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Entrepreneurship and an aging population

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Abstract

Several studies confirm a positive relationship between age and entrepreneurship. This paper analyses if this statement is true also for Sweden. By focusing on those above the age of 50, the paper adds knowledge about how individuals close to their retirement acts and how they contribute to the overall society. A first approach is to analyse the tendency at the regional level where the relationship between different age cohorts and the rate of new firm formation is analysed. In the second stage, an individual perspective is taken where the probability to become self-employed is expected to increase as individuals become older. By decomposing the population in different age cohorts, it is possible to find differences in the probability of becoming self-employed. To increase and deepen the knowledge about the relationship between age and entrepreneurship this paper further adds to existing literature by separating regions into different categories along the urban-rural hierarchy. The results confirm the finding that entrepreneurship is a positive function of age. Individuals above 55 and 64 have a positive influence on entrepreneurship at both the regional as well as the individual level where the impact is stronger in locations that are more rural.

Keywords: new firm formation, self-employment, age cohorts, micro data, urban-rural hierarchy

JEL classification codes: L26, R12, R30

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1. Introduction

The purpose of this paper is to make a theoretical and an empirical contribution to the literature on the effects of ageing populations on entrepreneurship and thereby also contribute to the current general discussion of the economic effects of aging populations. There exist today a rich and rapidly growing literature concerning on the one hand general as well as specific economic effects of ageing work forces and populations and on the other hand, the policy options to reduce the negative effects of ageing labour forces.¹

One basic policy area concerns the possibilities of extending the work careers of the ageing work force when the number of pensioners is increasing and the younger labour force is declining. One way to extend the work careers of older people might be for (some of) them to start a business, i.e. to become entrepreneurs (Webster and Walker, 2005; Kautonen et al., 2008). Of course, the importance of this alternative depends upon the willingness of older people to become entrepreneurs and the existence of efficient policy measures to increase this willingness if it is perceived to be too low. The alternative might also be a result of necessity if there are no other options for an individual. Seen as a policy option, increased self-employment among older people can generate many positive outcomes. It might i) prolong the working lives of older people (Webster and Walker, 2005), ii) reduce older age unemployment (PRIME, 2005), iii) increase the social inclusion of older individuals (Kautonen, et al., 2008), and iv) enhance the innovative capacity of the economy by employing the human and social capital of older individuals through new innovative start-ups (Botham and Graves, 2009).

There are actually many examples of that many older workers engage in some form of transitional employment between their career employment and the complete withdrawal from the labour force (Bruce et al., 2000; Cahill et al., 2006). Evidences from the US show that self-employment rates increase dramatically among people aged 50 and over (Quinn and Kozy, 1996; Cahill et al., 2007). This indicates that some older workers do not transition from career employment to retirement but to self-employment, which might provide the flexibility in hours and type of work that older workers desire.

¹ See, e.g., Johnson and Zimmerman (1993), Auer and Fortuny (2000), OECD (2001), Visco (2001), von Nordheim (2004), Nyce and Schieber (2005), Turner and Williams (2005), OECD (2006), Roberts (2006), Taylor (2006).

However, in general, little research has been devoted to the relationship between ageing and entrepreneurship and even less attention has been devoted to people 50 and older, who engage in self-employment (de Bruin and Firkin, 2001; Singh and DeNoble, 2003; Karoly and Zissimopoulos, 2004; Kerr and Armstrong-Stassen, 2011).

Certainly, earlier studies of the relationship between ageing and entrepreneurship highlight important and interesting aspects of the relationship between population ageing and entrepreneurship. However, they also suffer from many distinct limitations, such as small sample sizes, small-scale surveys with questionable validity and reliability, vague theoretical foundations and narrow research questions. Generally, there is a lack of analyses of the relation between population ageing and entrepreneurship based upon distinct theoretical frameworks and using large-scale databases.

It seems to be a generally accepted result in the literature that the relationship between entrepreneurship and age follows the shape of an inverted U, i.e., at younger ages the probability to become an entrepreneur increases with age, that at a certain age this probability reaches a maximum and declines thereafter. However, we have not found any publication that illustrates this distribution even if this information seems to be fundamental for discussing the relationship between age, ageing and entrepreneurship. It is of course essential to know if this distribution is stable over time and if it looks the same in different regions. Having established the form of the distribution, it then is interesting to understand the underlying reasons that can explain the distribution. First, when the determinants are known is it possible to start analysing what the options are for influencing the start-up probabilities at different ages.

Since the age distribution of the population and the work force varies substantially between different regions, it is also of interest to check; whether the differences are so large that they significantly can influence entrepreneurship in different regions. To know this is very important in a time with ageing populations, since new firm formation is recognized having important stimulating effects on regional economic development (Mueller, 2006).

In this paper, we will highlight how the propensity to start new firms varies between different age groups in Sweden and explain this propensity by means of characteristics of the individuals concerned. In particular, we explore two aspects of the

relationship between ageing and entrepreneurship. Firstly, we analyse how the rate of new firm formation in different type of regions is influenced by the age structure of the population in these locations. It is a well-known fact that the population ageing varies substantially across locations. Not least, a high share of older people characterizes locations in the sparsely populated, rural parts of the country. The situation is on the other hand quite different in many locations in the metropolitan regions, which are characterized by a relatively young population. Information about how the age structure influences the rate of new firm formation has a great interest from a policy point of view, since demographic trends are very difficult to reverse.

Secondly, we analyse how the probability of becoming self-employed varies across different age cohorts controlling for locational factors as well as for a number of other characteristics of individuals. This analysis provides information about if the probability of older people to start a firm varies across locations as well as how this propensity varies over the age distribution of individuals. In addition, this information is of a great policy interest in a country with an ageing population. The results confirm an inverted U-shape between age and entrepreneurship. However, individuals above 55 and 64 clearly contribute to the level of entrepreneurship both at the regional and individual level. There are also differences among different regional categories.

This paper is organized as follows: section 2 focuses on previous research in the area of entrepreneurship and ageing. Section 3 describes the relationship between age and entrepreneurship, focusing on both the push and pull factors of becoming an entrepreneur when you are older. The following section is devoted to the empirical analysis where a regional as well as an individual effect is taken. The last section, 5, concludes the paper.

2. Earlier research on ageing and entrepreneurship

The literature on the effects of ageing on entrepreneurship is somewhat limited in helping us understand what factors influence the willingness of older people to become entrepreneurs or what policy measures that might increase this willingness. The literature dealing with these issues is surprisingly limited (Kautonen, 2008; Kibler et al., 2012) and also partly biased towards social and psychological aspects.² Curran and Blackburn

² For an overview of earlier research, see Weber and Schaper (2004).

(2001) find a low general interest for entrepreneurship for older people in Britain. Singh and DeNoble (2003) examine early retirees' decision to become self-employed and outline the factors (combination of social, financial and personal reasons) that would influence the self-employment choice and the types of entrepreneurial paths emanating from that choice. Rogoff (2007, p. 94) concludes that "later-life entrepreneurship is a significant fact of economic life for older Americans and will continue to grow." Empirical evidences for the US and Great Britain indicate that older self-employed persons are significantly more likely to continue working and less likely to retire than their employed counterparts are (Quinn, 1999; Parker and Rougier, 2007; Zissimopoulos and Karoly, 2007).

Kautonen (2008) remarks that the fact that 16 % of 839 small firms founded in Finland between 2000 and 2006 were founded by individuals aged 50 and above indicates that older entrepreneurship is not a marginal issue. Tornikoski and Kautonen (2009) find that the entrepreneurial intentions of older individuals are mostly influenced by their perception as to how easy or difficult they think starting up a business would be. Kautonen et al. (2010) shows that work history becomes a significant determinant of entrepreneurial intentions only at people's later career stages and that a "blue-collar" career has a significant negative impact mainly due to perceived inferior social contacts. Kerr and Armstrong-Stassen (2011) examine older retired workers' engagement in post-career entrepreneurship and wage-and-salary employment and found that those choosing entrepreneurship exhibited different demographic characteristics and psycho-social needs than those choosing employment. Kautonen et al. (2011) find in an empirical study of Finnish individuals that social norms perceived as permissive of enterprising activity in the third age, i.e. in the age 50 and above, exert a significant positive influence of entrepreneurial intentions (!) in this age segment.

Lévesque and Minetti (2006) present theoretically arguments that the relationship between age and the likelihood of starting a new business starts to grow at a relatively early age, reaches a maximum and declines thereafter. The entrepreneurial propensity tends to reach its peak between the ages of 35 and 40 approximately (Bates, 1995; Welter and Rosenblatt, 1998).

Reynolds et al. (2003) report empirical evidence showing individuals between 25 and 34 years of age to be most likely to start a new business. Also, Blanchflower (2004) suggests that the likelihood of starting a new business is maximized among young individuals. Some studies indicate that the entrepreneurial activity rates among older people are about half of those in the younger cohorts (Curran and Blackburn, 2001; Hart et al., 2004) indicating that older people are significantly less likely to engage in entrepreneurial activity than younger individuals. Arenius and Minetti (2005) disclose empirical results indicating that the probability to start a business declines with age. However, they do not test for the opportunity highlighted by Lévesque and Minetti (2006) that the probability might first increase with age and then start to decline at a certain age. In a study using German data, Bergmann and Sternberg (2007) find that age has no effect on so-called necessity entrepreneurship. However, for other types of entrepreneurship they find that the age variable (measured in years) has a positive effect on the start-up propensity, while age variable squared has a negative impact, indicating a reversed U-shaped relationship.³

Wagner and Sternberg (2004) and Mueller (2006) found similar results with respect to the effect of age on start-up propensity. Interestingly, it seems as if the survival rates of businesses established by older entrepreneurs are higher than for those started by younger entrepreneurs (Cressy and Storey, 1995), which may be due to most extensive and more varied experiences, superior networks and a stronger financial situation (Arkebauer, 1995; Blackburn et al., 1998; Hindle and Rushworth, 2002).⁴ These results suggests that while the ability to establish and run a firm is higher at an older age, there is an age after which the motivation for entrepreneurial behaviour starts to decline, which is in line with the results in a study from Norway (Rotefoss and Kolvereid, 2005).

3. The influence of aging on entrepreneurship

In this section, we present the theoretical framework upon which we will base our empirical analyses. We start with presenting the general decision problem that in principle every potential entrepreneur faces and will after that discuss how ageing might

³ Earlier Bates (1997) found a similar U-shaped relationship with respect to age.

⁴ It appears on the other hand as if businesses established by older entrepreneurs exhibit slower growth rates than the ventures undertaken by younger entrepreneurs (Peters et al., 1999).

influence the decisions of potential entrepreneurs. Our basic assumption is that potential entrepreneurs are well-informed, rational and risk-neutral decision-makers, who will decide to start a new business if this is the best of all available alternatives in terms of expected financial outcome. We assume that the fundamental motivation for entrepreneurs is the economic gain, even if a number of other motivations have been suggested in the entrepreneurship literature (Jayawarna et al., 2013) . If a new business is not profitable, it will fail whatever the underlying motivation for launching it. Based upon the above assumption the decision problem can be illustrated as follows (Nyström, 2006):

$$\left\{ \int_0^L [E(p_t)E(q_t) - E(q_t)E(c_t)]e^{-\delta t} dt - E(F) \right\} [1 - E(\tau_e)] \geq \int_0^L E(\hat{Y}_t)e^{-\delta t} dt [1 - E(\tau_Y)] + \varepsilon$$

where $E(p_t)$ is the expected price for the product provided by the new firm, $E(q_t)$ is the expected sales volume, $E(c_t)$ is the expected unit cost for producing and distributing the product, $E(F)$ is the expected start-up cost, $E(\tau_e)$ is the expected tax on firm profits, $E(\hat{Y}_t)$ is the expected income from the best alternative if the potential entrepreneur decides not to start a new firm, $E(\tau_Y)$ is the expected tax on the alternative income, ε is the compensation that the potential entrepreneur demands for taking the risk of starting a firm, δ is the depreciation ratio, L is the expected life time of the firm, and $e^{-\delta t}$ is the discount factor of future incomes and costs. When the left hand side is larger than the right hand side a potential entrepreneur will start a new business. If the two sides are equal, we cannot know what the decision will be.

Now we turn to our basic question: How will the decision concerning the same entrepreneurial project differ for an older potential entrepreneur compared to a younger potential entrepreneur? We start with those factors that we think would increase the probability that an older potential entrepreneur would decide actually to become an entrepreneur and will then continue with the factors that we think will work in the other direction.

3.1 Factors increasing the probabilities that older potential entrepreneurs will become entrepreneurs

We expect the following factors will increase the probability that an older potential entrepreneur will become an entrepreneur (Parker, 2009):

1. They may possess more human capital than younger ones due to life-long learning and on-the-job-training (Singh and DeNoble, 2003; Weber and Schaper, 2004). Formal education and training can increase the likelihood for becoming an entrepreneur due to i) acquisition of skills, ii) credentialing, and iii) sorting people by ambition and assertiveness (Kim et al., 2006). They have gained more and more varied expertise and professional experiences through their professional life (Brüderl et al., 1992; Light and Rosenstein, 1995; Gray, 1998; Parker, 2004; Bergmann and Sternberg, 2007) including i) technical knowledge (Jones-Evans, 1996) ii) prior industrial experience (Storey, 1994; Shane, 2003), iii) managerial experience (Steiner and Solem, 1988; Boden Jr and Nucci, 2000; Kim, et al., 2006), and iv) prior experience of starting a business (Shane, 2003). Thus, they may have become better at identifying and evaluating business opportunities and they may know more about how to start and run a business, which will reduce both the start-up costs and the running costs.
2. They normally have accumulated a larger capital due to savings, inheritances, and investments in their own home (Blanchflower and Oswald, 1998; Lussier and Pfeifer, 2001; Singh and DeNoble, 2003; Weber and Schaper, 2004), which reduces the need to borrow money to start and run the business and thus leads to lower capital costs. This implies that the liquidity constraint becomes less of a constraint for self-employment as people become older (Evans and Leighton, 1989b). There is a positive relationship between the assets of a potential entrepreneur and the probability of becoming self-employed (Evans and Jovanovic, 1989; Bruschi, 1992).
3. Low income prospects and financial necessity might encourage older workers to become entrepreneurs (Smeaton and McKay, 2003; Cahill, et al., 2007; Walker and Webster, 2007):
 - a. Older workers who become unemployed might find it difficult to get a new job or a job with a wage at the same level as in their earlier job might consider an alternative career as entrepreneur. Opportunities for work outside of self-employment often diminish over the age of 50.
 - b. They might want to continue their career when they are forced to retire and have to survive on a smaller pension income, which induces a search for

alternative income sources of which entrepreneurship is one (Weber and Schaper, 2004).

4. They have had time to develop richer private, professional and business networks, i.e. social capital (Birley, 1985; Dubini and Aldrich, 1991; Larson, 1991; Baucus and Human, 1994; de Bruin and McLaren, 2002; Aldrich and Cliff, 2003; Singh and DeNoble, 2003; Weber and Schaper, 2004) which will tend to reduce start-up costs and possibly lead to larger sales due to links to many potential customers.
5. They have a higher probability of having been self-employed before. Earlier self-employment in the past makes it more likely to become self-employed again (Rotefoss and Kolvereid, 2005; Mueller, 2006).
6. They demand other work conditions and/or are dissatisfied with their current job, such as age discrimination (Min, 1984; Evans and Leighton, 1987; Metcalf and Thompson, 1990; Dibden and Hibbett, 1993; Light and Rosenstein, 1995; Parsons and Mayle, 1996; Blackburn, et al., 1998; Brown, 2000; C.K. Chiu et al., 2001; de Bruin and Firkin, 2001; Platman, 2004; Webster and Walker, 2005):
 - a. Flexible work schedule and hours (Quinn, 1999; Karoly and Zissimopoulos, 2004; Zissimopoulos and Karoly, 2007).
 - b. Job autonomy and independence (Bond et al., 2005; Walker and Webster, 2007).
 - c. Greater opportunities for learning and development (Bond, et al., 2005).
 - d. Alternative career opportunities (Singh and DeNoble, 2003; McClelland et al., 2005).
7. They want to be active and feel that they are socially included (Webster and Walker, 2005; Kautonen, et al., 2008).
8. They may have been interested a long time becoming entrepreneurs but have postponed the start-up as a result of the family life cycle (Singh and DeNoble, 2003; Weber and Schaper, 2004).

3.2 Factors decreasing the probabilities that older potential entrepreneurs will become entrepreneurs

We expect the following factors to decrease the probability that older potential entrepreneurs will become entrepreneurs (Parker, 2009):

1. They are more risk-averse than younger potential entrepreneurs (Lévesque et al., 2002), i.e., they demand a higher risk premium.
2. They avoid riskier occupations, such as entrepreneurship since the value of the information and knowledge gained is lower than they were younger (Miller, 1984).
3. They have lower levels of formal post-secondary education (Robinson and Sexton, 1994; Lussier and Pfeifer, 2001; Weber and Schaper, 2004).
4. The human capital they possess has a lower discounted value due to knowledge depreciation.
5. They have a shorter time horizon than younger potential entrepreneurs and thus use a higher discount factor $e^{-\delta t}$ (Bates, 1995; Schultz, 1995). Starting a new business often leads to high sunk costs, due to the costs of setting up a business plan, doing market research, developing the product, dealing with legal and administrative problems, etc. With a shorter expected time span of a new business, the shorter is the period over which these sunk costs can be earned back.
6. They may face challenges in the form of lower levels of health, energy and productivity (Curran and Blackburn, 2001; Weber and Schaper, 2004).
7. They may value leisure higher than younger potential entrepreneurs (Lévesque and Minetti, 2006).
8. They may be discriminated due to age by financiers and customers (Weber and Schaper, 2004).

4. Empirical analysis

To empirically test the effect of an ageing population on entrepreneurship the empirical approach is divided into two parts. The first part investigate how demographic variables influence the rate of new firm formation at the regional, municipal⁵, level using a fixed-effects model for the period 1993 to 2010. The variables in focus are the average age of the population in the municipality and the share of individuals above the age of 55 and 64. The second part of the empirical analysis uses individuals as the unit of observations. Here the focus is on the probability of becoming self-employed and how this probability is influenced by the age of the individual. To analyse this we apply a logit model.

⁵ Municipalities are the finest level of public administration in Sweden. There are in total 290 municipalities.

4.1 Regional level: Data and description of variables

The dataset originates from Statistics Sweden and covers variables at the municipal level for the period 1993 to 2010. The new firm formation variable is constructed by Statistics Sweden that uses firm-level data aggregated to the municipal level. It is unfortunately not possible to access the micro-data and find out specific details about each individual firm.

A firm is registered as a new firm if a new organization number is identified *and* the majority of the employees are new, i.e. if they did not work in the firm before the organization number was changed. New firms that arise due to division of firms or mergers of already existing firms are not registered as new firms. Only firms with economic activity are analysed for each year, i.e. firms that report VAT and/or payroll tax. Thus, by using these criteria only new active establishments are included in the sample. The number of new firms is standardized by the number of individuals in the labour force following the labour market approach (Audretsch and Fritsch, 1994).⁶ The labour market approach is strengthened by the fact that it is mostly individuals and not firms that create new firms and that the start-ups normally are done close to their place of residence (Mueller and Morgan, 1962; Evans and Jovanovic, 1989; Sorenson and Audia, 2000).

The explanatory variables in focus are those that describe the demographic structure of the municipalities: the average age of the inhabitants in the municipality and the share of the population above the age of 55 and those above the age of 64 (Quinn and Kozy, 1996; Cahill, et al., 2007). The age of 64 were used since this is the average retirement age in Sweden in 2009 (Eurostat, 2009).

New firms arise in environments that are booming and/or already have a large demand and this is captured by including a variable that measure the change in demand and the economic size of the municipality (Armington and Acs, 2002; Sutaria and Hicks, 2004a; van Stel and Suddle, 2008). Economic size is measured as the municipality's accessibility to wage sums in the own municipality, in municipalities in the same functional region, and in the rest of Sweden (Johansson et al., 2002; 2003). The size measure is highly correlated with the intensity of human capital, correlation above 0.8. A

⁶ The ecological approach where the number of new firms is standardized by the total number of firms in a municipality has also been tested with similar results.

larger share of highly educated individuals foster knowledge spillovers and can be used as valuable inputs (Johansson and Wigren, 1996; Malmberg et al., 1996; Malmberg and Maskell, 1997; Parker, 2004; Karlsson and Backman, 2011). The human capital variable is not included due to the high correlation. Another labour market factor is the unemployment rate that has an ambiguous effect on new firm rate formation (Binks and Jennings, 1986; Audretsch et al., 2001; Parker, 2004; Sutaria and Hicks, 2004b). The industrial structure in a municipality affects the new firm formation rate where locations with larger firms on average have a hampering effect (Mason, 1991; Boden Jr, 1996). The industry sector is also measured by the number of establishments in the service sector (two-digit Sic-code: 45-96) divided by the population capturing possible knowledge spillovers within this sector (Armington and Acs, 2002; Lee et al., 2004).

Table 1 Description of variables, regional level

Description	Indicator	Exp. sign
<i>Dependent variable</i>		
Number of new firms standardized by the number of individuals in the labour force, in municipality s at time t		
<i>Independent variable</i>		
Average age in municipality s at time t	Age structure	+
Proportion of the population that is above the age 55 in municipality s at time t	Age structure	+
Proportion of the population that is above the age 64 in municipality s at time t	Age structure	+
Annual change in total wage sum, in municipality s at time t , in thousand SEK	Change in demand	+
Accessibility to wage sum in municipality s at time t , in thousand SEK	Economic size	+
Unemployment rate, proportion of labour force registered as unemployed, in municipality s at time t	Push or pull factor	+/-
Mean establishment size, in municipality s at time t	Industry structure	-
Number of establishments in the service sector divided by the population, in municipality s at time t	Industry structure	+

4.2 Regional level: Method and Empirical results

To test the relationship between the age structure of the population in a municipality and the rate of new firm formation a fixed-effects model is used for the period 1993 to 2010.⁷ Due to the high bivariate correlation (above 0.8) between the variables that describe the

⁷ The fixed effects is inefficient if the within variance is low which is often the case dealing with regional variables that change slowly over time, a random-effects model and a pooled OLS show the same results as Table 2.

age structure in the municipality, average age and share of individuals above the age of 55 and those above the age of 64, the estimation is separated into three specifications. All the other bivariate correlations are below 0.6. Spatial dependence is not detected in the data according to the test of Pesaran and Friedman (De Hoyos and Sarafidis, 2006). There are in total 290 municipalities in Sweden in 2010 but due to reorganisations of the municipalities over time only 283 municipalities have data for the whole time period.

Table 2 New firm formations and an ageing population

Dependent variable: Proportion of new firm formation (ln)			
	Spec. 1	Spec.2	Spec.2
Average age in municipality s at time t (ln)	0.640** (0.226)	-	-
Proportion of the population that is above the age 55 in municipality s at time t	-	0.677** (0.260)	-
Proportion of the population that is above the age 64 in municipality s at time t	-	-	0.831** (0.317)
Annual change in total wage sum, in municipality s at time t , in thousand SEK	1.50e-10 (7.62e-10)	1.52e-10 (7.71e-10)	8.59e-11 (7.80e-10)
Accessibility to wage sum in municipality s at time t , in thousand SEK (ln)	-0.115** (0.046)	-0.130** (0.044)	-0.142** (0.041)
Unemployment rate, in municipality s at time t	-0.807** (0.387)	-0.772** (0.384)	-0.826** (0.385)
Mean establishment size, in municipality s at time t (ln)	-0.731*** (0.070)	-0.722*** (0.071)	-0.737*** (0.070)
Number of establishments in the service sector divided by the population, in municipality s at time t (ln)	0.411*** (0.064)	0.411*** (0.064)	0.421*** (0.065)
Constant	-2.923** (1.345)	-0.561 (0.783)	-0.291 (0.704)
N	5094	5094	5094
n (municipalities)	283	283	283
F-value	188.29	188.71	184.22
R ² overall	0.60	0.58	0.56

Cluster (municipality) standard errors in parenthesis to reduce the effect of heteroscedasticity, *** significant at one per cent, ** significant at five per cent, * significant at ten per cent. The estimations include year dummies

The results indicate that the average age of the population in a municipality has a positive impact on the new firm formation. The same positive effect for new firm formation is observed for the variables measuring the share of the population above the age of 55 and those above the age of 64. Thus, there is a positive relationship between an older demographic composition of the inhabitants in a municipality and the rate of new firm formation. The obvious downside of this empirical approach is that it is impossible to tell

if it is the older individuals that start new firms or if this variable is simply picking up another effect. To clarify the relationship between an older population and entrepreneurship we will, in the next step focus on the individual choice of becoming self-employed and if this is influenced by the age of the individual.

The rest of the control variables follow the expected sign except the measure for the economic size of the region, which is negative and significant. This type of finding is however found in other empirical studies analysing determinants of new firm formation (Andersson and Koster, 2011). The following table attempts to capture differences among different types of regions. The regional categories are the same as those introduced by the Swedish Board of Agriculture and described in Westlund (2011): i) metropolitan municipalities (municipalities in the functional regions of Stockholm, Gothenburg and Malmö), ii) urban municipalities (regional centres outside the metropolitan areas and their “suburb municipalities”), iii) rural municipalities (municipalities not part of (i) or (ii) with a population density above five people per km²); and iv) sparsely populated rural municipalities (population density below 5 people per km²). The estimations are as before estimated in three specifications but these are not reported individually. The control variables are from the estimation with the average age in the municipality but are robust for all three specifications; these results are available on request.

Table 3 New firm formations and an ageing population, different regional categories.

Dependent variable: Proportion of new firm formation (ln)				
	Metropolitan municipalities	Urban municipalities	Rural municipalities	Sparsely populated rural municipalities
Average age in municipality s at time t (ln)	0.612** (0.276)	1.397*** (0.380)	-0.638 (0.422)	0.903 (0.627)
Proportion of the population that is above the age 55 in municipality s at time t	0.864** (0.320)	1.720*** (0.451)	-0.902** (0.444)	1.994** (0.925)
Proportion of the population that is above the age 64 in municipality s at time t	1.246*** (0.311)	2.258*** (0.663)	-0.656 (0.611)	2.393** (0.926)
Annual change in total wage sum, in municipality s at time t , in thousand SEK	-6.56e-10 (5.98e-10)	9.60e-9 (1.32e-8)	1.34e-8 (3.85e-8)	3.37e-7 (2.36e-7)
Accessibility to wage sum in municipality s at time t , in thousand SEK (ln)	0.044 (0.075)	-0.095 (0.179)	-0.142 (0.115)	0.111 (0.214)
Unemployment rate, in municipality s at time t	-0.602 (0.818)	-1.090 (0.771)	-0.603 (0.457)	0.348 (0.905)

Mean establishment size, in municipality s at time t (ln)	-0.388*** (0.114)	-0.489*** (0.156)	-0.774*** (0.066)	-1.258*** (0.141)
Number of establishments in the service sector divided by the population, in municipality s at time t (ln)	0.317** (0.123)	0.114 (0.118)	0.414*** (0.073)	0.509** (0.206)
Constant	-6.177*** (1.808)	-6.854 (3.513)	2.234 (2.337)	-6.141 (4.141)
N	792	810	2880	612
n(municipalities)	44	45	160	34
F-value	69.05	78.78	150.09	112.62
R ² overall	0.69	0.48	0.71	0.66

Cluster (municipality) standard errors in parenthesis to reduce the effect of heteroscedasticity, ***significant at one per cent, **significant at five per cent, *significant at ten per cent. The estimations include year dummies

There are some differences among the different regional settings. The average age in the municipality is only significant in the urban categories (metropolitan municipalities and urban municipalities). The variable measuring the share of the population above the age of 55 is significant in all cases but negative for rural municipalities. The share of the population above 64 is however positive and significant for all regional categories. The magnitude of the parameter is largest for sparsely populated rural municipalities. Thus, there are some differences but the general picture of a positive effect on entrepreneurship from older individuals is supported.

The control variables that has a significant impact on the new firm formation rate is the mean establishment size (negative effect) and the number of establishments in the service sector (positive effect). New firm formations vary according to industry structure where some industries provide more opportunities for the creation of firms by producing a broad range of products, by a fast growth rate, or by having lower start-up costs (Malecki, 1993; Dean and Meyer, 1996).

4.3 Individual level: Data and description of variables

In this part of the analysis, we use individuals as the unit of observation. The empirical approach is built on data from Statistics Sweden that covers all registered individuals in Sweden above the age of 16 in 2009 (approximately 7.6 million individuals). The final number of observations is slightly less than four million individuals since individuals with missing values in one or several independent variables are dropped from the data set.

The regressand is a discrete variable that equals 1 if the individual has changed his/her status to become self-employed in 2010 compared to 2009, 0 otherwise. An individual is registered as self-employed if it is the main income source for the individual, i.e. there are individuals that combine self-employment with being employed in a firm. All the regressors are measured in 2009. The independent variables in focus is the variable capturing the age of the individual and the shape of the age function (age squared), several dummies are also included distinguishing different age cohorts (above 50, above 55 and above 64) (Rees and Shah, 1986; Evans and Leighton, 1989a; Blanchflower, 2000). The age 64 is used since it is the average retirement age in Sweden in 2009 (Eurostat, 2009). Control variables are on the individual, establishment and location level. The individual level captures the human capital of the individual (length of the education and education type), immutable characteristics (gender and country of origin) and labour market characteristics (occupation, tenure and number of prior work places) (Borjas, 1986; Rees and Shah, 1986; Evans and Leighton, 1989a; Robinson and Sexton, 1994; Blanchflower, 2000; Shane and Khurana, 2003; Andersson and Klepper, 2013). The establishment characteristics (where the individual worked) include the industry of which the firm belongs to, size and if the work place seized to exist in 2009 (Bates, 1995; Boden Jr, 1996; Andersson and Klepper, 2013). The individual variables are described in Table 4. The location characteristics are the same as used in the previous empirical approach described in Table 1 and used in previous studies (Evans and Leighton, 1989a; Schuetze, 2000; Giannetti and Simonov, 2004; Parker, 2004; Rupasingha and Goetz, 2013).

Table 4 Description of variables, individual level

Description	Indicator	Exp.sign
<i>Dependent variable</i>		
Change in employment status between 2009 and 2010, 1=self-employed in 2010 and not in 2009, 0=otherwise		
<i>Independent variable (all variables are measured in 2009)</i>		
Age of individual	Age	+
Age square	Functional form of age variable	-
Dummy, 1= age between 50 and 55, 0=otherwise	Dummy 50-54	+
Dummy, 1= age between 55 and 64, 0=otherwise	Dummy 55-63	+
Dummy, 1= age between 64 and 75, 0=otherwise	Dummy 64-75	+
Number of schooling years	Education length	+/-
Categorization of different educational tracks (15 in total)	Education type	

Dummy, 1=male, 0=female	Gender	+
Dummy, 1=born in Sweden, 0=otherwise	Country of origin	+
Categorization of different occupations (4 in total: cognitive occupations, occupations in management and administration, social occupations, and standardized occupations) ^a	Occupation	
Number of years as an employee	Tenure	
Number of prior employers divided by the tenure (since 1990)	Diversified experience	+
Categorization of different industries (based at the two-digit level, 86 in total) (previous work place)	Industry category	
Number of employees (previous work place)	Establishment size	-
Dummy, 1= establishment failure, 0=otherwise	Establishment failure	+

^a Johansson and Klaesson (2011)

4.4 Individual level: Method and Empirical results

To analyse the effect from the independent variables a logit model is estimated for all individuals in the sample. The reported coefficients are the odds ratios. Odds ratio cannot be negative so a decrease is indicated by a value below one. An odds ratio above one indicates a positive impact on the probability of becoming self-employed. When dealing with quadratic terms multicollinearity is inevitably present. In order to reduce multicollinearity problems, age has been centred on its mean. By centring, the relationship between high (low) original value and high (low) squared values is reduced and hence also the multicollinearity (Smith and Sasaki, 1979). To deepen our understanding about the relationship between age and self-employment in different regional contexts the empirical analysis conducts the same empirical analysis on four different regional categories described in the previous section. The results are presented in Table 5.

Table 5 Relationship between self-employment and the age of the individual, different regional categories

Dependent variable: Binary outcome, 1=became self-employed in 2010, 0=otherwise					
	All individuals	Metropolitan municipalities	Urban municipalities	Rural municipalities	Sparsely populated rural municipalities
Age	1.006** (0.001)	1.003** (0.002)	1.001** (0.002)	1.009** (0.002)	1.015** (0.003)
Age ²	0.999** (0.001)	0.999** (0.001)	1.000 (0.001)	0.999 (0.001)	0.999 (0.001)
Dummy 50-54	0.801*** (0.027)	0.889*** (0.034)	0.749*** (0.035)	0.740** (0.030)	0.801 (0.097)
Dummy 55-63	0.861*** (0.015)	0.823*** (0.029)	0.851*** (0.024)	0.908*** (0.027)	0.902 (0.058)
Dummy 64-75	1.887***	1.511***	2.060**	2.151***	2.631***

	(0.081)	(0.077)	(0.126)	(0.108)	(0.318)
Education length	1.046*** (0.006)	1.055*** (0.006)	1.031*** (0.007)	1.046*** (0.008)	1.037* (0.021)
Gender (1=male)	1.840*** (0.044)	1.852*** (0.078)	1.991*** (0.057)	1.679*** (0.054)	1.758*** (0.124)
Country of origin (1=Sweden)	1.177*** (0.028)	1.109*** (0.031)	1.279*** (0.038)	1.236*** (0.047)	1.218* (0.136)
Tenure	1.029*** (0.003)	1.026*** (0.003)	1.039*** (0.004)	1.031*** (0.004)	1.014 (0.010)
Diversified experience	6.574*** (0.357)	7.562*** (0.611)	6.339*** (0.432)	5.368*** (0.360)	5.927*** (1.017)
Establishment size	0.843*** (0.007)	0.849*** (0.009)	0.830*** (0.007)	0.846*** (0.007)	0.863*** (0.017)
Establishment failure	1.585*** (0.041)	1.493*** (0.053)	1.639*** (0.094)	1.654*** (0.087)	1.563*** (0.184)
Controlling for education type	YES	YES	YES	YES	YES
Controlling for occupation	YES	YES	YES	YES	YES
Controlling for industry	YES	YES	YES	YES	YES
Controlling for regional type	YES	NO	NO	NO	NO
Municipal variables					
Average age (ln)	0.969 (0.342)	1.321 (0.687)	1.039 (0.664)	0.516 (0.276)	0.083 (0.095)
Proportion of the population that is above the age 55	0.873 (0.386)	1.469 (1.196)	1.713 (1.965)	0.448 (0.283)	0.123 (0.204)
Proportion of the population that is above the age 64	0.725 (0.399)	1.595 (1.700)	0.886 (1.288)	0.386 (0.320)	0.019 (0.213)
Annual change in total wage sum, in thousand SEK	1.001 (0.124)	1.001 (0.124)	1.001 (0.122)	1.001 (0.122)	1.000 (0.122)
Accessibility to wage sum, in thousand SEK (ln)	0.951** (0.019)	0.975 (0.051)	1.004 (0.059)	0.879** (0.027)	0.965 (0.066)
Unemployment rate	0.049** (0.065)	0.005* (0.016)	0.032 (0.068)	0.250 (0.583)	0.132 (0.327)
Mean establishment size (ln)	0.654*** (0.038)	0.674** (0.126)	0.646** (0.083)	0.697*** (0.053)	0.488** (0.104)
Number of service establishment divided by the population (ln)	1.298*** (0.072)	1.353** (0.208)	1.335** (0.137)	1.079 (0.086)	1.391 (0.284)
Constant	0.005*** (0.008)	0.001** (0.001)	0.001 (0.003)	1.885 (4.773)	258.002 (1670.496)
N	3 814 961	1 439 508	1 131 757	1 133 399	108 136
Pseudo R ²	0.09	0.09	0.10	0.08	0.08

Cluster (municipality) standard errors in parenthesis to reduce the effect of heteroscedasticity, ***significant at one per cent, **significant at five per cent, *significant at ten per cent. All independent variables are from 2009. Due to multicollinearity among the age variables (continuous) and the age dummy variables, these are estimated separately. The control variables are reported for the estimation with the continuous age variables. The regressands capturing the age structure in the location is also estimated separately.

For all individuals we find that the age variable is above one and significant indicating that age increases the probability to become self-employed. Age squared is just below one and significant indicating a marginally decreasing effect from age. Thus, self-employment is a positive function of age but is marginally decreasing confirming an

inverted U-shape. All the dummy variables indicating the different age cohorts are significant. However, it is only the dummy variable for those aged 65 to 74 that is above one, which indicates a positive effect on the probability of becoming self-employed. The parameter for those individuals in the age 64 to 75 is 1.887. This indicates that the odds of individuals between 64 to 75 of becoming self-employed is 1.887 times that of individuals below the age of 64 or above 75. Individuals aged 50 to 54 and those aged 55 to 63 have a lower probability of becoming self-employed compared to the other age cohorts.

Turning to the different regional categories, we find that the age variable is positive for all regional categories and above one indicating a positive effect on the probability of becoming self-employed. The squared age variable is only significant for metropolitan municipalities and indicates a marginally decreasing effect. The dummy variables indicating different age groups differ somewhat along the urban-rural hierarchy. The dummy variables indicating individuals aged 50 to 63 are below one meaning that they have a lower probability of becoming self-employed. The difference across the different regions is that these dummies are not significant in sparsely populated rural municipalities. The magnitude of the dummy variable (individuals in the age 50-54) is highest for the metropolitan municipalities. For those aged 55-63, the parameter is highest for rural municipalities. It is only the dummy variable for those aged 64 to 75 that is above one, which indicates a positive effect of becoming self-employed. The odds of individuals in the age 64 to 75 of becoming self-employed ranges across the regional categories in the magnitude between 1.5 and 2.6. The highest odds is found for rural and sparsely populated rural municipalities with odds of 2.2 and 2.6, respectively, indicating that individuals in these regions and in this age cohort is more than two times that of individuals below the age of 64 and above 75.

Different regions have different milieus and institutional settings that are manifested through the different regional categories. Resources in different locations vary in their composition, dispersion, and turnover. Some sites are characterized by an abundance of important input factors such as labour, capital, information, financial resources, and material. If resources are spread out, the cost of discovering and acquiring them will increase compared to resources directly accessible to the new firm. The

turnover rate of resources, caused by mobility of labour and capital, generates instability (Stearns et al., 1995). The motives for starting a new firm might also differ in different regional settings. Reynolds et al. (2004) distinguish between necessity- and opportunity-based start-ups. Necessity-based firm creation occurs if the firm founder is forced to start a new firm due to an economic shock, such as unemployment. Opportunity-based, on the other hand, is an active choice when a firm founder identifies and acts on an economic opportunity. Many rural locations have limited employment possibilities, and consequently the creation of a new firm is not a substitute for employment in a firm but a means to avoid unemployment, i.e. opportunity-based (Friedman, 1987; Audretsch and Keilbach, 2007; Tervo, 2008). Connecting this to the age variables individuals above the age of 64 (average retirement age in Sweden) might be forced to become self-employed in the more rural areas since their level of pension scheme is too low. Individuals in rural locations might also have limited employment opportunities due to the industry structure, age discrimination or other factors.

The control variables are as expected. The individual characteristic that positively affects the probability of becoming self-employed is: if you have more education, born in Sweden, are male, have a longer tenure, more previous working places, and if your work place in 2009 ceased to exist. The only individual variable that diminishes the probability of becoming self-employed is the size of the work place. Individuals working in small establishments tend to have a higher probability of becoming self-employed. The regional control variable that increases the probability of becoming self-employed is the number of establishments in the service sector per capita. As the average establishment size increases, less individuals become self-employed. The local demand has the same effect, which is unexpected since more individuals tend to become self-employed or start new firms if the region is growing. This could be explained by the tendency to become self-employed in more rural locations where the accessibility to wage sums are lower. The regional variables that measure the age structure in the municipality are insignificant.

The next figure shows the relationship between the predicted probability of becoming self-employed and the age of the individual for all individuals and the four different regional categories. The fitted values are estimated using a logit model with only one independent variable age and age squared.

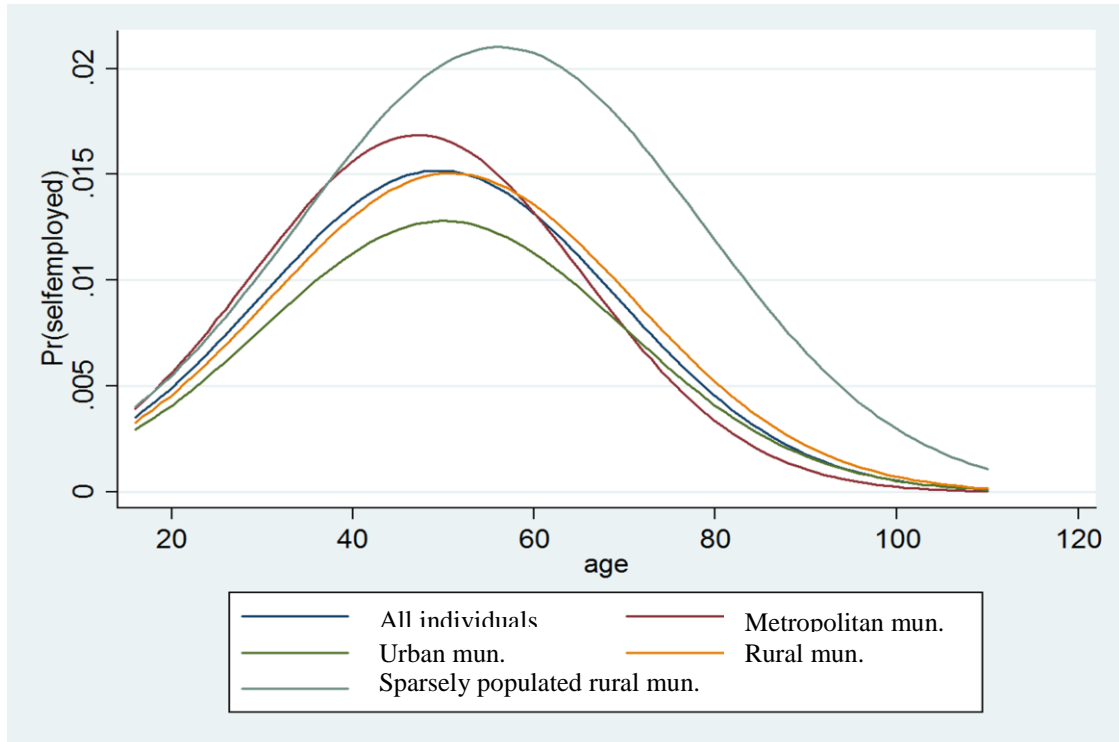
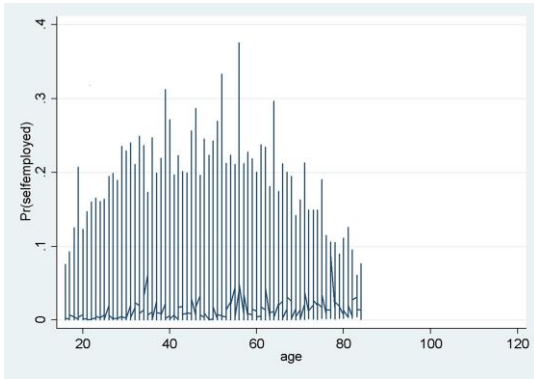
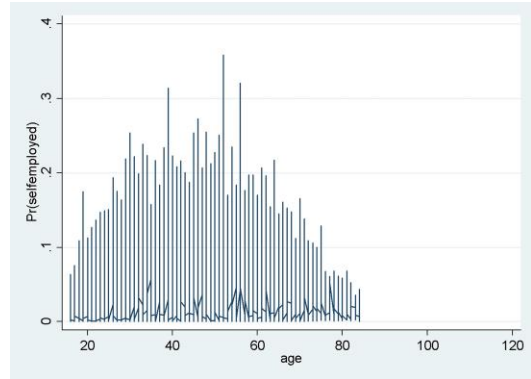


Figure 1 Predicted probability of becoming self-employed versus the age of the individual, for all individuals and the four regional categories.

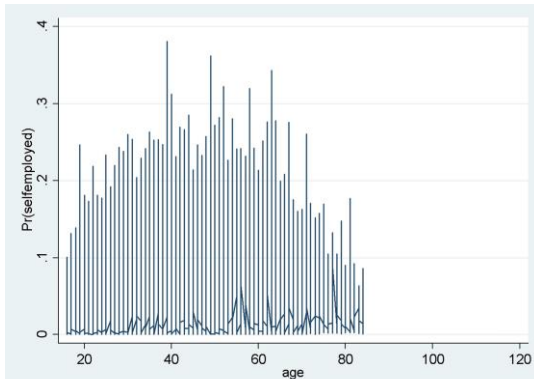
Figure 1 clearly shows the different patterns of the relationship between the probability of becoming self-employed and age, in different regional settings. The region that diverts from the rest is sparsely populated rural municipalities. In this category, the probability of becoming self-employed is higher than the rest and it peaks at a higher age. The peak for this category is around the age of 60 while the other regions have a peak around 50 to 55. It is interesting that the peak is reached at approximately where individuals can access their pension funds, confirming the proposition that access to financial funds increases the propensity of becoming self-employed. The probability of becoming employed in the different regional categories can be found in the appendix, Table A1. As can be seen in the figure there are no large differences for the probability of becoming employed across the different regional categories. The next set of figures show the relation of the predicted probability of becoming self-employed and the age using the full model (same as Table 5). The figures show the results for all individuals plus the different regional categories.



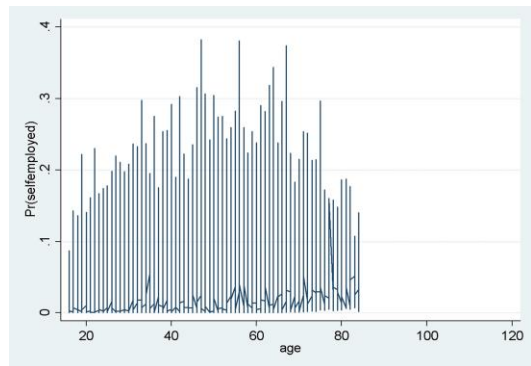
All individuals, full model



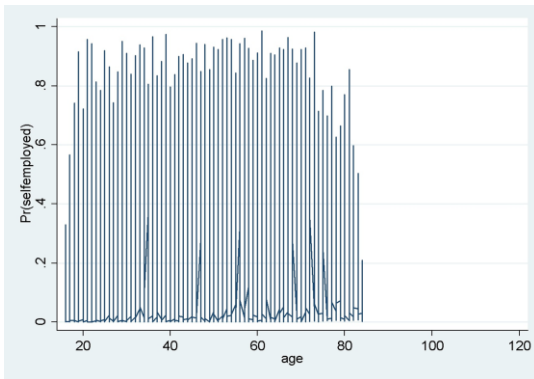
Metropolitan mun., full model



Urban mun., full model



Rural mun., full model



Sparsely pop. rural mun., full model

The figures show differences across different regional categories where again sparsely populated rural municipalities diverge from the other categories. The same pattern as in figure 1 is confirmed where the probability to become self-employed is higher in sparsely populated rural municipalities regardless of age. The above discussion deals with the

general picture in Sweden and in different type of regions where the industry is used as a control variable. To deepen the analysis of different sectors since there are most likely differences across sectors as different sectors have different set of rules and regulations. According to the law regulating employment security in Sweden, employees lose their tenure when they become 67 years old.. The sample is therefore divided into five different sectors of which the individual worked in 2009: agriculture, fishery, forest and mining (two digit Sic-code: 01-09), manufacturing (two digit Sic-code: 10-33), retail (two digit Sic-code: 45-47), private service sector (two digit Sic-code: 55-82), and public sector (two digit Sic-code: 85-93). The same municipal variables as in table 5 are included but these variables are not recorded, as they do not change from presented in table 5.

Table 6 Relationship between self-employment and the age of the individual, different sectors

Dependent variable: Binary outcome, 1=became self-employed in 2010, 0=otherwise					
	Agriculture, fishery, forest and mining	Manu- facturing	Retail	Private service sector	Public sector
Age	0.991*** (0.003)	1.029*** (0.003)	1.001 (0.002)	0.999 (0.003)	1.034*** (0.005)
Age ²	0.999** (0.001)	1.000*** (0.001)	0.999*** (0.001)	0.999*** (0.001)	1.001*** (0.001)
Dummy 50-54	0.836* (0.088)	0.746*** (0.045)	0.919* (0.044)	0.849** (0.049)	0.737*** (0.053)
Dummy 55-63	0.859* (0.074)	1.079 (0.060)	0.788*** (0.038)	0.852*** (0.045)	0.822*** (0.041)
Dummy 64-75	1.063 (0.110)	3.463*** (0.248)	1.400*** (0.128)	1.159** (0.058)	4.360*** (0.575)
Education length	1.056** (0.026)	1.059** (0.012)	1.028** (0.011)	1.035*** (0.010)	1.096*** (0.026)
Gender (1=male)	1.583*** (0.159)	2.002*** (0.110)	1.880*** (0.069)	1.876*** (0.093)	1.887*** (0.064)
Country of origin (1=Sweden)	0.971*** (0.161)	0.869*** (0.052)	1.205*** (0.062)	1.174*** (0.044)	1.108*** (0.051)
Tenure	1.051*** (0.011)	1.022*** (0.007)	1.038*** (0.005)	1.024*** (0.004)	1.005 (0.005)
Diversified experience	2.277*** (0.457)	12.846*** (1.728)	5.316*** (0.445)	5.967*** (0.386)	35.504*** (3.543)
Establishment size	0.816*** (0.015)	0.811*** (0.008)	0.768*** (0.009)	0.836*** (0.008)	1.099*** (0.016)
Establishment failure	1.425*** (0.157)	2.313*** (0.262)	1.640*** (0.106)	1.340*** (0.056)	2.126*** (0.172)
Controlling for education, occupation, industry and regional type	YES	YES	YES	YES	YES
Constant	0.081 (0.156)	0.112 (0.150)	0.084** (0.083)	0.006*** (0.004)	0.012*** (0.016)

N	51 836	552 718	481 440	814 064	993 362
Pseudo R ²	0.06	0.09	0.08	0.08	0.08

Cluster (municipality) standard errors in parenthesis to reduce the effect of heteroscedasticity, ***significant at one per cent, **significant at five per cent, *significant at ten per cent. All independent variables are from 2009. Due to multicollinearity among the age variables (continuous) and the age dummy variables, these are estimated separately. The control variables are reported for the estimation with the continuous age variables. The regressands capturing the age structure in the location is also estimated separately.

Conclusions

In this paper, the aspect of ageing and entrepreneurship has been addressed. The development in Sweden along with most other developed countries is a larger share of elder individuals. This will lead to many challenges where a smaller amount of individuals will have to carry a large cost burden of taking care of the older generations. We propose that this burden will be less heavy if older individuals are more prone to start new firms or become self-employed. In this way, older individuals contribute to the society by starting new firms and prolonging their participation in the labour force. It might also increase the overall level of employment in a region. This paper adds to the existing literature on age and entrepreneurship by focusing on individuals above the age of 50.

The empirical findings support a positive relationship between the share of elder individuals (above the age of 55 and those above the age of 64), the average age in a municipality and the share of local start-ups. The first empirical testing is at the municipal level so we cannot prove that it is older individuals that start new firms. The empirical analysis is therefore extended by using individuals as the unit of observations where the probability of becoming self-employed is tested against the age of the individual. The results confirm an inverted relationship between the age of an individual and the probability of becoming self-employed. To be above the age of 55 and 64 have also a positive effect on becoming self-employed. The age effect is strongest in the most rural municipalities.

The results indicate that individuals approaching their retirement are prone to become self-employed. To emphasize this tendency the (local) government should make it easier for these individuals by providing training and education specifically for this age cohort about being self-employed. It is reasonable that different age cohorts demand

different information and support. One option to shift the curve leftwards (in figure 1), i.e. the probability to become self-employed peak at an earlier age, is to facilitate individuals to access financial capital since this enables them to become self-employed. The individual can for example accumulate financial capital if he/she can have more capital saving with a lower tax rate. The next step is to analyse further new firm formation and the relationship with the age of the individual. The focus will be on the characteristics of the workforce in the new firms to clarify if there are more elder individuals that start/work in new firms.

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Appendix

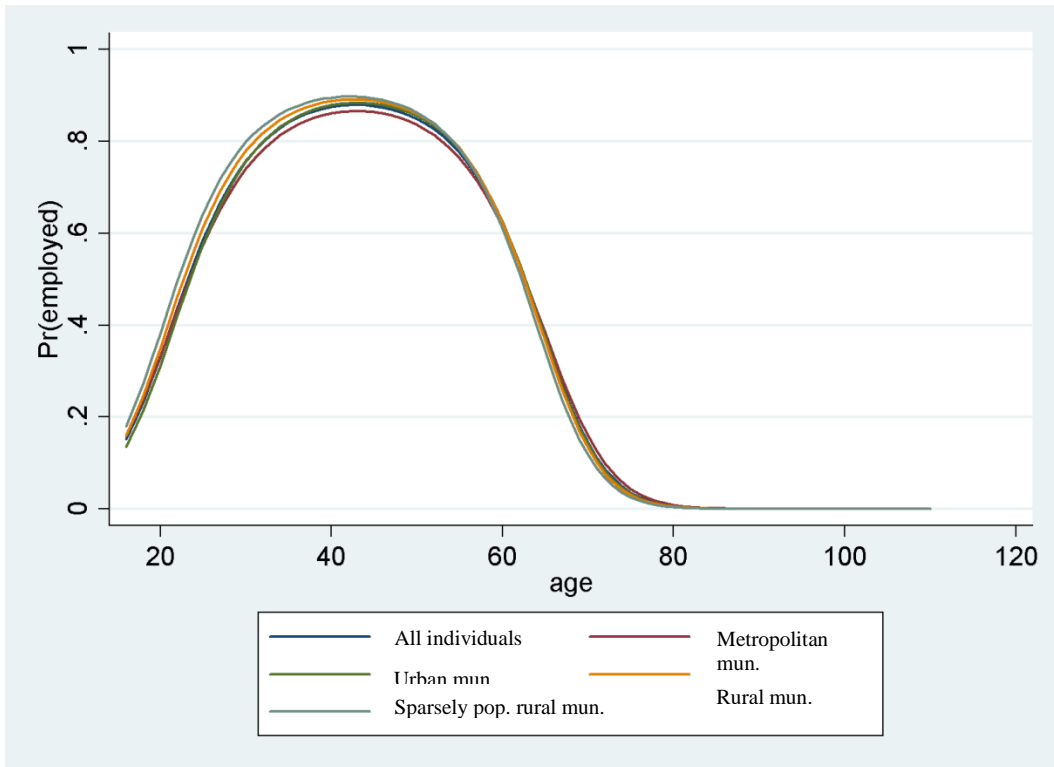


Figure A1 Predicted probability of becoming employed versus the age of the individual, for all individuals and the four regional categories.