New Firm Performance:
Does the Age of Founders Affect
Employment Creation?

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Contents

Summary

The ageing population increasingly becomes a challenge for policy makers. Given the expected changes in the age decomposition of the workforce, it becomes more pressing to understand the nature of the relationship between age and entrepreneurship. More specifically: what are the consequences of an ageing (entrepreneurial) population on entrepreneurial performance?

The present study investigates the effect of the age of the entrepreneur at start-up on the size of newly started firms, taking into account possible mediating effects. A distinction is made between two decisions: (1) to become an employer, and (2) to hire a certain number of employees. We use a sample of 849 new firms from three different cohorts (1998, 1999, 2000) that survived the first three years after start-up. To explain the decision to become employer we estimate a probit model and to test for the number of employees we estimate a negative binomial count model.

A first conclusion of our study is that it is important to make the distinction between the two decisions: the decision of entrepreneurs whether or not to become an employer depends on other factors than the decision of employers regarding the number of employees. A second conclusion is that age has a negative relationship with the outcome of both decisions, but that these relationships are completely mediated by the mediating variables included in our study. We find that entrepreneurs who start at older age are less likely to work fulltime in their new venture, are less willing to take risks and have a lower perception of their entrepreneurial skills. Each of these factors has, in turn, a positive impact on the probability of employing personnel. For the number of employees we find a negative indirect effect of age through the effect of age on the perception of entrepreneurial skills.

Assuming that, with the ageing workforce, the share of older people starting up their own business increases, the findings of our study suggest that an ageing population is expected to negatively affect employment creation by newly started enterprises. Not only does the age of the entrepreneur at start-up indirectly lower the probability to become an employer, it also appears to reduce the number of employees hired three years after start-up. Additional research into the relationship between age and entrepreneurship (e.g. in different countries) and into the macro-economic effects of this development is needed.

1   Introduction

Entrepreneurship may be affected by the ageing of the population
The ageing population becomes an important challenge for society. Possible consequences of the ageing population for, e.g., public health systems and the sustainability of national pension systems, are already heavily debated. Less attention has been given to the consequences the ageing population may have for entrepreneurship[1]. An increasing share of older individuals in the population is likely to affect the number of newly created enterprises as well as the performance of established firms. For example, using data from the Global Entrepreneurship Monitor, Verheul and Van Stel (2010) show that people in the age category between 25 and 34 years old are more likely to be involved in starting a business than older individuals. A similar age pattern can be found for business ownership: for the Netherlands, Van Es and Van Vuuren (2010) report that the levels of business ownership are highest in the age group 25 - 44. In terms of the performance of established entrepreneurs, Henley (2005) finds that middle-aged entrepreneurs (with a peak at 48 years) are most successful in creating employment. These findings suggest that the ageing population may have a negative effect on a country's start-up and employment rate.

Given the expected changes in the age composition of the workforce, it becomes increasingly relevant to understand the nature of the relationship between age and entrepreneurship. Despite recent attention for the topic (Lévesque and Minniti, 2006; Kautonen, 2008; Zissimopoulos and Karoly, 2007), our current understanding of the role of age in entrepreneurial activity is still too fragmented to draw any definite conclusions and provide policy makers with appropriate guidelines for action. Furthermore, existing studies on the relationship between age and entrepreneurship have focused mainly on the question to what extent age explains entry into self-employment (Curran and Blackburn, 2001; Zissimopoulos and Karoly, 2007; Karoly and Zissimopoulos, 2004; Singh and DeNoble, 2003). Few studies have related age of the entrepreneur to employment creation and other measures of entrepreneurial performance. The studies that investigate the relationship between age and employment creation (Henley, 2005; Schutjens and Wever, 2000; Bosma et al., 2004; Cowling et al., 2004; Stam et al., 2008) often include age as a control variable and refrain from discussing the implications of their findings related to age within the context of the ageing population. In addition, these studies have reported diverse findings. This ambiguity in results may be attributed to the fact that researchers include different sets of independent variables in their analyses, which will affect the reported 'direct' relationship between age and entrepreneurship.

In fact, any relationship between age (at start-up) and entrepreneurship is likely to be an indirect one, where age affects founder's characteristics such as health status, availability of financial capital, relevant experience, start-up motives and goals. These characteristics may, in turn, affect the decision to become an employer and hire employees; they act as mediators in the relationship between

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[1] This paper assumes an occupational notion of entrepreneurship, using business ownership as measure of entrepreneurship.

age and entrepreneurship variables. None of the studies that we identified so far, however, discusses the possibility of mediating effects.

Entrepreneurial age and employment creation: controlling for mediation

We assume that the effect of an entrepreneur's age at start-up on entrepreneurial activity is mediated by various characteristics of the founder. In this study, we examine several possible mediating effects. This is an important contribution to the scarce literature on the relationship between an entrepreneur's age and entrepreneurial performance.

From a policy perspective it is important to gain insight into mediating effects because, whereas the age of the entrepreneur as such is not something that can be (easily) influenced, policy makers may be able to manipulate possible mediating factors in the relationship between age and entrepreneurship. For example, if it is found that older entrepreneurs have a lower growth ambition than younger entrepreneurs, the origin of this lower ambition may be further investigated and targeted by specific measures.

The entrepreneur's decision regarding the number of employees

Many entrepreneurs make a conscious decision not to hire any employees. Instead, they remain solo self-employed[1]. We therefore distinguish between two different decisions with which an entrepreneur who wishes to expand is faced: (1) the employer-decision: the decision to switch from being solo self-employed to an employer who hires one or more employee(s) and, conditional upon the first, (2) the employee-decision: the decision to hire a certain number of employees.

Most studies investigate only one of these decisions. Carroll et al. (2000), Cowling et al. (2004) and Millan (2008), for example, investigate the decision to become an employer, while Burke et al. (2002) and van Praag and Cramer (2001) investigate the decision to hire a certain number of employees. Henley (2005) investigates both decisions, but he does so within a single framework, estimating an ordered probit regression. In this study, we investigate both decisions separately from each other. Within the context of the first decision, we compare entrepreneurs with and without employees, and for the second, we compare employers with a lower or higher number of employees. To our knowledge, this has not been done before. As a benchmark, we will also estimate a model that does not distinguish between the two decisions and that doesn't account for mediating effects.

A focus on employment creation after three years

For some entrepreneurs it takes several years before they hire their first employee. Nevertheless, Brummelkamp et al. (2009) illustrate that this decision is usually taken within a few years after the start of the enterprise: they find that more than 70% of all Dutch enterprises that hired their first employee in 2004 existed for no more than three years. In studying the relationship between a

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[1] Solo self-employed are also known as own-account workers or business owners without personnel.

founder's age and entrepreneurial performance, we focus on enterprises that survive the first three years, and examine the extent to which the age of an entrepreneur at start-up affects employment creation in the firm after three years.

The remainder of this study is structured as follows. In the next chapter we discuss relevant findings from previous research and present the theoretical framework for our study. Subsequently, we discuss the research methodology and available data in chapter three. The results are presented in chapter four. First bivariate analyses are presented regarding the age of the entrepreneur, firm size and the mediators that are included in this study. Section 4.2 presents the results from the benchmark model. The next two sections discuss the results of the models on the two individual decisions of the entrepreneur. In the final section of chapter four we compare the results of the benchmark model with the results of the models regarding the employer-decision and the employee-decision. The main results are summarized in chapter five.

2 The role of age in the decision process of entrepreneurial individuals

2.1 Entrepreneurship rates

Business ownership rates vary considerably between countries. For 2007, business ownership rates in OECD countries (as percentage of the labour force) ranged from approximately 6% (Luxembourg and Switzerland) to approximately 20% (Greece and Italy) (Wennekers et al, 2009, table 3). The share of business owners who are solo self-employed also shows considerable differences across countries. For example, in 1997 solo self-employed accounted for less than 50% of all business owners in Austria, Denmark and Germany, while they accounted for 80% or more in Mexico, Belgium and Hungary[1] (OECD, 2000, table 5.4).

These figures are the result of a remarkable change in the development of entrepreneurship that occurred approximately thirty years ago: after a long period of declining business ownership rates in (almost) all developed countries, since 1980 many of these countries witnessed a reversal of this trend and reported an annual growth rate of the number of business owners that exceeded the annual growth rate of the labour force[2].

The OECD statistics also show that, for most of the countries on which data is available, the share of solo self-employed (as a share of all business owners) increased over time. Wennekers et al. (2009) hypothesise that the recent 'global' increase in entrepreneurship rates is to a considerable degree caused by an increase in the share of solo self-employed (Wennekers et al, 2009).

2.2 The occupational decision

A basic assumption in entrepreneurship research is that individuals make their occupational decision on the basis of expected utility of the available (selected) alternatives (Carroll et al., 200; Parker, 2006; Van Praag and Cramer, 2001). Cowling et al. (2004) present a formal model where a risk-neutral individual is faced with the choice between three labour market positions: paid employment, solo self-employment or job-creating self-employment. This model assumes a single simultaneous decision-making process, where the individual decides whether or not to become entrepreneur and, if so, how many employees should be hired.

Others, however, point out that many individuals do not possess the necessary cognitive abilities required to determine their labour market position within the context of one single conscious decision. Instead, they assume a hierarchical decision tree where the decision process is split up into several different decisions (Singh and DeNoble, 2003).

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[1] For the Netherlands, the corresponding figure is 63%.

[2] For a sample of 23 OECD countries, Wennekers et al. (2009) illustrate that during the period 1972 - 2007, the annual growth rate of the number of business owners exceeded the annual growth rate of the labour force (1.38% versus 1.15%).

For this study, we assume that the following separate, although related, decisions can be distinguished: (1) the decision to become self-employed; (2) (for entrepreneurs only) the decision to become an employer, and (3) (for employers only) the decision to hire a certain number of employees. We focus on the latter two decisions, related to employment creation. These two decisions are treated as separate decisions, because they have a different point of departure. The decision to become an employer requires the solo entrepreneur to give up his or her, often highly valued, independence in order to become a manager (even if this would only involve a little amount of time). The point of departure for the third decision is an entrepreneur who already decided to accept a managerial role, and then has to decide how many employees to hire.

2.3 Age as determinant of self-employment

Many studies have explored the determinants of self-employment. These studies show that the decision to become an entrepreneur is influenced by a combination of environmental factors (e.g., sector, region, business cycle) and individual characteristics. Individual characteristics that have been taken into account in previous research include previous labour market status, risk attitude, attitudes towards entrepreneurship, human and social capital, available financial capital, health status and demographic factors such as gender, ethnic background, household composition and age (Bates, 1995; Beugelsdijk and Noorderhaven, 2005; Davidsson and Honig, 2003; Dunn and Holtz-Eakin, 2000; Hout and Rosen, 2000; Thurik et al., 2008).

Age of the entrepreneur may affect entrepreneurship indirectly through its relationship with other determinants of self-employment. In this case the age effect is mediated by the other determinants. Various potential mediators have been included in previous research, such as human capital (Carroll et al., 2000; Millan, 2008; van Praag and Cramer, 2001), social capital (Millan, 2008), risk attitude (Holtz-Eakin et al., 1994), financial capital (Millan, 2008) and health status (Weber and Schaper, 2003). However, these studies do not systematically examine or discuss the relationship between age and potential mediators.

With respect to the direct relationship between age and self-employment, findings are ambiguous. Some report a negative relationship (Delmar and Davidsson, 2000), some a positive relationship (Borjas and Bronars, 1989; Lin et al., 2000), whereas others find a nonlinear one (Georgellis et al., 2005; Rees and Shah, 1986). For example, using a European sample, Millan (2008) finds an inverse u-shaped relationship with age: both the probability of entering self-employment from paid work and of entering self-employment from unemployment first increase with age, and then decrease after the age of about 35 years old. Based on a literature review, Bönte et al. find that "most empirical studies suggest a positive - usually an inverse u-shaped - relationship between an individual's age and the individual's decision to start a business" (Bönte et al., 2007, p. 2).

In this study, we assume that any relationship between age and entrepreneurship is likely to be an indirect one. Given this assumption, if a direct effect is found, this merely indicates that relevant mediators are missing from the model. The ambiguity of previous findings might then be explained by differences in the independent variables that are included in these studies.

2.4 Age as determinant of the choice to become employer

Only a few studies investigated the extent to which age determines the entrepreneur's choice to become an employer. These studies generally include similar independent variables as the studies examining the determinants of the decision to become self-employed. For example, Cowling et al. (2004) investigate determinants of self-employment and employership and use the same set of explanatory variables in both equations.

In terms of the relationship with age, different studies in this field have reached different conclusions. For example, estimating a probit regression to explain whether or not a sole proprietor hired any employees, Caroll et al. (2000) find that age has a negative relationship with the decision to hire employees. Next to age, they include the following independent variables: industry dummies, marital status and number of dependents (children, parents, others). Cowling et al. (2004) also examine the choice of an entrepreneur to become employer and find that the relationship with age is different for women and men. For male entrepreneurs, they find an inverse u-shaped effect, where the probability of being an employer is highest at the age of 41 (after which it declines). For female entrepreneurs, they do not find a significant relationship with age. Finally, Millan (2008) shows that the transition from own-account worker to employer does not (directly) depend on age of the entrepreneur, but he finds a u-shaped effect of years of experience, reaching a minimum at approximately 10 years of experience. This suggests that there may be an indirect effect of age, through experience, on employership.

2.5 Age as determinant of employment

Although many authors have examined determinants of firm size, this is usually done from the perspective of a profit-maximizing firm rather than that of a utility-maximizing individual (the entrepreneur). The main difference between these two perspectives is that a utility-maximizing entrepreneur will take into account the disutility associated with performing certain tasks (e.g., the coordinating tasks involved with managing employees), whereas this is irrelevant in models on profit-maximizing firms. Two exceptions are the studies by Van Praag and Cramer (2001) and Burke et al. (2002). Both studies explicitly focus on the labour demand of entrepreneurs, and include several individual-level determinants, such as entrepreneurial abilities and start-up motivation. Neither of these two studies includes age of the entrepreneur as an explanatory variable.

Studies that include age as an explanatory variable tend to find a negative or inverse U-shaped relationship between age of the entrepreneur and the level of employment. Henley (2005) finds an inverse U-shaped relationship between the entrepreneur's age and the number of employees, with the peak at 47.8 years old: "Ceteris paribus the most successful job creators appear to be in middle age" (Henley, 2005, p. 190). Similarly, Storey (1994, p. 146) finds evidence for an inverse U-shaped relationship between the founder's age and employment after seven years, arguing that it is "neither the very young nor the very old founders which are more likely to establish new firms which will grow". The support for this claim is, however, relatively weak: the relevant parameters are statistically significant at a 10% confidence level rather than 5%. This common finding may relate to the lower need of older individuals to earn additional income because, generally, the costs of living (i.e., support burden, mortgage or interest

on housing) decrease with age (Davidsson, 1991). These costs may also be relatively low for young people, becoming substantial in the 'middle-age' category. This would support the inverse U-shaped relationship between age and employment that is sometimes found. Furthermore, the lower need of individuals to earn additional income is consistent with the lower growth ambition of older individuals as is reported in several studies (Lau and Busenitz, 2001; Autio, 2005; Terjesen and Szerb, 2008).

Employment growth

Finally, we mention some studies that examine the relationship between age and employment *growth* in young enterprises. Schutjens and Wever (2000) find no evidence for a direct effect of age of the entrepreneur on employment growth in companies younger than four years old. Using the same data set, but examining employment growth during the first ten years of existence, Stam et al. (2008) arrive at a different conclusion and report a negative direct effect of age on the likelihood of employment growth[1]. Davidsson (1991) also finds evidence for as negative effect of an entrepreneur's age on employment growth. Focusing on fast-growing firms, Brüderl and Preisendörfer (2000) find support for an inverse U-shaped relationship, where the percentage of fast growing firms is highest for founders in their middle ages (after 10-20 years of work experience).

Although employment growth is highly relevant, estimating determinants of firm growth in a sample of start-ups has the disadvantage that the (large) category of firms without growth includes solo self-employed as well as firms with employees. Employment-creating firms are thus compared with a default category that consists of two very different kinds of firms. For this study, we therefore use the level of employment as dependent variable.

2.6   The mediated effect of age on employment creation: a framework

In the literature review so far we mainly discussed direct effects of age: i.e., reported effects of age on employment creation that occur after controlling for other relevant variables. As mentioned earlier, in the present study we assume the relationships between age and employment creation to be indirect. That is, the age of entrepreneurs may have an effect on various individual characteristics, which, in turn, influence the level of employment three years after the enterprise started. We examine the possible impact of the following individual characteristics: motives & goals, competencies and social capital (Barkham, 1994). In addition, we examine whether various firm-specific factors play a role. Our framework is presented in Figure 1. The framework gives an overview of the mediating relationships we test in the present study.

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[1] Otherwise, these two studies report many similar results, including the insignificance of educational level and the positive effect of the number of employees at start-up.

Figure 1   A framework on indirect effects of founder's age on employment creation
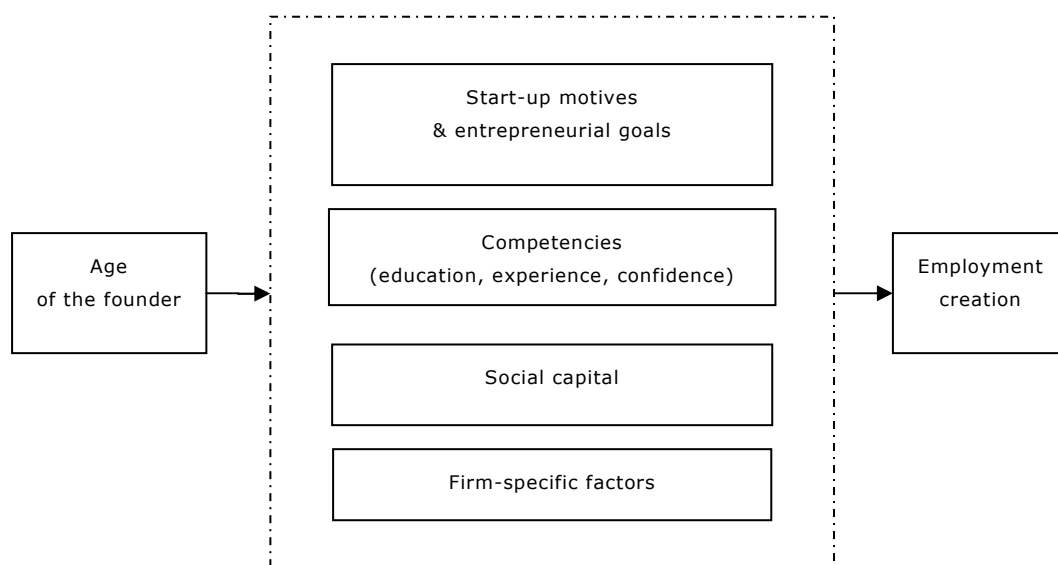
Although not presented in Figure 1, we control for gender of the entrepreneur because several studies indicate that women are less likely to run large or grow-ing firms than men (Carter et al., 1997; Cooper et al., 1994). Furthermore, we control for industry by including a set of industry dummies. Below we discuss the various elements of this framework: why and how we test for their effects on employment creation.

Employment creation

Employment creation is measured by way of two decisions: to become an em-ployer (vis-à-vis solo self-employed) and to hire a certain number of employees (measured three years after start-up). Most existing studies on job creation in entrepreneurial firms focus on firms that have been in existence for more than five years, rather than on start-ups (Storey, 1994). Only a couple of studies have investigated employment (growth) in the first three years of existence (Barkham, 1994; Schutjens and Wever, 2000).

Motives and goals

We distinguish between motivation at start-up and specific goals the entrepre-neur has set for the next two to three years, including: improving expertise, im-proving product quality, maximizing profits and/or maximizing revenues. It can be expected that high motivation and challenging goals increase the willingness of the individual to acquire the necessary (human) resources. It also enables the entrepreneur to cope with the stress related to growing the business.

Competencies

We include several measures capturing relevant competencies, including educa-tion level, industry experience, entrepreneurial experience and the degree to which work is similar to what the individual has done before (s)he started the

current enterprise (Barkham, 1994). Furthermore, we include a measure for entrepreneurial self-efficacy to capture an individual's self-confidence as an entrepreneur. Because risk-taking is such an distinct feature of entrepreneurship, we separately include a measure for the degree to which the entrepreneur believes (s)he is a risk taker. Growing a business is a risk-intensive activity which clearly distinguishes itself from running a shopkeeper-type company. Not only are educated, experienced, and entrepreneurial self-confident individuals better able to cope with the stress and complexity of a growing business, they may also have less difficulty in gaining credibility in the market, for example, with customers, suppliers, employees and investors.

Social capital

It has been argued that successful entrepreneurs are those who possess the most relevant market information (Barkham, 1994, p. 119). One way of acquiring such information (that the entrepreneur him-or herself does not yet possess) is through networking. Hence, we include a measure of social capital in the analysis to capture information gathering through contact with other entrepreneurs.

Firm-specific factors

In addition to these characteristics of individual entrepreneurs, we take into account several firm-specific factors, including whether the entrepreneur started a business from scratch or has taken over an existing enterprise, time investments (distinguishing between part-time and full-time activity), financial capital investments, and the degree of innovativeness of the business. We include the latter variable because high-tech firms are often well represented among high-growth firms and innovation appears a crucial factor in determining firm growth (Freel, 2000; Geroski, 2000).

The age of the founder

Each of the individual characteristics just described is a potential mediator in the relationship between a founder's age and employment creation. For example, entrepreneurs who start at a young age may have different goals than entrepreneurs who start at an older age. In addition, they are likely to have less relevant experience. Older founders have had more time to build up a network and are, accordingly, expected to have better access to information in networks (indicating higher levels of social capital).

Although in this study we focus on the indirect effects of a founder's age on employment creation, there could still be a remaining direct effect of a founder's age. We do not represent this direct effect in Figure 1 because we assume that, if we control for all relevant mediating factors, a negligible direct age effect remains.

3   Research methodology

3.1   An econometric model

We assume that the decision to become an employer and the decision to hire a certain number of employees are distinct choices, possibly each with a distinct set of determinants. These choices are therefore modelled separately (Figure 2). We model the first decision (to become an employer) by way of a probit regression:

$$P_i[D_{1,i}=1|X_i]=\varphi(X_i'\beta) \tag{1}$$

where P_i denotes the probability that D_1 occurs for entrepreneur i. $D_{1,i}=1$ if the solo entrepreneur decides to become an employer, and $D_{1,i}=0$ if the entrepreneur decides to operate solo without employees. X_i represents a vector of independent variables.

Figure 2   How entrepreneurs decide on the number of employees: a hierarchical decision tree
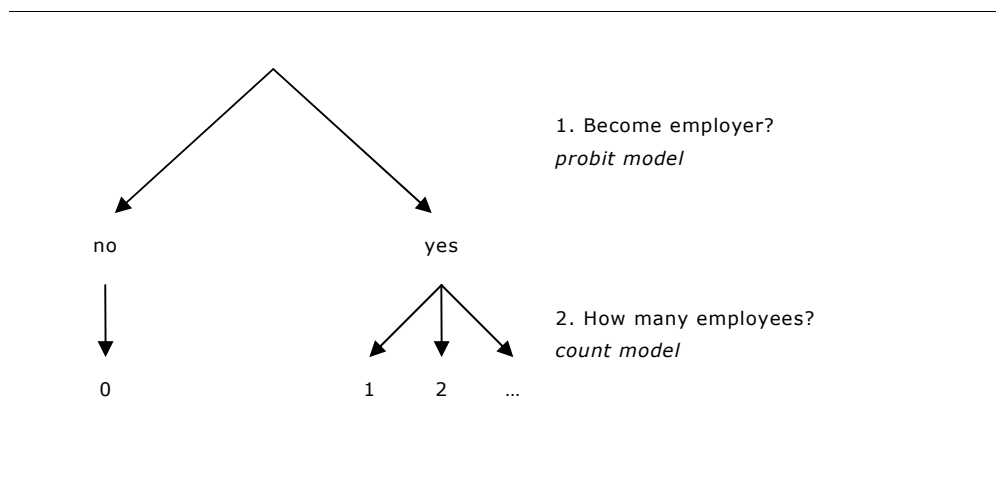
The number of employees that is actually hired can only take discrete values ($D_{2,i}=0,1,2,…$). In addition, the majority of observations in our sample concern low values (entrepreneurs employing less than 10 employees after three years). A count model is a suitable model to explain variables with these characteristics (Bönte et al., 2007). Therefore, we use a count model to explain the actual number of workers employed, for the sub-sample of entrepreneurs who have decided to hire employees.

A standard assumption is that $D_{2,i}$ follows a Poisson distribution with mean and variance equal to λ, that is: $D_{2,i} \sim$ Poisson(λ). This model assumes that the variance of $D_{2,i}$ is equal to the mean of $D_{2,i}$. In our study this would be too restrictive because we have overdispersion, i.e., the variance of $D_{2,i}$ is (much) larger than its mean. To account for this we will make use of the more general negative binomial distribution (denoted by NB2) to model the number of employees. The model is then specified as follows:

$$D_{2,i}|X_i\sim NB2(\mu_i,\alpha) \tag{2}$$

with $\mu_i = E[D_{2,i}|X_i] = \exp(X_i'\gamma)$ and α the scale parameter of the distribution. By parameterizing the expectation of the negative binomial distribution we end up with the negative binomial count model.

The vector of independent variables, X_i, can be presented as $X_i = (C_i, M_i, A_i)$, where C_i represent the control variables (gender, industry and start-up year dummies[1]), M_i the mediators, and A_i the age of the entrepreneur. To test for the existence of mediating variables in the relationship between founder's age and employment creation, we combine the protocols proposed by James and Brett (1984) and Baron and Kenny (1986). According to Baron and Kenny (1986) one can test for effects of mediating variables, M_i, by first examining the relationship between the proposed antecedent A_i (entrepreneurial age) and the dependent variables ($D_{1,i}$ & $D_{2,i}$) and, subsequently, investigating to what extent this relationship diminishes (or vanishes) if the mediating variables, M_i, are included in the model. To support the inference that M_i completely mediate the effect of age on the dependent variables ($D_{1,i}$ & $D_{2,i}$), the effect of age should be significant in models including only C_i and A_i but not in the models including C_i, A_i and M_i. James and Brett (1984) propose a test where one model includes mediators, M_i, and controls, C_i, and a second model also includes A_i. If the added value of A_i is not significantly different from zero, M_i can be seen as completely mediating the relationship between age (X_i) and employment creation ($D_{1,i}$ & $D_{2,i}$). A significant result provides support for a direct effect of age.

In this study we combine the two protocols by estimating three separate variants of the probit and count model with different explanatory variables. The variables included in each variant are: (a) C_i and A_i, (b) C_i and M_i, and (c) C_i, M_i and A_i. We assume the presence of fully mediating effects when the following requirements are met: significant effect of A_i on $D_{1,i}$ & $D_{2,i}$ in model (a); significant effect of M_i on $D_{1,i}$ & $D_{2,i}$ in model (b); and a non-significant effect of A_i on $D_{1,i}$ & $D_{2,i}$ in model (c). Likewise, we assume the presence of a direct effect in case of a significant effect of A_i on $D_{1,i}$ & $D_{2,i}$ in model (a) in combination with a significant added effect of A_i on $D_{1,i}$ & $D_{2,i}$ in model (c). To test for a significant added effect of the set of explanatory variables A_i in the model, we make use of the Likelihood Ratio (LR) test.[2]

3.2   Data and sample description

To test for age effects on the employment creation of new firms, we use data from the research institute EIM Business & Policy Research. Data are retrieved from three different cohorts of the so-called Start-Up Panel that consists of Dutch entrepreneurs who started a business in 1998, 1999 or 2000. In each of these years, 500 new entrepreneurs entered the panel. From the moment they entered the panel, the entrepreneurs were monitored annually by means of an extensive written (or later: telephone) questionnaire. Data in the panel cover various topics including personal characteristics of the entrepreneur (age, gender, education, entrepreneurial experience, start-up motivation, time investments, etc.), firm characteristics (legal form, number of owners and employees,

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[1] The dataset includes entrepreneurs that started in three different years (1998, 1999 and 2000).

[2] The LR test is based on the loss of likelihood when (implicitly) imposing parameter restrictions on a model by leaving out one or more regressors.

sector, start-up or take-over, etc.), and objectives and strategy (growth goals, R&D activities, networking, export activity, etc.). The annual results have been merged into a single database that contains annual observations for 1,626 entrepreneurs (with and without employees). Next, we selected those entrepreneurs who were still in the sample three years after start-up. This resulted in a data base with 849 observations. Dependent, age, mediating and control variables are presented in Table 2.

A large share of entrepreneurs in our data set (83 percent) is self-employed. Another 14 percent has less than 5 employees. Only about 3 percent employs five or more workers after three years (Table 1). More than 50 percent of the entrepreneurs was 30 to 45 years old when they became entrepreneur. Younger entrepreneurs are less prevalent: 16 percent of the entrepreneurs is younger than 30 years old. About a quarter of the entrepreneurial population is occupied by entrepreneurs aged 45 years or more.

On average, older entrepreneurs in our sample are highly educated: about 55 percent of the entrepreneurs aged 45 or higher has a high level of education versus an average of 41 percent for the whole sample[1]. These levels are higher than for the Dutch labour force as a whole (in 2001, 26% of the Dutch labour force had a higher educational level; 25% for the labour force below 45 years of age, 27% for the labour force of 45 years or more[2]).

Table 1   Distribution of the number of employees 3 years after start-up

Number of employees (three years after start-up)	Frequency	Percentage
None	707	83
1-4	116	14
5 or more	26	3
Total	849	100

The majority of entrepreneurs (67 percent) in our sample is male. This is consistent with findings of earlier studies. This gender effect is strongest amongst the elder entrepreneurs: 30 percent of the male entrepreneurs in our sample is 45 years or older, against 19 percent of the female entrepreneurs (Table 3**Error! Reference source not found.**). Summary statistics for the other variables are included in the annex.

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[1] A Chi-square test rejects the hypothesis that entrepreneurial age and educational level are independent of each other at a significance level of 1% level.

[2] Source: own calculations based on statistics from Statline, the on-site database from Statistics Netherlands.

Table 2   Description of variables used in analysis

Variable	Description
Employer (D_1)	Does the entrepreneur have employees? (0=solo entrepreneur; 1=employer)
Number of employees (D_2)	Number of employees in the business (excluding family members).[a]
Age at start-up	Age at start-up was measured with an ordinal scale with 10 age categories of 5 years each. For each category we take the median age, except for the first and last category. The resulting scale has a minimum of 18 and maximum of 65 years and is treated as a continuous variable.
Intrinsic	Main start-up motive is wish to be own boss or the challenge (dummy)
Push	Main start-up motive is (threat of) unemployment or dissatisfaction with wage job (dummy)
Opportunist	Main start-up motive is discovery of market opportunity or opportunity to earn higher income as self-employed as compared to paid employment (dummy)
Work-life	Main start-up motive is better possibilities to combine work and personal life or necessity due to personal circumstances (dummy)
Other motivation	Main start-up motive is availability of own financial means or it just happened (dummy)
Improve own expertise	Important entrepreneurial objective at start-up is to improve expertise (dummy)
Improve quality of products	Important entrepreneurial objective at start-up is to improve the product quality (dummy)
Maximize profits	Important entrepreneurial objective at start-up is to maximize profits (dummy)
Maximize revenues	Important entrepreneurial objective at start-up is to maximize revenues (dummy)
Education level	Dummies for education categories: (1) Low: primary school and pre-vocational secondary education, (2) Middle: general secondary education, (3) High: tertiary education and/or graduate level
Industry experience	Respondent worked in the same industry in wage-employment before (dummy)
Entrepreneurial experience	Respondent started at least one firm before this one (dummy)
Entrepreneurial self-efficacy	To what extent does the entrepreneur believe that (s)he possesses entrepreneurial competencies? (1) very weak, (2) weak, (3) strong nor weak, (4) strong, (5) very strong
Risk attitude	To what extent does the entrepreneur believe that (s)he possesses the courage to take risk? (1) very weak, (2) weak, (3) strong nor weak, (4) strong, (5) very strong.
Social capital	Entrepreneur has frequent contact with other entrepreneurs outside of the 'regular' business contacts (dummy)
Take-over	Dummy indicating a take-over (value 1) or newly started business (value 0)
Start-up capital	Three dummies indicating amount of start-up capital (own and foreign) invested in the business: (1) <10,000; (2) 10,000-100,000; (3) >100,000 in guilders[b]
Full-time	Dummy indicating that respondent works at least 40 hours per week
Innovativeness	Dummy indicating that a large share of products and services are based on techniques that were not applied three years ago
Male	Dummy indicating gender of the respondent (0=female, 1=male)
Industry	8 Industry dummies (to control for 9 sampled sectors)
Start-up year	2 year dummies (to control for the 3 years in which the sampled entrepreneurs started their enterprise)

a) although the written questionnaire explicitly asked to report the number of full-time equivalents, the results suggest that entrepreneurs reported the number of employees instead: more than 99% of the answers were integers or natural numbers, which is not consistent with the large share of employees working part-time in the Netherlands.

b) in 1998 - 2000, one guilder had an average value of 0.47 US Dollar.

Table 3   Age at start-up by gender (N=839)

Entrepreneurial gender	Entrepreneurial age		
	Younger than 30 years	*30-44 years*	*45 years or older*
Male	17%	52%	30%
Female	14%	67%	19%
Overall	16%	57%	27%

Table 3   Age at start-up by gender (N=839)

Female	14%	67%

4 Results

4.1 Bivariate analysis

As a first test of the relationship between age of the founder and the number of employees, Table 4 presents the two variables in a single table. We see that 91 percent of the entrepreneurs aged 45 and older do not have any employees, which is more than the sample average of 83 percent, and the rates for entrepreneurs in the age classes: 'younger than 30 years' and '30-44 years'. Older entrepreneurs are less likely to become employers compared to the entrepreneurs in the other age categories.

Table 4   Firm size by age of entrepreneur at start-up (in percentages), N=839

Number of employees (three years after start-up)	< 30 years	30-44 years	> 44 years	Total sample
None	80	81	91	83
1-4	18	15	8	14
5 or more	2	4	2	3
Total	100	100	100	100

The hypothesis that age category and firm size category are independent of each other is rejected by a chi-square: the Chi-Square test statistic equals 13.098. Having 4 degrees of freedom, the hull hypothesis of independence is rejected at a 1% level.

To see how the number of employees is divided over the different industries included in our sample, Table 5 shows the number of employees per sector. We see that in the majority of sectors more than 70% of the entrepreneurs are self-employed without employees. A smaller share of solo self-employed individuals is present in the sectors: hotels and restaurants; manufacturing; and transport, indicating that it is more difficult to act as a sole trader in these sectors.

Table 5   Firm size per sector (in percentages), N=837

	Number of employees (three years after start-up)			
Sector	None	1-4	5 or more	total
Manufacturing	62	29	10	100
Construction	89	10	1	100
Wholesale	83	17	0	100
Retail	80	18	2	100
Hotels and restaurants	67	29	5	100
Motor vehicles	72	28	0	100
Transport	63	21	16	100
Business and financial services	84	12	4	100
Other services	88	10	2	100

A variable can only mediate between the founders' age and firm size, if it is significantly correlated with both of these variables. Table 6 presents the Spearman rank correlation coefficients for the relationships between founder's age and firm size with each of the other variables. The following seven variables meet this necessary requirements for mediating variables: the objectives of maximizing profits and revenues, education level, entrepreneurial self-efficacy, risk attitude, take-over, and working fulltime in the business.

Table 6   Correlations of variables with founder's age and firm size

Variable	Age	Firm size
Push motive	0.113***	-0.029
Opportunist motive	-0.062*	0.038
Intrinsic motive	-0.05	0.052
Work life motive	-0.028	-0.074**
Improve expertise	-0.046	-0.062*
Improve product quality	0.034	0.032
Max. profits	-0.112***	0.108***
Max. revenues	-0.062*	0.162***
Education level	0.169***	-0.076**
Industry experience	-0.037	0.055
Entrepreneurial experience	0.109***	0.042
Entrepreneurial self-efficacy	-0.097***	0.229***
Risk attitude	-0.085**	0.181***
Social capital	0.004	0.075**
Take-over	-0.072**	0.103***
Start-up capital	0.01	0.277***
Full-time	-0.183***	0.277***
Innovativeness	-0.005	0.041

*, **, *** *indicate significance at 10, 5 and 1 percent level, respectively.*

4.2   The benchmark model: explaining the number of employees for all recently started entrepreneurs

To provide a benchmark for our own results, we start by estimating a model that does not differentiate between the employer-decision and the employee-decision. Such a model assumes that the choice between hiring zero or one employees depends on the same factors as the choice between hiring 24 or 25 employees. Age is included as a possible determinant, but we do not examine for the presence of mediating effects. For reasons explained in section 3.1, we use a count model to estimate this model. The results are presented in table 7.

Table 7   Parameter Estimates of Count Models Explaining Number of Employees (including zero employees)

Parameters	Benchmark Model 1	
	Coefficient	S.E.
Intercept	-7.236***	2.41
Age at start-up	0.140	0.11
(Age at start-up squared)/100	-0.246*	0.14
Male	-0.248	0.27
START-UP MOTIVES		
Intrinsic (base)		
Push	0.338	0.32
Opportunist	0.105	0.45
Work-life	-0.929**	0.43
Other motivation	0.491	0.57
OBJECTIVES		
Improve own expertise	-0.681**	0.31
Improve product quality	0.639**	0.27
Maximize profits	-0.31	0.27
Maximize revenue	0.704**	0.28
COMPETENCES		
Educational level		
Low (base)		
Medium	0.382	0.33
High	-0.019	0.35
Industry experience	0.127	0.29
Entrepreneurial experience	0.142	0.44
Entrepreneurial self-efficacy	0.867***	0.20
Risk attitude	0.094	0.20
SOCIAL CAPITAL	0.070	0.32
FIRM-SPECIFIC FACTORS		
Take-over	0.063	0.44
Start-up capital		
Less than 10,000		
10,000 - 100,000	1.130***	0.30
More than 100,000	2.288***	0.44
Full-time	1.494***	0.31
Innovativeness	0.401	0.31
Pseudo R-squared	0.14	
Log-likelihood	-542.59	
Effective sample (N)	801	

*, **, *** indicate significance at 10, 5 and 1 percent level, respectively.

Industry dummies and start-up year dummies are included but not reported.

We find weak support for the presence of a direct age effect: the negative parameter for age squared is significant at the 10% confidence level. The estimated parameters suggest an inverse u-shaped effect, peaking at an age of approximately 28 years. This result is similar to the results reported by Henley

(2005) and Storey (1994), although our results indicate a peak at a younger age.

The results from table 7 indicate that the strongest relationship is found for the availability of start-up capital and working full-time. It is not clear, however, to which extent these relationships describe causal effects on the size of the firm three years after start-up. These results could also indicate a spurious relationship, where for example entrepreneurs with the objective to maximize revenues not only decide to hire relatively many employees, but also to work full-time and obtain as much foreign capital[1] as possible.

The results also show significant relationships between the objectives and start-up motives of the entrepreneurs and firm size. These relationships are more likely to indicate causal relationships than the relationships for start-up capital and working full-time. In particular, firm size tends to be the highest for the entrepreneurs with the objectives of maximising revenues or improving quality. The objective of improving ones own expertise is associated with the smallest firms. Firm size is also related to the motives for becoming an entrepreneur. Firm size tends to be smallest for those who became entrepreneur to increase their possibilities to combine work and private life (or who were forced due to personal circumstances). Remarkably, we find no difference in firm size between entrepreneurs who were intrinsically motivated to become an entrepreneur, those who started for opportunistic reasons and those who were pushed into employment.

Finally, we find only limited effects of competences on firm size. Educational level and experience do not seem to be related to firm size. What does matter, is the level of entrepreneurial self-efficacy. The direction of the causality is, however, not clear: although entrepreneurs with low levels of entrepreneurial self-efficacy may be less inclined to actually pursue a growth strategy, it may also be the case that achieving growth (or a certain firm size) increases the levels of entrepreneurial self-efficacy.

In the following two sections, we will examine whether the choice between hiring zero or one employees indeed depends on the same factors as the choice between hiring 24 or 25 employees. To this end, we separate the employer-decision from the employee-decision and estimate three models for each decision. This allows us to test whether the potential mediating variables indeed act as mediators.

4.3   Becoming an employer

Table 8 shows the parameter estimates for the probit models. In the first model we only include age, gender and dummies controlling for industry and start-up year. In this model we see a direct negative effect of age on the propensity that an entrepreneur hires employees. The non-linear nature of this effect suggests that the negative age effect becomes stronger if entrepreneurs are older. With respect to the possible mediating variables, the results in models 2 and 3 show that highly educated individuals are less likely to hire employees. This finding might be interpreted as a sign that highly educated individuals are less ambitious

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[1] Foreign capital is part of our measure for start-up capital.

in terms of becoming an employer. This would be inconsistent with the majority of studies that find positive relationships between educational level[1] and entrepreneurship (Donselaar et al., 2007, chapter 4).

However, an important difference between these existing studies and ours is that they tend to compare wage-employment to self-employment, without distinguishing between solo self-employment and self-employed with employees (employership). Our study only includes business owners and compares solo self-employed with employers. This suggests another interpretation of our finding, one that is consistent with existing research: highly educated people tend to favour solo self-employment over wage-employment (rather than over employership). Formulated differently: high education levels are not associated with relatively low levels of employership (as percentage of the labour force), but with relatively low levels of wage-employment and relatively high levels of solo self-employment.

Wennekers et al. (2009) argue that solo self-employment is a diverse category, including solo entrepreneurs with an ambition to grow, 'quasi self-employed' still working for their previous employer, independent handyman, craftsmen and freelance professionals. The negative relationship between education level and employership might be due to the fact that relatively many highly educated individuals favour a position as freelance professional over wage-employment.

Entrepreneurial self-efficacy is positively related to the decision to employ workers. Hence, the more an entrepreneur believe that (s)he possesses entrepreneurial competencies, the higher the likelihood that (s)he decides to expand and hire employees. Risk attitude also positively relates to the decision to become an employer: risk tolerant entrepreneurs are more likely to become employers.

Entrepreneurs who are motivated to start a business because they want to have a better work-life balance and/or have the objective to improve their own expertise are less likely to become employer. When an entrepreneur hires employees (s)he has to devote part of the available time to coordinating tasks and managing employees. Hence, there will be less time left for the entrepreneur to be at home, or gain more expertise in his or her field. Finally, working more hours in the business and investing more money both are positively related to the decision to become an employer.

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[1] In particular regarding the difference between individuals with medium and high education levels.

Table 8   Parameter Estimates of Probit Models Explaining Employer

| | Probit Model 1 | | Probit Model 2 | | Probit Model 3 | |
| | age and controls | | controls and mediators | | age, controls & mediators | |
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	-1.438	0.95	-2.492***	0.58	-2.847**	1.19
Age at start-up	0.067	0.05			0.042	0.05
(Age at start-up squared)/100	-0.119**	0.06			-0.077	0.07
Male	0.183	0.12	-0.22	0.14	-0.204	0.15
START-UP MOTIVES						
Intrinsic (base)						
Push			-0.165	0.17	-0.127	0.17
Opportunist			0.107	0.23	0.072	0.23
Work-life			-0.41*	0.22	-0.408*	0.22
Other motivation			0.333	0.25	0.352	0.26
OBJECTIVES						
Improve own expertise			-0.4***	0.15	-0.41***	0.15
Improve product quality			0.18	0.14	0.183	0.14
Maximize profits			0.013	0.14	-0.014	0.14
Maximize revenue			0.228	0.14	0.206	0.14
COMPETENCES						
Educational level						
Low (base)						
Medium			-0.202	0.16	-0.201	0.16
High			-0.522***	0.18	-0.481***	0.19
Industry experience			-0.002	0.15	-0.03	0.15
Entrepreneurial experience			-0.047	0.23	0.011	0.23
Entrepreneurial self-efficacy			0.317***	0.10	0.301***	0.10
Risk attitude			0.169*	0.10	0.166*	0.10
SOCIAL CAPITAL			0.103	0.16	0.09	0.16
FIRM-SPECIFIC FACTORS						
Take-over			0.01	0.23	0.021	0.23
Start-up capital						
Less than 10,000						
10,000 - 100,000			0.393***	0.15	0.441***	0.15
More than 100,000			1.257***	0.22	1.311***	0.22
Full-time			0.862***	0.15	0.792***	0.16
Innovativeness			0.139	0.16	0.146	0.16
Pseudo R-squared	0.06		0.25		0.26	
Log-likelihood	-337.43		-268.58		-265.59	
Effective sample (N)	801		801		801	
LR statistic (age effect)					5.98*	

*, **, *** indicate significance at 10, 5 and 1 percent level, respectively. ª Industry dummies
and start-up year dummies are included but not reported.

When the mediators are included (model 3), we see that the age effect disap-
pears, providing evidence that the effect of age on becoming an employer is me-

diated by (at least some of) the individual characteristics included in our model. Age is mediated by the following variables: entrepreneurial self-efficacy, high level of education, risk attitude, and fulltime commitment in the business. More specifically, because older entrepreneurs are characterized by a lower level of entrepreneurial self-efficacy, are more likely to be higher educated, are more risk-averse and spend less time in the business, they are less likely to become employer.

4.4 Employers hiring employees

To identify the determinants of the number of employees, we estimate three Negative Binomial Count Models using the same set-up as that of the probit models. We only take into account entrepreneurs that have at least one employee such that the sample consists of only employers. The results are presented in Table 9.

The first count model only includes age, gender and dummies controlling for industry and start-up year. In this model we see a highly significant non-linear age effect. More specifically, there is a reversed U-shaped relationship between age of the founder and the number of employees. The estimated parameters indicate that employers who started their enterprise in their thirties employ the most workers after three years. The maximum is obtained at a start-up age of approximately 35 years. After that, the number of employees decreases with age.

While the decision to become an employer is negatively influenced by a high level of education (see Table 8), the results in Table 9 (in models 2 and 3) show that the number of employees is hardly affected by the education level of the entrepreneur. We nevertheless notice that the estimated parameters for the medium and high educational levels are positive and very similar. This suggests that if there is an effect of education level, it will most likely be a positive effect of having at least a medium education level as compared to only a lower educational level.

Just as in the probit regression explaining the decision to become employer, we see that entrepreneurial self-efficacy is also important in explaining the number of employees. A high level of confidence in the own entrepreneurial competences contributes to a firm's level of employment.

In contrast with the results in the probit regressions, in the count regressions we see that the entrepreneurial objective of improving the own expertise is not important for the number of employees hired. However, we see that starting a business because of a push factor (i.e., unemployment or dissatisfaction with wage job) instead of an intrinsic motivation is positively related to the number of employees. One could argue that once you employ more people in the company, this hinders the entrepreneurs in working independently. Entrepreneurs who are pushed into self-employment and already employ people are not confronted with this trade-off.

Table 9   Parameter Estimates of Count Models Explaining Number of Employees (excluding zero employees)

| | Count Model 1 | | Count Model 2 | | Count Model 3 | |
| | age and controls | | controls and mediators | | age, controls & mediators | |
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	-4.148*	2.38	-2.408*	1.37	-4.495	2.93
Age at start-up	0.345***	0.13			0.188	0.14
(Age at start-up squared)/100	-0.484***	0.17			-0.29	0.19
Male	-0.056	0.32	-0.261	0.32	-0.197	0.32
START-UP MOTIVES						
Intrinsic (base)						
Push			1.147***	0.39	0.973**	0.40
Opportunist			-0.034	0.53	0.003	0.54
Work-life			-0.513	0.57	-0.573	0.57
Other motivation			-0.809	0.70	-0.763	0.72
OBJECTIVES						
Improve own expertise			-0.596*	0.36	-0.574	0.36
Improve product quality			0.406	0.32	0.411	0.33
Maximize profits			-0.475	0.33	-0.52	0.33
Maximize revenue			0.491	0.36	0.493	0.36
COMPETENCES						
Educational level						
Low (base)						
Medium			0.605	0.39	0.729*	0.40
High			0.643	0.41	0.664	0.40
Industry experience			0.47	0.32	0.425	0.33
Entrepreneurial experience			0.873*	0.52	0.726	0.52
Entrepreneurial self-efficacy			0.509**	0.24	0.509**	0.24
Risk attitude			-0.155	0.24	-0.141	0.24
SOCIAL CAPITAL			-0.076	0.37	-0.08	0.36
FIRM-SPECIFIC FACTORS						
Take-over			-0.396	0.45	-0.175	0.47
Start-up capital						
Less than 10,000						
10,000 - 100,000			0.396	0.38	0.486	0.42
More than 100,000			0.49	0.46	0.428	0.52
Full-time			0.144	0.45	0.123	0.46
Innovativeness			0.751**	0.38	0.602	0.39
Pseudo R-squared	0.06		0.11		0.12	
Log-likelihood	-259.70		-245.01		-243.17	
Effective sample (N)	133		133		133	
LR statistic (age effect)					3.68	

*, **, *** indicate significance at 10, 5 and 1 percent level, respectively. Industry dummies and start-up year dummies are included but not reported.

Innovative firms[1] tend to have more employees than firms that are not considered to be innovative. This effect is, however, only significant in count model 2. Once age is introduced (count model 3), the relationship between innovativeness and number of employees is no longer significant.

In terms of mediation effects, we see that - when including age next to the controls and mediators (in model 3) - age no longer has a significant effect on the number of employees (as was the case in model 1). In addition, the Likelihood Ratio statistic is insignificant, indicating that age does not contribute to the explanation of employment in model 3. In other words, the effect of age on the number of employees is completely mediated. Furthermore, the results identify only one mediating variable: entrepreneurial self-efficacy. Older entrepreneurs are less confident of their own entrepreneurial skills, thereby negatively affecting the number of employees hired[2]. It may be that with age, entrepreneurs become more realistic about what they can and can not do, and this also applies to a complex activity such as starting up and running a young business.

4.5 A comparison with the benchmark model

The role of the mediators

According to the benchmark model, newly started entrepreneurs are likely to employ relatively many employees three years after their start-up, if their motive to become entrepreneur is something other than improving on the work-life balance, if their objective is to improve quality and/or maximise revenues (and not to improve their own experience) and if they have high levels of entrepreneurial self-efficacy. High employment levels are furthermore associated with availability of start-up capital and working full-time.

Only one of these variables seems to affect both the employer-decision (the decision of entrepreneurs to become employer) and the employee-decision (the decision of employers on the number of employees to hire): entrepreneurial self-efficacy. For the other significant variables from the benchmark model, we only find a significant effect on the employer-decision. These results are consistent with our assumption that the employer-decision and the employee-decision are influenced by different factors.

The results of the benchmark model do not support the assumption that employment creation is dependent on the educational level of the entrepreneur. This lack of impact of educational level is also reported by Schutjens and Weever (2000) and Stam et al. (2008). A possible explanation is that the educational level has different effects on the employer- and employee-decisions. Some support for this explanation can be found in the results for the employer-decision and employee-decision models: highly educated entrepreneurs are less likely to become employer than entrepreneurs with a low educational level (probit models 2 and 3), but within the sample of employers they are more likely to hire many

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[1] Innovative firms are defined as firms with a high share of products that are based on techniques that were not applied three years ago.

[2] Again, there may be reversed causality here (see footnote 7).

employees (count models 2 and 3; the positive parameters are however not significant).[1]

Direct and indirect age effects

The benchmark model finds weak support for the effect of age on firm size for newly started entrepreneurs. The effect that we find is negative, suggesting the older the starting entrepreneur, the smaller the firm will be three years later. However, the support is only weak, and neither the model on the employer-decision (probit model 3) nor the model on the employee-decision (count model 3) supports the presence of a direct age effect.

These results seem to differ from previous studies on determinants of firm size that include age as one of the determinants. Previous studies generally find a negative or an inverse u-shaped relationship between entrepreneurial age and the level of employment. An important difference with our own study is the mediating variables that are included in our study. If we include only age and control variables in our models (see probit model 1 and count model 1), we find a inverse u-shaped effects for the count model explaining the number of employees hired by employers. The parameter estimates suggest that the maximum is obtained for entrepreneurs starting at approximately 35 years of age. These results are similar to those of Henley (2005) and Storey (1994). However, once we introduce mediating variables related to entrepreneurial characteristics and firm-specific factors, we no longer find significant direct age effects in our models on the employer- and employee decision. The models on the employer-decision and employee-decision indicate the presence of indirect age effects, especially regarding the employee-decision (in the count models, the parameters of age variables are approximately halved when mediators are added to the model).

Some of the mediating variables that we use are also present in the studies by Henley (2005) (such as educational level and working full-time) and Storey (1994) (such as educational level, industry experience, entrepreneurial experience and working full-time). The majority of the mediating variables used in our study are, however, not included in these previous studies. These include amongst others start-up motives, objectives, entrepreneurial self-efficacy and risk attitude. Given these findings, one might hypothesise that these mediating variables 'explain' the inverse u-shaped effect of age on employment levels that is often found in other studies. Further research is needed to substantiate (or reject) this hypothesis.

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[1] A different explanation is that the available measure for the educational level of the entrepreneur is not precise enough; the three categories may be too broad. For example, Henley (2005) distinguishes between five educational levels and reports significant effects of educational level.

5 Conclusions

In this paper we examine how the age of start-up entrepreneurs affects firm size. The basic assumption within our framework is that the entrepreneur is faced with two distinct decisions that should be analysed separately. The first decision is the employer-decision: the entrepreneur has to make a decision about whether or not to become an employer. The second decision is the employee-decision, which is only relevant for employers: it concerns the decision regarding the actual number of employees to hire. A first conclusion or our study is that this assumption seems justified: the employer-decision depends on other factors than the employee-decision. We found only one variable that affects both decisions (the entrepreneurial self-efficacy); otherwise, the outcomes of these decisions depend on different factors. A second conclusion is that age has a negative relationship with the employer-decision and the employee-decision, but that these relationships are mediated by the other variables included in our study. Once we account for these mediating effects, our results are consistent with the results of prior studies into determinants of firm size.

The employer-decision

Whether or not an entrepreneur decides to become an employer, depends on a variety of factors that include entrepreneurial characteristics as well as firm-specific factors. The results of our study indicate that entrepreneurs are less likely to become an employer if their main motivation is to improve their work-life balance, if their main objective is to improve their own expertise, and if they are highly educated. On the other hand, entrepreneurs with high levels of self-efficacy and/or a positive risk attitude, who have considerable start-up capital available and are working full-time are most likely to become employer. In our model, age has no direct effect on the employer-decision.

The employee-decision

Within the subsample of employers, we find that only a few of the variables in our model seem to affect the number of employees. First of all, employers that are pushed into entrepreneurship tend to employ more employees than employers that started from different motives. We have as yet not found a satisfactory explanation for this remarkable finding. Secondly, we find a positive relationship between levels of entrepreneurial self-efficacy and the number of employees. However, the direction of the causality of this relationship might run both ways. Finally, there is weak support that employers with a medium educational level employ more employees than employers with a low educational level. In our model, age has no direct effect on the employee-decision.

Indirect age-effects

Older entrepreneurs are characterized by a lower level of entrepreneurial self-efficacy, are more likely to be higher educated, have a lower tolerance of risk and are less often prepared to work full-time. Each of these factors has a negative impact on the outcome of the employer-decision. Consequently, older entrepreneurs are less likely to become employer. The effect of age on the number of employees is mediated by entrepreneurial self-efficacy and level of education.

Once these mediating variables are included in the model, we no longer find significant direct age effects. A possible explanation is that the mediating variables in our model account for all of the age effects, but this result could also be caused by the small sample size (especially for the employee-decision).

Assuming that, with the ageing workforce, the share of older people starting up their own business increases, the findings of our study suggest that an ageing population is expected to negatively affect employment creation by newly started enterprises. Not only does the age of the entrepreneur at start-up indirectly lower the probability to become an employer, it also appears to reduce the number of employees hired three years after start-up. Additional research into the relationship between age and entrepreneurship (e.g. in different countries) and into the macro-economic effects of this development is needed.

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ANNEX I   Summary statistics

This annex reports summary statistics for the variables that are included in this study.

Table 10   Number of employees and age of entrepreneur at start-up: summary statistics

Variable	Min	Max	Average	Valid observations
Number of employees	0	400	1.15	849
Age at start-up	18	65	38.8	839

Source: EIM.

Table 11   Main motive to become entrepreneur

Main motive to become entrepreneur	Observations	
	number	share
Intrinsic (wish to be own boss, performing specific work, challenge of being entrepreneur)	425	51.2%
Push (unemployment, threat of unemployment, dissatisfaction with wage job)	161	19.4%
Opportunist (discovery of market opportunity, opportunity to earn higher income as self-employed as compared to paid employment)	71	8.6%
Work-life (better possibilities to combine work and personal life, necessity due to personal circumstances)	119	14.3%
Other (availability of own financial means, it just happened)	54	6.5%
Total	830	100%

Do not know / no answer: 19 observations.
Source: EIM.

Table 12   Educational level of the entrepreneur

Highest completed educational level	Observations	
	number	share
low (primary school and pre-vocational secondary education)	231	27.4%
medium (general secondary education)	267	31.7%
high (tertiary education and/or graduate level)	345	40.9%
Total	843	100%

Do not know / no answer: 6 observations.
Source: EIM.

Table 13   Entrepreneur self-efficacy

To which extent do you possess the following qualification:	*Observations*	
entrepreneurial skills	*number*	*share*
very low	1	0.1%
low	35	4.1%
neither low nor high	319	38.2%
high	376	45.0%
very high	105	12.6%
Total	836	100%

Do not know / no answer: 13 observations.
Source: EIM.

Table 14   Risk attitude of the entrepreneur

To which extent do you possess the following qualification:	*Observations*	
taking risks	*number*	*share*
very low	1	0.1%
low	37	4.4%
neither low nor high	268	32.2%
high	404	48.6%
very high	121	14.6%
Total	831	100%

Do not know / no answer: 18 observations.
Source: EIM.

Table 15   Start-up capital

Amount of start-up capital (in guilders)	*Observations*	
	number	*share*
< hfl. 10.000	372	44.7%
hfl. 10.000 to hfl. 100.000	382	45.9%
> hfl. 100.000	79	9.5%
Total	833	100%

Do not know / no answer: 16 observations.
Source: EIM.

Table 16   Sector of industry

Industry	Observations	
	number	share
Manufacturing	21	2.5%
Construction	121	14.3%
Wholesale	53	6.3%
Retail	96	11.4%
Hotels and restaurants	21	2.5%
Motor vehicles	18	2.1%
Transport	19	2.3%
Business and financial services	325	38.4%
Other services	172	20.3%
Total	846	100%

Do not know / no answer: 3 observations.
Source: EIM.

Table 17   Year in which the entrepreneur started as entrepreneur

Start-up year	Observations	
	number	share
1998	283	33.3%
1999	292	34.4%
2000	274	32.3%
Total	849	100%

Source: EIM.

Table 18   Summary statistics on dummy variables

Variable	No	Yes	valid observations
Employing employees	707	142	849
Improve own expertise	185	646	831
Improve quality of products	357	467	824
Maximize profits	443	392	835
Maximize revenues	461	383	844
Industry experience	312	533	845
Entrepreneurial experience	785	64	849
Social capital	709	140	849
Take-over	789	59	848
Full-time	402	447	849
Innovativeness	660	188	848
Male	284	565	849

Source: EIM.

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