cycle literature, in which older firms are believed to reach a more stable phase over time. This might bring about a reconsideration of the network of the firm and even the discontinuation of network ties.

Drawing a comparison between the multilevel model and the fixed-effects model in table 4.3, we find differences in size of the coefficients and in one case, namely the effect of having a business partner on network size, even a different sign of the coefficient, although none of these coefficient are significant. The coefficient for the only significant variable, performance, has the same sign in both models, but is larger in the fixed-effects outcome. Besides this we don't see any major differences between the two types of models. This is somewhat disappointing on the one hand, as we cannot draw conclusions to what extent network size is being influenced by firm performance at a certain point in time or by changes in performance over time. On the other hand, we do show that firm performance influences network size, so the relationship between the entrepreneurial network and firm performance is found to work both ways.

5. Conclusion and discussion

In this paper we wanted to shed more light on the relation between the network of an entrepreneur and firm performance. In doing so, we join a long line of research on this topic, to which we wanted to make two contributions. The first concerns the direction of the relationship between (entrepreneurial) networks and firm performance, as we argued that the causal relation between the two could work both ways. Secondly, with the use of longitudinal (panel) data we made a contribution to the research base using a dynamic perspective regarding this topic.

We explored the relationship between firm performance and the network of the entrepreneur by comparing the outcomes of mixed effects multilevel (i.e. random-effects) models with those of fixed-effects models. In doing so, we found that the relationship between the size of the network of an entrepreneur and firm performance truly works both ways. Although this is a somewhat dissatisfying outcome, as the direction of the causal relationship still remains unclear, we do see an added value from this outcome. In many studies it is assumed that networking influences firm performance and here we have shown that performance also has an influence on network size. Moreover, where we found (changes in) firm performance to be influenced by (changes in) network size as well as by a number of other variables (the hours worked per week and the presence of a business partner), (changes in) the network size seems to be influenced only by (changes in) firm performance. This means that the assumptions discussed in paragraph 2.2 in regard to variables influencing network size are not supported. But as we know that network size does influence performance, we believe that the effect of many of the independent variables on network size is being transmitted so to say through the effect of performance on network size. An example to clarify our argument; we found that the number of hours worked per week has a positive influence on firm performance. An increase in firm performance in its turn will lead to an increase in network size, as our models show. So the effect of an increase in the hours worked per week might not have a direct impact on the network size, but does work to increase network size indirectly through its effect on firm performance. This example together with the other outcomes of our analyses show that the relationship between the network of an entrepreneur and firm performance is more complex and multifaceted than it would seem from the outset.

The analyses reported in this paper have left us with a lot of food for thought and ideas for future research. We would like to explore other ways of solving the causality question in the relationship between networking and firm performance. One option would be to estimate models using instrumental variables that influence one of the variables, being either the entrepreneurial network or firm performance, but do not have a relation with the other variable. This has similarities with the first step of the Heckman estimation, which we unfortunately were not able to incorporate in this paper. We hope that, with some additional research on the topic, we will be able to make use of the Heckman procedure in the future, thereby shedding more light on the selection procedures within our panel. The same goes for the BUC-estimator that was used in the analyses, but of which the outcomes to some extent remain unclear to us. We do believe that a correction of the regular fixed-effects ordered logit model is necessary in order to solve the 'incidental parameters problem', but we are not sure of the estimation technique that should be used to do so.

A final consideration has to do with the variables used in our analyses. The measures used to estimate network size and firm performance are not perfect and only tell a part of the tale. Concerning the entrepreneurial networks we could also include variables explaining network composition, for example the number of family contacts in one's network, or the measure of network size could be expanded to also include contacts used for private purposes. Regarding firm performance, other measures could be used besides firm sales, for instance profit or employment figures. We also did not include variables on specific strategic actions by the entrepreneurs with

respect to firm performance. Information on certain firm goals that an entrepreneurs has, for instance growth in performance, is available in the SSNE1 and SSNE2 and it would be interesting to incorporate this information in future research as well.

So although many questions remain, with this paper we have shown that the relationship between (entrepreneurial) networks and firm performance is more complex than one might think and that solving the causality question remains an interesting avenue for future research.

References

Baetschmann, G., Staub, K. E. & Winkelmann, R. (2015). Consistent Estimation of the Fixed Effects Ordered Logit Model. Journal of the Royal Statistical Society: Series A, 178(3), 685–703.

Bailey, S. & Marsden, P. V. (1999). Interpretation and interview context: examining the General Social Survey name generator using cognitive methods. Social Networks, 21(3), 287–309.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120.

Batjargal, B. (2003). Social capital and entrepreneurial performance in Russia: A longitudinal study. Organization Studies, 24(4), 535–556.

Brüderl, J., & Schussler, R. (1990). Organizational Mortality: The Liabilities of Newness and Adolescence. Administrative Science Quarterly, 35(3), 530–547.

Burt, R. S. (1984). Network Items and the general social survey. Social Networks, 6, 293–339.

Butler, J. E. & Hansen, G. S. (1991). Network evolution, entrepreneurial success, and regional development. Entrepreneurship & Regional Development, 3(1), 1–16.

Cooke, P. (2007). Social capital, embeddedness, and market interactions: An analysis of firm performance in UK regions. Review of Social Economy, 65(1), 79–106.

Dyer, J. H. & Singh, H. (1998). The relational view: cooperative strategy and sources of competitive advantage. The Academy of Management Review, 23(4), 660–679.

Garnsey, E. (1998). A theory of the early growth of the firm. Industrial and Corporate Change, 7(3), 523–556.

Gedajlovic, E., Honig, B., Moore, C. B., Payne, G. T. & Wright, M. (2013). Social Capital and Entrepreneurship: A Schema and Research Agenda. Entrepreneurship Theory and Practice, 37(3), 455–478.

Granovetter, M. (1985). Economic action and social structure: the problem of embeddedness. American Journal of Sociology, 91(3), 481–510.

Hoang, H. & Antoncic, B. (2003). Network-based research in entrepreneurship. Journal of Business Venturing, 18(2), 165–187.

Hoang, H. & Yi, A. (2015). Network-based Research in Entrepreneurship: A Decade in Review. Foundations and Trends in Entrepreneurship, 11(1), 1–54.

Jack, S. L. (2010). Approaches to studying networks: Implications and outcomes. Journal of Business Venturing, 25(1), 120–137.

Lechner, C. & Dowling, M. (2003). Firm networks: external relationships as sources for the growth and competitiveness of entrepreneurial firms. Entrepreneurship & Regional Development, 15(1), 1–26.

Marsden, P. (1987). Core discussion networks of Americans. American Sociological Review, 52(1), 122–131.

Mason, C. M., Carter, S., & Tagg, S. (2011). Invisible Businesses: The Characteristics of Home-based Businesses in the United Kingdom. Regional Studies, 45(5), 625–639.

Nahapiet, J. & Ghoshal, S. (1998). Social Capital, Intellectual Capital, and the Organizational Advantage, 23(2), 242–266.

Rabe-Hesketh, S. & Skrondal, A. (2012). Multilevel and Longitudinal Modelling Using Stata (Third Edition). College Station, TX: Stata Press. Volume I and II.

Schutjens, V., G. Mollenhorst and B. Völker (2015). Changing social networks of entrepreneurs in Dutch residential neighborhoods', in C. Mason, D. Reuschke, S. Syrett and M. Van Ham (Eds.). Entrepreneurship in Cities, Neighborhoods, Households and Homes. Cheltenham UK : Edward Elgar, forthcoming

Sleutjes, B., Van Oort, F. & Schutjens, V. (2012). Cohesion, Liveability and Firm Success in Dutch Neighbourhoods. In: Welter, F., D. Smallbone and A. Van Gils (Eds.) Entrepreneurial processes in a Changing Economy: Frontier in European Entrepreneurship Research. Cheltenham UK: Edward Elgar, 24-46.

Snijders, T.A.B. & Bosker R.J. (2012) Multilevel analysis. An introduction to basic and advanced multilevel modelling (Second Edition). London UK: Sage.

Stam, W., Arzlanian, S. & Elfring, T. (2014). Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators. Journal of Business Venturing, 29(1), 152–173.

Uzzi, B. (1996). The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect. American Sociological Review, 61(4), 674–698.

Völker, B. & Flap H. (2002). The Survey of the Social Networks of the Dutch (SSND1), Data and Codebook. Utrecht: Utrecht University/ICS.

Watson, J. (2007). Modeling the relationship between networking and firm performance. Journal of Business Venturing, 22(6), 852–874.

Westlund, H. & Adam, F. (2010). Social Capital and Economic Performance: A Meta-analysis of 65 Studies. European Planning Studies, 18(6), 893–919.

Zaheer, A. & Bell, G. G. (2005). Benefiting from network position: Firm capabilities, structural holes, and performance. Strategic Management, 26, 809-825.

Appendix I: Descriptives table

Variable	2008	2013
Performance (average)	4.08 (1.81)	3.96 (1.87)
Network size (average)	2.79 (1.78)	2.81 (1.67)
Hours worked (average)	42.94 (20.22)	40.1 (20.57)
Business partner	31.67%	29.44%
Home-based	83.33%	82.78%
Move between 2008-2013	x	10%
Age entrepreneur (average)	49.48 (9.25)	
Years existence firm (average)	18.06 (19.18)	
Local market orientation	32.78%	
Education (per type)		
1. No tertiary education	61.11%	
2. Lower tertiary education	25%	
3. Higher tertiary education	13.89%	

Source: SSNE1, 2008 & SSNE2, 2013

Appendix II: Correlation Table

	Performance	Network size	Hours worked	Business partner	Home-based	Move	Age of entrepreneur	Years of existence firm	Education	Market Orientation
Performance	1.000									
Network size	0.1797	1.000								
Hours worked	0.5976	0.0465	1.000							
Business partner	0.3161	0.0631	0.1371	1.000						
Home-based	-0.3309	-0.0955	-0.2477	-0.2148	1.000					
Move	0.0188	-0.0104	0.0748	-0.0692	-0.1002	1.000				
Age of entrepreneur	-0.2329	-0.1991	-0.1493	-0.2046	0.2186	-0.0645	1.000			
Years of existence firm	0.3208	-0.1232	0.3795	0.1882	-0.1125	-0.0726	0.1006	1.000		
Education	-0.0629	0.0645	-0.1650	-0.0835	0.0224	-0.0439	0.0656	-0.2345	1.000	
Market Orientation	0.0646	-0.1011	0.2024	0.0635	-0.1421	-0.0244	0.0237	0.2188	-0.1979	1.000