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Which firms employ older workers?

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Abstract

There is an increasing emphasis on the importance of allowing people as they grow older to continue to work according to their work capacity and preferences. This paper builds on earlier literature that shows that firms employ older workers, but they tend not to hire them, and provides an explorative analysis of the establishments that employ older workers. A special focus is on how sensitive are the findings when the definition of older workers become more restrictive. Using employer-employee data from Swedish administrative registers, we found that the difference in establishments' employment is large enough to explain some of the observed difference across definitions. The retirement age in the guaranteed pension scheme, i.e., 65 years, seems to be one of the institutional settings that affect both the employees and employers' decision for work after 65, but also the establishment's size, age and ownership.

Keywords: active aging, older workers, establishments, firms.

JEL Classification: J21, J22, J23, J24, J26.

1 Introduction

This paper is a descriptive analysis of which firms employ older workers, with focus on the variation of most influential factors when restricting the definition of older workers. This is of high relevance for policy makers concerned about the progressive increase of the old-age dependency ratio (i.e., the number of people aged 65 and above relative to those aged 15 to 64), which in the EU is projected to increase from 29.6% in 2016 to 51.2% in 2070 (European Union, 2018). The rapid increase of the old-age dependency ratio started some decade ago to bring worries about both the sustainability of the pension system and the increasing demand for social and health care services. Increasing retirement age, adjusting benefit payouts and increasing healthcare copayments are some solutions discussed and/or implemented by national governments since the 1990s (OECD 2011). However, the participation of the older population in the labor market is determined by both supply and demand sides (Heywood and Siebert 2009). From the supply side, earlier literature suggests that health conditions, partner's retirement and a growing preference for leisure with age are some of the factors which explain both the number of older workers and how many hours they work. From the demand side, earlier literature suggests that the costs of hiring and training associated with shorter tenure and the low profitability of old workers' specific training are some of factors that reduce firms' demand for older workers. In these contexts, the government policies designed to influence labor market participation of the older population are also demand or supply oriented. Most of the policies are focus on increasing people's incentives to work to a later age (i.e., financial penalties or other measures against early retirement, allowing work while receiving a pension, tax benefits for people that work after the social insurance age is reached. However, less policies are designed to increase the firm's incentives to employ older workers. However, Cloostermans et al. (2015)'s systematic literature review found insufficient and limited evidence for a favourable effect of interventions to promote work-related components of sustainable employability in ageing workers. More knowledge and empirical evidence are needed in order

to support the policy recommendations for changes. Regardless of the intervention's content (lower number of work hours, adjustment in work tasks, work schedules, work environment), relatively little is known about which firms hire older workers and which firms keep their employees after they have reached the mandatory retirement age. Our paper aims to add to the literature by analyzing the relationship between establishments' characteristics and their likelihood of employing older workers using employer-employee data, combining data from official registers for both individuals and firms in Sweden. The focus on Sweden is relevant given the country's generous social insurance and pension systems, but also the rules that make employers responsible for maintaining a good physical, psychological and social work environment for all employees. All these institutional settings are aimed to motivate people to continue to work according to their capacities and preferences as they grow older. However, much less was done to motivate firms to hire and/or to employ older workers. Therefore, our paper's main contribution here will be to provide an explorative analysis of establishments that employ older workers, including the sensitivity of the results to the definition of older workers.

Even though the employer's behavior is subjected to laws that regulate the employment and hiring rules and mandatory-retirement clauses in labor contracts, the effects of job protections on employment are still controversial in the empirical literature. The empirical findings summarized in Boeri and Van Ours (2013), generally confirm that tighter regulation decreases both the hiring and firing rates, and suggest that the effect on aggregate employment varies across studies. Additionally, tighter employment protection legislation may strengthen the position of insiders and have negative effects on outsiders (or new entrants).

Despite the variety of possible explanations, to our knowledge, no attempt has been made to quantify differences in institutional settings and firm characteristics or to understand whether these differences are sufficient to explain the variation in firms' employment of older workers. Understanding which of these institutional settings and/or firm characteristics, if any,

is important enough to explain the path of the employment of older workers across establishments, is a starting point of designing policy interventions aimed to motivate employers to employ people who are motivated to continue to work according to their capacities and preferences as they grow older. This paper aims to analyze the factors suggested by the previous literature to explain the difference between firms that employ and firms that do not employ older workers. In particular we are interested in if we can detect differences in employment of older workers due to the employer's size, age, belonging to an enterprise group and industry affiliations, but also due to the characteristics of the human capital of the firms.

Next, we present the institutional setting and data. Section 3 relates our study to the literature on economic incentives, labor supply and labor demand. Section 4 our econometric method and our results. Section 5 ends with concluding remarks.

2 Institutional settings and data

In what follows, we present some of the institutional settings in Sweden, the data and the definition of the variables used in the empirical analysis.

2.1 Institutional settings

2.1.1 Collective agreements

Sweden has no statutory minimum wage laws. Instead, minimum wages are determined by collective agreements between the unions and the employer organizations, separately in each industry. Given a set of task-specific characteristics, minimum wages may vary by job-complexity level and worker experience. The union contracts are extended to *all* workers in each firm. With few exceptions, the union contracts are binding irrespective of whether the individual worker is a union member. The coverage of collective labor agreements is close to 90%

The employer is paying the contribution to the social insurance for each worker. Therefore, the employees are generally well insured against income losses in case of unemployment, sickness, disability and parental leave. The replacement rate is dependent on individual earnings before the employee's leave.

2.1.2 Job protection and seniority rule

In Sweden, the basic rules regarding employment protection are stated in the labor law, which describes the rules that need to be followed when firms dismiss workers. The most common reasons for dismissals are economic and production related (including for example "lack of work"), but dismissals for personal misconduct are possible. Discrimination based on gender, *age* or ethnic origin is prohibited. In addition to the labor law, most firms have to follow the collective agreements, which typically extend the minimum requirements stated in the law (for example, by increasing the advance notice periods).

The seniority rules have been included in Swedish legislation since 1974. The basic rule states that workers may be laid off in inverse order of seniority when a firm downsizes for economic reasons. For workers with equal seniority, the youngest worker is laid off first. In addition to the *establishment* as the basic unit, blue- and white-collar workers within the same establishment are usually treated as separate groups. Additionally, the competence of the worker and her/his role in the establishment's production is taken into consideration, as long as the agreements are not discriminatory.

2.1.3 Pension

It is possible to get a *guarantee pension* from age 65. Eligibility for the guarantee pension starts to be earned after three years' residency and is collected proportionally up until the maximum guarantee pension is reached at 40 years' residency.

The retirement age is flexible, *pension from the income* and *premium pension* can be claimed from the age of 61. The general retirement age in Sweden has been 65 since the 1970s

and up to 2001, when all employees have an unconditional right to work until age 67. Thereafter, the employment can be terminated provided that their employer gives them at least one month's written notice. Further, the amount of state pension to which Swedish employees are entitled is based upon the amount of income they have earned over their whole working career.

The incentive to work after age of 65 was made stronger in 2007, when the earned income tax credit reform and a payroll tax reduction were introduced for workers above age 65.

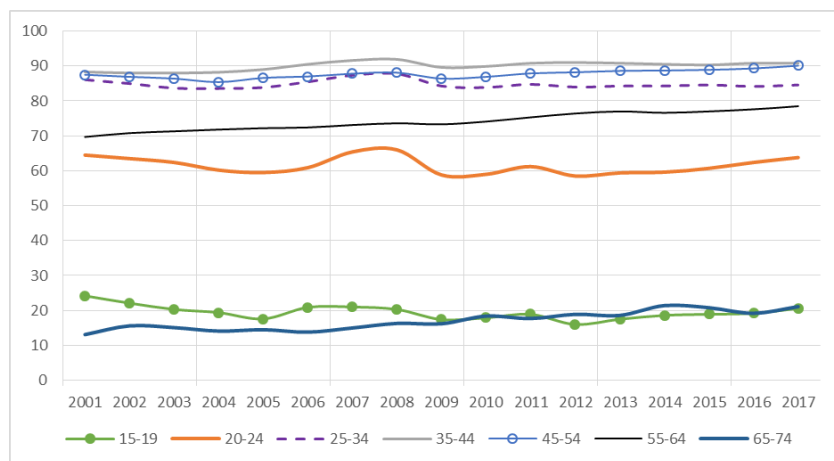
2.2 Data

The data analyzed in this study is extracted from an employer-employee database, which was designed during the 1980's by a group of researchers at the Trade Union Institute for Economic Research (FIEF) and is administrated by Statistics Sweden. The FIEF data includes all Swedish workplaces except for the following industrial classifications: agriculture, hunting and forestry; fishing; mining and quarrying; private households with employed persons; and extra-territorial organizations. Examples of variables at firm level included are the firm size (i.e., number of employees), firm age, ownership, and industry sector. Additionally, the Regional labor market statistics (RAMS) includes data on all establishments on the composition of the labor force with respect to educational level and demographics. Finally, the individual database is extracted from the Longitudinal integration database for health insurance and labor market studies (LISA), which contain detailed information from official registers since 1990 for all individuals who are 16 years and older in the year of observation. Using information about each individual age, employment status and earned income, we identify *older individuals who work*. We use a key-variable to match-merge them to their establishments, giving us information whether the establishment employ older workers, and in case, how many. This dummy variable is the dependent variable analyzed in our study.

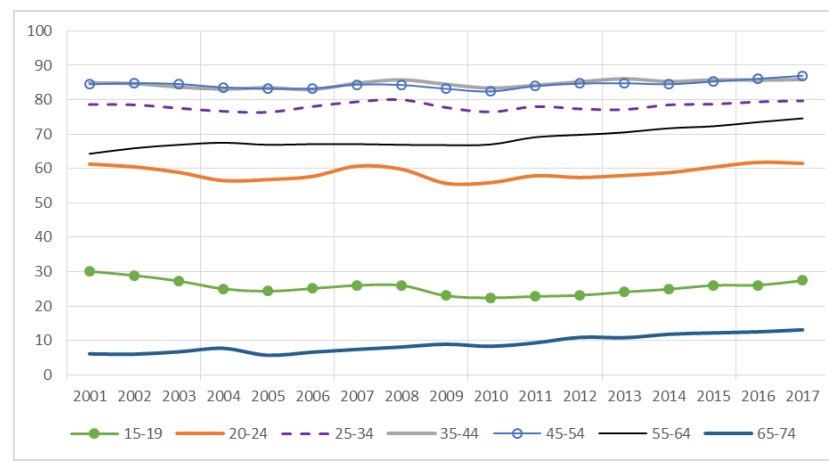
2.2.1 Individual data and older workers

There is no clear-cut definition of the concept older workers across the empirical studies that build on Lazear (1979)'s theoretical framework (mentioned in the previous sections) and reported empirical evidence that firms retain older workers but do not hire them. While Lazear analyzed a sample of US-individuals who were **58-63 years old** in 1969, with a follow-up survey in 1971, Hutchens (1986) focuses on US-workers who are **55 or older**, Daniel and Heywood (2007) on workers **over 51** (using UK establishment data), and Garcia et al. (2017) on workers **over 50** (using Portuguese data).

In Sweden during 2000-2012, the percentage of workers aged 40-50 was relatively stable, fluctuating around 86 percent, while the percentage of workers aged 51-60 and workers older than 60 varies much more (Figures 1a, 1b and 2 and Tables 1a and 1b). Therefore, we define older workers starting at the age of 60. In order to analyze the sensitivity of the age-definition of older workers, we choose to use several definitions of older workers: 1) 60 years or older, 2) 61 years and older, 3) 62 years of older ... and so on, until 15) 71 years or older. In the next subsection we present of a short summary of the mean characteristics of firms that employ or do not employ older workers. In order to test how sensitive the firms' characteristics are with respect to the definition of older workers, we chose to focus on the year 2005, since it is long enough after the change in 2001 that allows workers to work until they turn 67; and two years before the introduction of the first step of the EITC-reform.



a) Men



b) Women

Figure 1 Employment rates by age-groups and gender, 2001-2017

Source: own plots using SCB aggregate statistics

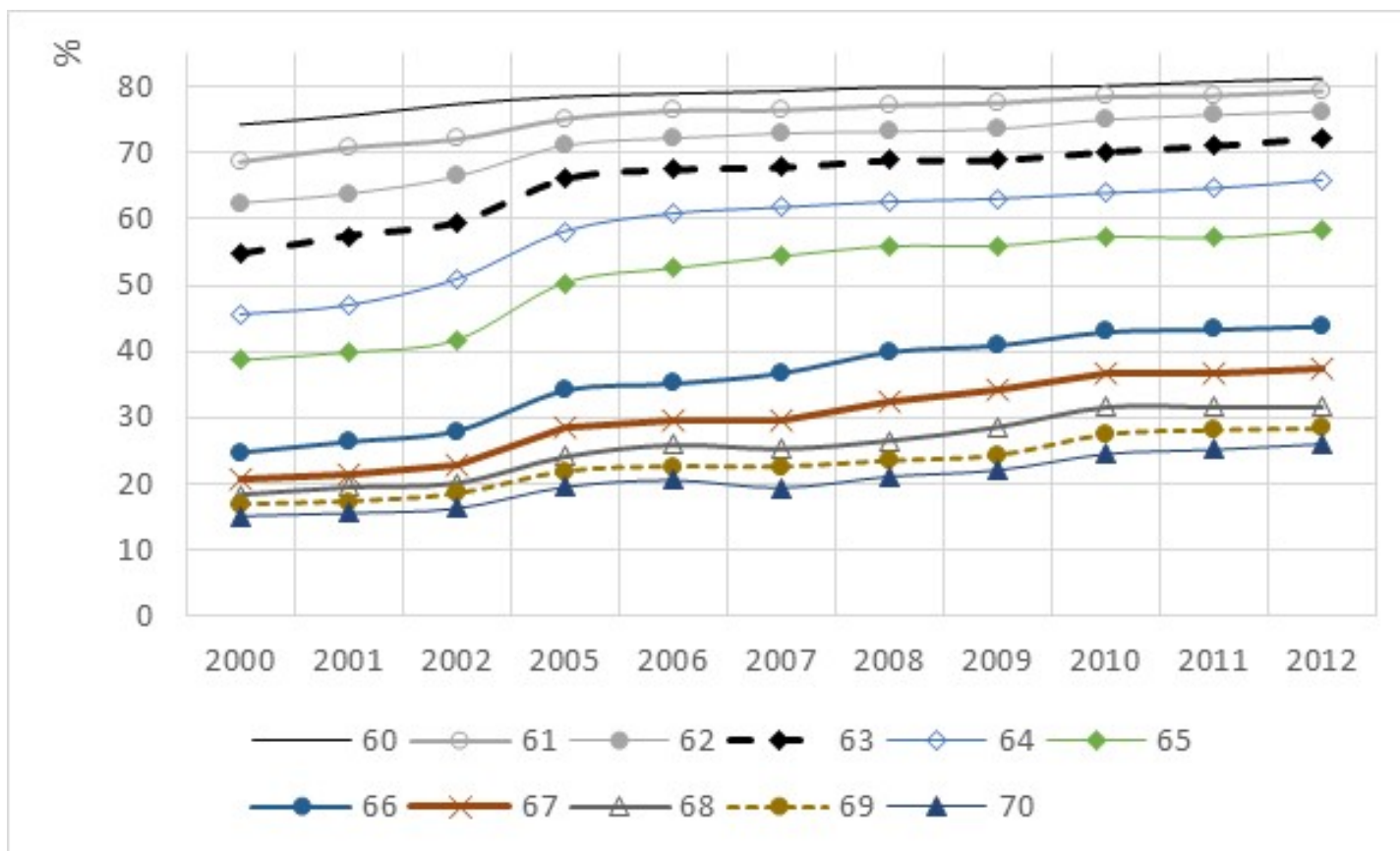


Figure 2 Percentage of working older people, by age, 2000-2012

Source: own computations based on employer-employee data

2.2.2 Firm data

Our sample contain all 473 226 establishments that exist in our data in the year 2005. After match-merging workers who are 60 years or older to the establishments, we construct a dummy variable, eow_{jk} , which takes the value one if the establishment j has at least a k -years old or older employee, and zero otherwise. A separate dummy variable is created for each age, i.e., $k = 60, 61, \dots, 71$. For example, if the establishment j has at least one employee who is 60 years old and no employee older than 60, then $eow_{j60} = 1$ and all other dummy-definition variables will take value zero, i.e., $eow_{j61} = eow_{j62} = \dots eow_{j70} = 0$. These definition dummy variables are the dependent variable in our empirical analysis. Table 2 below shows that the number of establishments who employ older workers, according to our definitions, decreases from 19.14 percent when the age limit is 60, to 13.5 percent when it is 65. By age-limit of 68, the percentage is down to 6.73 and continues to decrease to 4.59 when the age limit is 70 and to 3.8 percent when is 71. The biggest decrease is at age 65.

Our explorative analysis now focuses on the mean characteristics of establishments that employ older workers (eowes) and those establishments that do not employ older workers (neowes).

2.2.2.1 The human capital of the firm

Tables 1a and 1b present the average demographic characteristics of the workers employed by establishments who employ older workers (eow) and those establishments that do not employ older workers (neow), respectively. All variables are measured in percentage of the total of all employees at the establishment level.

Gender. Regardless the definition, about 60 percent of the employees of the eow-establishments are men, while in the neow-establishments the percent is about 65. The

differences are statistically significant, and therefore we can conclude that on average the now-establishment employ more men than eow-establishments.

Age. Except the percentage of youngest workers (i.e., 16-24 years old), which does not vary significantly across definitions, there are big difference both across definitions within the same group of establishment and between the two types of establishments (i.e., eow and neow).

Workers 16-24 years old represent about 5 percent of all employees in eowes and about 6-7 percent of all neowes. In the remaining three age-categories, i.e., 25-39, 40-54 and 55-59, neows employ on average much more workers. All differences are statistically significant.

The most interesting results and variations is in the age-group 60-64 years old. This group represent about 23-32 percent of all employees of the eowes that employs older workers defined as 60+- 64+ workers, but only 4-10 percent of the workers employed by neowes. However, starting with the definition of age limit 65+, the 60-64 years old represent about 9 percent of the eowes' employees, but about 12 percent of the neowes. This implies that any empirical analysis should carefully and adequately consider this difference, especially when the dependent variable is the number of employees who are 60+ to 64+.

Even though, the older age group (i.e., 65 years old or older) is very much affected by our definition of older workers, the descriptive statistics suggest that there are workers who are 65 or older are working in neowes, which are more open for employing the oldest older workers.

Educational level. The highest educated employees have more than high-school education and represent about 27 percent of all employees in the neowes and about 28-29 percent of the eowes. The variation is larger among the two lower educated groups, where the medium educated (i.e., high-school education) is about 43-48 for eowes and about 52-53 percent for neowes, and the lowest educated employees is about 20-22 percent for eowes and about 18-19 percent for neowes. These descriptive also suggest that there might be difference in the labor skills needed to be performed in eowes and neowes, and therefore healthy older

workers likelihood to continue to work might be directly or indirectly connected to their education (for example, lawyers, accountants, physicians, scientists, etc.).

Country of birth. Regardless of definition, Swedish born employees represent about 91 percent of all workers employed by eowes. For neowes, the percentage is lower and vary across definitions (i.e., 86-88 %). While there is a relatively little differences both across definitions and between eowes and neowes for the percentage of both employees born in other Nordic country (about 2-3 percent) and in the rest of European countries (3-4 percent), there is a big difference between ewes (i.e., about 2 percent) and neowes (about 5-7 percent) regarding the percentage of employees born outside Europe. These descriptive statistics may suggest some insights related to the differences in work experience and/or work norms, culture and attitudes across both employees and employers, which should also be taking in consideration in an empirical analysis.

2.2.2.2 Mean organizational characteristics of firms

Tables 2a and 2b presents the average organizational characteristics of the establishments across definitions for the eowes and neows, respectively. Without the variable firm size whose unit of measurement is the number of employees at the establishment's level, all other variables are measured as percent of all firms.

Firm size. Figure 3 suggests that the average number of employees increases by definition for both eows (from 19 to 36 employees) and neowes (from 3 to 7 employees). These differences suggest a careful handling of this variable in the empirical analysis.

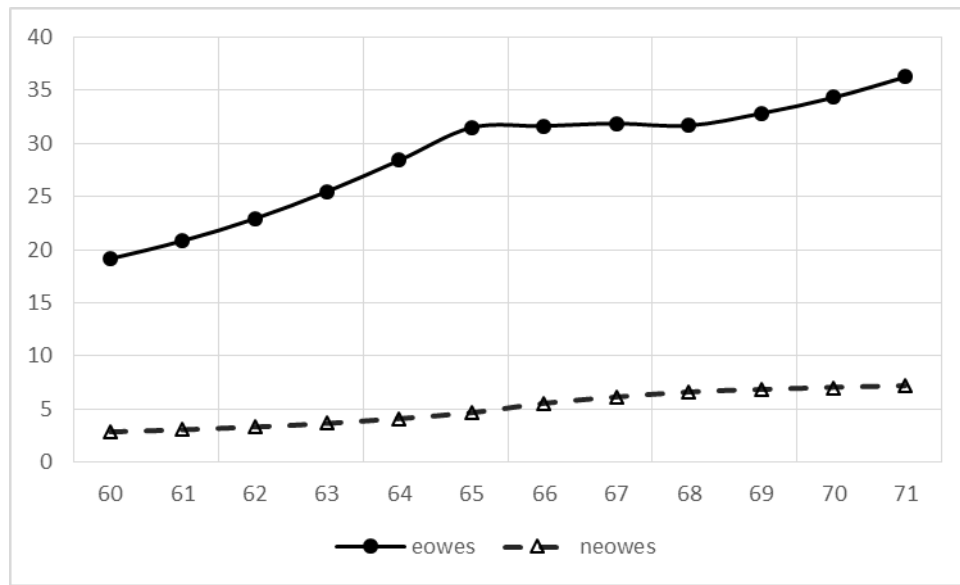


Figure 3 Average firm size for eowes and neowes, by definition of older workers

Ownership

State ownership. About 2-4 percent of all firms that employ older workers are owned by the state; around 4 percent for all definitions 60- to 65+, but decreases to 2.6 percent from 68+.

Municipality ownership. There is a difference across definitions for both eowes and neowes that seem to become stronger after the definition of 65+. Until this age limit, 12-13 percent of eowes are owned by a municipality, and afterwards the percentage decreases to 6 percent. For neowes, the percentage increases from 2 percent (60+) to 5 percent (vid 65+), and stays on this level for all other definitions. This difference and trend might be explained by institutional differences in the employment.

Private, no group affiliation. About 58-70 percent of all eowes and 78-85 percent of the neowes are owned by private firms that do not have a group affiliation.

Private, group affiliation. Regardless of definition, about 17 percent of all eowes and 9-11 percent of the neowes are owned by private firms that have a group affiliation.

Foreign. About 3-5 percent of all eowes and 3 percent of the neowes are owned by a foreign firm.

Legal form of firm

Sole proprietorship. There is a big difference across definitions for both eowes and neowes that seems to become stronger after the definition of 65+. Until this age limit, 19-20 percent of eowes have sole proprietorship, while afterwards the percentage varies up and down between 12 and 18 percent. For neowes, the percentage decreases from 47 (60+) to 42 percent (vid 65+) and 40 (68+) and stays on this level for all other definitions. This difference and trend might be explained by institutional differences in the employment.

Joint and limited partnership. About 5-6 percent of all eowes and 7 percent of the neowes.

Limited liability firm except B&I. 48 percent of all eowes until 65+ and decreases to 45 vid 69+; for neowes, 38-40 until 64+, and 41 percent afterwards.

Table 1a Mean demographic characteristics of employees in the establishments that *employs* older workers, by definition of older workers, 2005

	All firms	60+	61+	62+	63+	64+	65+	66+	67+	68+	69+	70+	71+
Gender (in %)													
– _male	64.04	60.26	59.85	59.48	59.10	58.94	59.16	60.48	60.74	60.87	60.60	60.44	60.11
– _female	35.96	39.74	40.15	40.52	40.90	41.06	40.84	39.52	39.26	39.13	39.40	39.56	39.89
Age groups (in %)													
– _1624	6.32	4.97	4.99	5.05	5.12	5.20	5.29	5.07	5.07	5.15	5.22	5.27	5.39
– _2539	28.19	19.26	19.48	19.70	19.92	20.13	20.37	19.19	18.96	18.80	18.71	18.69	18.79
– _4054	36.66	23.01	23.58	24.24	24.93	25.63	26.31	25.19	25.28	25.58	26.01	26.42	26.91
– _5559	13.32	9.09	9.18	9.32	9.55	9.79	10.01	9.47	9.44	9.53	9.67	9.89	10.20
– _6064	11.69	32.13	29.68	26.50	22.37	16.86	9.53	9.17	9.20	9.41	9.66	9.98	10.27
– _65plus	3.82	11.55	13.09	15.19	18.12	22.38	28.48	31.91	32.05	31.53	30.73	29.75	28.45
Education-groups (in %)													
– Before high school	19.58	22.44	22.27	22.13	21.88	21.58	21.03	21.47	21.34	21.24	21.04	20.80	20.11
– High school	51.74	48.43	48.17	47.78	47.41	47.01	46.53	45.45	44.95	44.50	44.08	43.57	43.17
– After high-school	27.86	27.86	28.15	28.51	28.89	29.24	29.75	29.72	29.54	29.16	28.79	28.31	27.98
Country of birth (in %)													
– Sweden	88.11	91.53	91.48	91.40	91.27	91.14	91.14	91.21	91.20	91.16	91.19	91.17	91.34
– Northern Europe	2.77	2.98	2.98	3.00	3.04	3.11	3.08	3.07	3.09	3.10	3.06	3.08	3.04
– Europe	3.74	3.19	3.25	3.31	3.37	3.39	3.39	3.39	3.40	3.41	3.38	3.36	3.28
– Other	5.38	2.30	2.29	2.29	2.33	2.36	2.38	2.33	2.31	2.33	2.36	2.39	2.34
Number of establishments	473226	156513	138032	118957	99730	80753	63462	49514	39469	31840	26356	21721	17983
Percent of establishments	100	33.07	29.17	25.14	21.07	17.06	13.41	10.46	8.34	6.73	5.57	4.59	3.80

Table 1b Mean demographic characteristics for establishments that do *not* employ older workers, by definition of older workers

	All firms	60+	61+	62+	63+	64+	65+	66+	67+	68+	69+	70+	71+
Gender (in %)													
– _male	64.04	65.92	65.77	65.58	65.36	65.10	64.80	64.46	64.35	64.27	64.25	64.22	64.20
– _female	35.96	34.08	34.23	34.42	34.64	34.90	35.20	35.54	35.65	35.73	35.75	35.78	35.80
Age groups (in %)													
– _1624	6.32	6.99	6.86	6.74	6.64	6.55	6.48	6.46	6.43	6.40	6.38	6.37	6.35
– _2539	28.19	32.61	31.78	31.05	30.40	29.85	29.40	29.25	29.03	28.87	28.75	28.65	28.57
– _4054	36.66	43.41	42.05	40.83	39.79	38.93	38.26	38.00	37.70	37.46	37.29	37.15	37.05
– _5559	13.32	15.42	15.03	14.67	14.33	14.05	13.84	13.77	13.68	13.60	13.54	13.49	13.45
– _6064	11.69	1.58	4.28	6.71	8.83	10.62	12.02	11.98	11.91	11.85	11.81	11.77	11.74
– _65plus	3.82	0.00	0.00	0.00	0.00	0.00	0.00	0.54	1.25	1.82	2.23	2.57	2.85
Education-groups (in %)													
– Before high school	19.58	18.16	18.47	18.72	18.96	19.17	19.36	19.36	19.42	19.46	19.49	19.52	19.56
– High school	51.74	53.38	53.21	53.07	52.90	52.71	52.55	52.47	52.36	52.26	52.19	52.13	52.08
– After high-school	27.86	27.86	27.74	27.64	27.59	27.58	27.57	27.64	27.71	27.77	27.81	27.84	27.86
Country of birth (in %)													
– Sweden	88.11	86.41	86.72	87.00	87.26	87.48	87.63	87.74	87.82	87.88	87.92	87.96	87.98
– Northern Europe	2.77	2.66	2.68	2.69	2.70	2.70	2.72	2.73	2.74	2.74	2.75	2.75	2.76
– Europe	3.74	4.02	3.95	3.89	3.84	3.82	3.80	3.79	3.78	3.77	3.77	3.76	3.76
– Other	5.38	6.91	6.66	6.42	6.20	6.01	5.85	5.74	5.66	5.60	5.56	5.53	5.50
Number of establishments	473226	316713	335194	354269	373496	392473	409764	423712	433757	441386	446870	451505	455243
Percent of establishments	100	66.93	70.83	74.86	78.93	82.94	86.59	89.54	91.66	93.27	94.43	95.41	96.20

Table 2a Mean organizational characteristics for establishments that *employ* older workers, by definition of older workers

	All firms	60+	61+	62+	63+	64+	65+	66+	67+	68+	69+	70+	71+
Firm Size	8.25	19.1	20.8	22.9	25.5	28.4	31.5	31.6	31.9	31.7	32.8	34.3	36.3
Ownership													
– state	1.72	3.94	4.07	4.22	4.33	4.35	4.19	3.57	3.01	2.68	2.62	2.57	2.59
– municipality	5.66	12.05	12.56	13.13	13.51	13.61	12.86	9.99	8.83	7.81	7.18	6.70	6.24
– private, no group affiliation	77.42	61.42	60.32	59.32	58.52	58.18	59.03	63.85	66.16	67.85	68.74	69.35	70.02
– private, group affiliation	11.34	16.70	16.96	17.11	17.35	17.54	17.71	17.18	16.97	17.06	17.09	17.13	17.13
– foreign	3.34	4.62	4.71	4.74	4.71	4.65	4.48	3.77	3.42	3.07	2.85	2.79	2.65
Legal form of firm													
– Sole proprietorship	38.80	21.54	20.66	19.64	18.56	17.26	15.90	17.54	17.23	16.33	15.13	13.73	12.13
– Joint and limited partnership	6.61	4.99	4.92	4.90	4.86	4.82	4.94	5.40	5.51	5.59	5.57	5.58	5.54
– Limited liability firm except B&I	41.56	48.32	48.15	47.88	47.63	47.59	47.84	46.96	46.05	45.75	45.33	45.05	44.71
– Non-profit organization	2.89	4.23	4.34	4.46	4.61	4.85	5.23	5.68	6.38	6.99	7.60	8.14	8.79
– Municipality	5.24	11.09	11.55	12.06	12.37	12.39	11.57	8.72	7.60	6.54	5.85	5.26	4.76
Number of establishments	473226	156513	138032	118957	99730	80753	63462	49514	39469	31840	26356	21721	17983
Percent of establishments	100	33.07	29.17	25.14	21.07	17.06	13.41	10.46	8.34	6.73	5.57	4.59	3.80

Table 2b Mean organizational characteristics for establishments that do *not* employ older workers, by definition of older workers

	All firms	60+	61+	62+	63+	64+	65+	66+	67+	68+	69+	70+	71+
Firm Size	8.25	2.9	3.1	3.3	3.7	4.1	4.7	5.5	6.1	6.6	6.8	7.0	7.1
Ownership													
– state	1.72	0.62	0.74	0.88	1.02	1.17	1.33	1.50	1.60	1.65	1.66	1.67	1.68
– municipality	5.66	2.50	2.81	3.15	3.56	4.02	4.54	5.15	5.37	5.50	5.57	5.60	5.63
– private, no group affiliation	77.42	85.33	84.47	83.50	82.47	81.38	80.27	79.01	78.45	78.11	77.93	77.81	77.72
– private, group affiliation	11.34	8.70	9.03	9.41	9.74	10.07	10.36	10.66	10.83	10.93	11.01	11.07	11.12
– foreign	3.34	2.71	2.78	2.87	2.98	3.07	3.17	3.29	3.34	3.36	3.37	3.37	3.37
Legal form of firm													
– Sole proprietorship	38.80	47.33	46.28	45.24	44.21	43.24	42.35	41.29	40.77	40.42	40.20	40.01	39.86
– Joint and limited partnership	6.61	7.41	7.31	7.19	7.08	6.98	6.87	6.75	6.71	6.68	6.67	6.66	6.65
– Limited liability firm except B&I	41.56	38.23	38.85	39.44	39.95	40.33	40.59	40.93	41.16	41.26	41.34	41.40	41.44
– Non-profit organization	2.89	2.23	2.29	2.37	2.43	2.49	2.53	2.57	2.57	2.60	2.61	2.64	2.66
Number of establishments	473226	316713	335194	354269	373496	392473	409764	423712	433757	441386	446870	451505	455243
Percent of establishments	100	66.93	70.83	74.86	78.93	82.94	86.59	89.54	91.66	93.27	94.43	95.41	96.20

3 Earlier literature and our hypotheses

3.1 Labor demand for older workers

For older workers, the literature of labor demand is significantly smaller than that of labor supply. A few studies, based on the theoretical model of Lazear (1974), demonstrate that employers tend to avoid investing in older workers, in part due to implicit contracts that discourage worker shirking and malfeasance by shifting compensation to the end of the contract. Therefore, firms still employ older workers, but they tend not to hire them (Hutchens 1986). Moreover, previous literature also reported the importance of institutional settings (laws, rules and norms) for the participation of the older people in the labor market; e.g., incentives to work until a later age, health insurance and EITC policy, policies against age discrimination, but also implicit contracts as described in Lazear (1979, 1981). Lazear's papers offers a theoretical explanation for the existence of mandatory retirement that is consistent with economic theory and tests this theory empirically. It is argued that the age of *mandatory* retirement is chosen to correspond to the age *voluntary* retirement, but the nature of the optimal wage profile results in a discrepancy between spot wage and spot value of the worker's marginal product. Therefore, firms can commit to wage contracts but cannot commit to not replace incumbent workers. Workers are risk averse, so an incentive exists for firms to smooth wages. This is because it is preferable to pay workers less than value of the worker's marginal product when they are young and more when they are old. By doing so the contract with *mandatory* retirement is Pareto *efficient*. In this context, as originally formulated by Becker (1962), *specifically trained workers* receive a wage that is less than their VMP. In that case, mandatory retirement would be irrational; *firms would want to keep workers with a wage less than VMP*.

Thus, under the standard theory of specific human capital one would hypothesize that *firms that employ but do not hire older workers would not use mandatory retirement*. Given this institutional context of our analysis, our hypothesis that workers who reach the mandatory

retirement age have a higher likelihood to continue to work as either self-employed or employed by a private firm than in firms with other ownership.

3.2 The job generation process and the stock of employees

The literature of firm growth focuses on indicators such as growth of employment, sales, and productivity, thereby shedding light on different aspects of the growth process (Coad, 2010a; Miller et al., 2013). An increasing number of studies focusing on analyzing firms' employment growth and its determinants provides both theoretical and empirical evidence for the importance of the firm's size for employment growth over time. A relatively large number of studies investigated how employment growth varies by firm size, based on Gibrat's law, which states that firm growth rates are independent of size (Gibrat 1931). Another large group of studies focus on the role of small businesses in job creation as pointed out by Birch (1979), which show that new U.S. firms create the majority of employment. Although the Birch studies have been criticized for methodological lacks (Davis et al., 1996), they inspired and generated many empirical studies that deal with the employment creation potential of new firms and businesses.

Earlier studies found that *firm size* has a significant effect on employment's growth; but the effect is negative when it measured in percentage, and positive when it is measured in absolute numbers (Delmar 1997).¹ However, firms exhibit different cyclical patterns of net job creation (e.g., see Hopenhayn and Rogerson, 1993), and this might vary across the *ownership* (e.g., Neumark et al. 2011 reporting an inverse relationship between net job growth rates and firm size, with small firms contributing disproportionately to net job creation). However, these results do not hold when *firms' age* is accounted for (e.g., Haltiwanger et al. 2013). Large mature firms have the largest employment shares and young firms are the fastest growing, but there are some *young small* firms, not small firms in general, that make the largest job creation

¹ Delmar (1997) reviewed 55 articles on firm growth and reports that it really matters whether the analysis concentrates on relative or on absolute growth.

rates (e.g., Haltiwanger et al., 2013; Hyytinen and Maliranta, 2013; Lawless, 2014). Based on these earlier findings, showing that both the size and the age of the firm are important factors for employment decision, we expect that these two factors have also effect on the decision of employing older workers that have accumulated skills and information that is valuable for the firm. However, if older employees are less mobile and if employers prefer to keep their skilled workers, our hypothesis is that *the probability is higher that older workers will work in older firms.*

Empirical evidence in Cabral and Mata (2003); Hellerstein and Koren (2006) suggests that the main determinants of firm sizes are not an entry-exit process. Instead, other studies find that firm age has a significant negative effect on firms' employment growth, i.e., young firms grow faster on average. Given that older workers are less mobile than they younger peers, we expect that *the new jobs created by young firms are more likely to be taken by younger*, and therefore our hypothesis is that the probability that *older workers will continue to work for the same firm is higher for older firms.* Moreover, given that older firms on average are larger than the small firms, our hypothesis is that *older workers are more likely to work in large firms.*

The question is what it looks like for self-employed and hybrid entrepreneurs in general, and in particular those who reaches the mandatory retirement age. Hybrid entrepreneurs, a concept introduced by Folta et al. (2010) to distinguish terminology from "part-time entrepreneurs" or "work mixers" by not requiring them to be full-time wage workers or self-employed part time. They need only to have a primary wage job and a secondary job in self-employment. Therefore, our hypothesis is that these employees will continue to work as long as they can. If they cannot continue to work as employed after reaching the mandatory retirement age, they will continue to work as self-employed.

Another group of studies show that young firms also have a higher propensity to invest in R&D than incumbents when entering new markets (Reinganum, 1983; Czarnitzki and Kraft,

2004), which suggests a higher demand for high-skills workers. A percent of older workers and retired workers use to have a specialized human capital that is very attractive and relevant for the R&D-intensive firms. Some of these high-skilled workers have been working for the same company for many years and therefore it is a high probability that older firms may enjoy advantages and innovate more effectively as they build on previous abilities and knowledge and gaining reputation that facilitate contacts with customers, suppliers and potential collaborators.

Earlier studies report another result that is relevant for understanding why not all firms are employing older workers – since the wages in high-skill job categories increase with firm size but not wages in low- and medium-skilled job categories (e.g., Autor et al., 2003). This might also suggest that it is a high probability that older workers that have high-skill jobs at large firms will stay and work for these firms even after the mandatory retirement. However, if larger firms are more likely to automate routine job tasks, then firm growth may act as a catalyst for task-replacing technological change.

4 Econometric analysis

4.1 Model

The point of departure for the empirical analysis are 473,226 establishments that exist in 2005 in our data. More than 94 percent of these are firms have a single establishment. The endogenous variable y_{jk} is Bernoulli distributed since it is either 1 if establishment j has at least one employee who is k -years or older in 2005 or 0 otherwise. In this case, the application of Generalized Linear Models (GLM) is appropriate. This class of models tries to explain the relation

$$E[y_{jk}|x_{jk}] = G(x'_{jk}\beta)$$

where x_{jk} is a vector of explanatory variables, β is the parameter vector to be estimated and $G(\bullet)$ a known link function. Assuming that the error terms in this model ε_{jk} are normally distributed, we apply the probit model

$$E[y_{jk}|x_{jk}] = Pr(y_{jk} = 1|x_{jk}) = Pr(x'_{jk}\beta + \varepsilon_{jk}) = \Phi(x'_{jk}\beta)$$

where $j=1, 2, \dots, n$ and $k = 60+, 61+, \dots, 71+$.

This implies that we estimate the probability that the firm employs older workers, where $\Phi(\bullet)$ is the cumulative density function of the standard normal density. Firm's probability to employ older workers is a function of the firm's institutional/organisational characteristics (e.g. size, age, ownership, legal form, sector, branch) and firm's employees demographic characteristics (e.g., shares of men and women, shares of different age-groups, shares of natives and immigrants, shares of different educational groups).

4.2 Model specification, empirical strategy and results

Following our explorative focus and our hypotheses of the importance of establishment's size, establishment's age, ownership and enterprise-group belonging, we start by a naïve setting, where the establishment's j probability of employing workers aged k or older is dependent only on the establishment's size (ES)

$$E[y_{jk}|ES_{jk}] = Pr(y_{jk} = 1|ES_{jk}) = Pr(\beta_k ES_{jk} + \varepsilon_{jk})$$

and we continue by adding on more variable or a group of dummy variables in each step; i.e., polynomial factors for establishment's size, establishment age, ownership, legal form, the demographical and socio-economic structure of the establishment.

This is done separately for each definition of older workers, starting with $k = 60$ or older (60+) until $k = 71$ or older (71+). This means that we estimate a probit model for each of our 12 definitions of older workers (i.e., 60+, 61+, ..., 71+). For each definition we use a hierarchical approach, first focusing on the hypothesis about the effect of establishment size on the probability of the establishment to employ older workers, and then adding a new variable each time when we test a new hypothesis. This implies that for each age-definition we estimated more than 25 models, which implies that totally we estimated more than 250 models. We do this in order to explore how sensitive the parameter estimates are to the model specification (Table x) and the definition of older workers.

Next, we present the marginal effects. However, the interpretation of the marginal effects of the probit model is not straightforward when the explanatory variables are in logarithmic

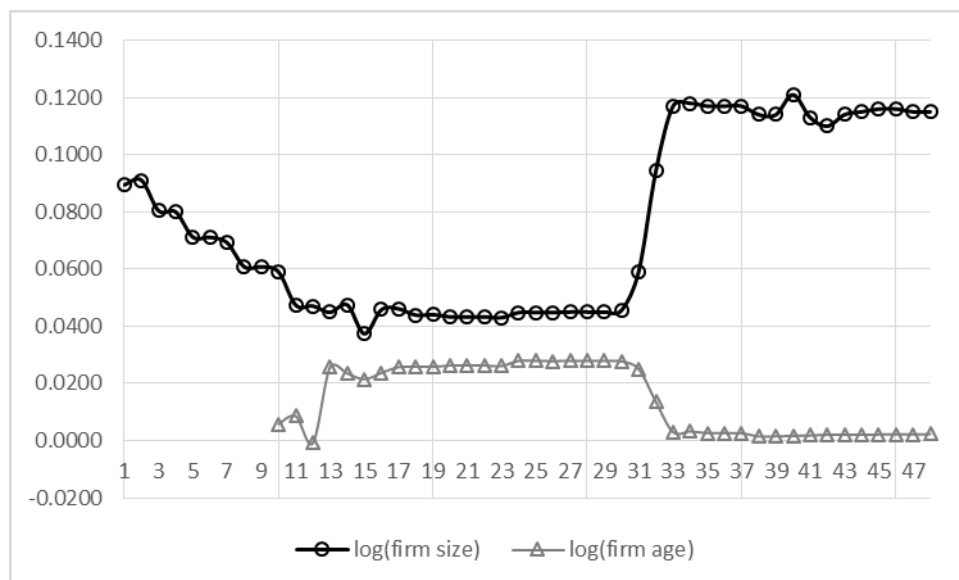
form (which we used it for both firm size and firm age in order to help the convergence of the maximum likelihood's algorithm). This implies that the interpretation of the marginal effect of any of this two explanatory variables is that a difference of 1 in $\ln(X)$, not percent, nor 1 percentage point. For example, the marginal effect for $\ln(\text{size})$ for the definition 65+ in the full specification (M48, Table 6), is associated with an increase of 0.0115 in the probability of employing older workers (i.e., $y = 1$).²

Given the complexity of interpretation, we will not interpret the magnitude of the estimated marginal effects. Instead, we will focus on the sensitivity of the marginal effects across model specification (Figures 3-4 and Tables 3-5) and across definition of old-age (Table 6). Figure 3 shows that the magnitude of marginal effects of the establishment's size and establishment's age are relatively sensitive to their interaction and their polynomial specification and the human capital structure of the establishment, but almost not affected by belonging to the Enterprise group (M16), Ownership form (M17), Legal form (M20), Swedish Standard Industrial Classification, SNI) (M29). The estimates are computed for the definition of 65+. The question is now how sensitive these estimates are. The definition becomes more restrictive with each step it is changed, which is mirrored by a progressive decrease in the number of the establishments employing older workers. Figure 4 shows how the magnitude of the estimated marginal effects of the establishment's size (on the primary axis) and the share of establishments employing older workers (on the secondary axis) decreases by the definition of older workers. As expected, there are much fewer establishments employing older workers with each one year increase on the age definition.

All tables and figures suggest that the *firm size* is an important factor for the decision of employing older workers. The magnitude of the average marginal effect is affected by the firm's age, ownership and sector. The most significant change was driven by the control of the self-employment, being driven by the combination of many micro-firms and own by younger and middle-age self-employed. The *firm ownership* is an important factor for the decision of employing older workers. *Private* firms with no group affiliation have a higher probability to employ workers 66 or older than firms owned by state and municipalities, which might be a results of different institutional rules. Foreign ownership implies a lower probability of employing older workers. Moreover, even the legal form of firm is an important factor, sole

² A difference of 1 in $\ln(X)$, when viewed from the perspective of x itself, means x being multiplied by $e = 2.71828$. So the absolute change in x is $2.718 \cdot X - X$, which simplifies to $1.718 \cdot X$. Putting that in percentage terms, it is a 172% change in X . So, if the "baseline" probability is, say 0.10, an increase of 1 in $\ln(\text{size})$, i.e., 172% in the establishment size, is associated to an expected probability of 0.1115. (or 11,15%).

Joint and limited partnership and non-profit organizations having a higher probability of employing older workers.



Note: 1= only size (an number of employees), 2= + size-dummy micro (self-employed); 3= + size-dummy small; 4= size-dummy medium; 5-9= + size polynomials terms; 10= + establishment age; ...

Figure 3 Marginal effects of establishment's size and age (in logarithmic form) on the probability of employing older workers, by *model specification*

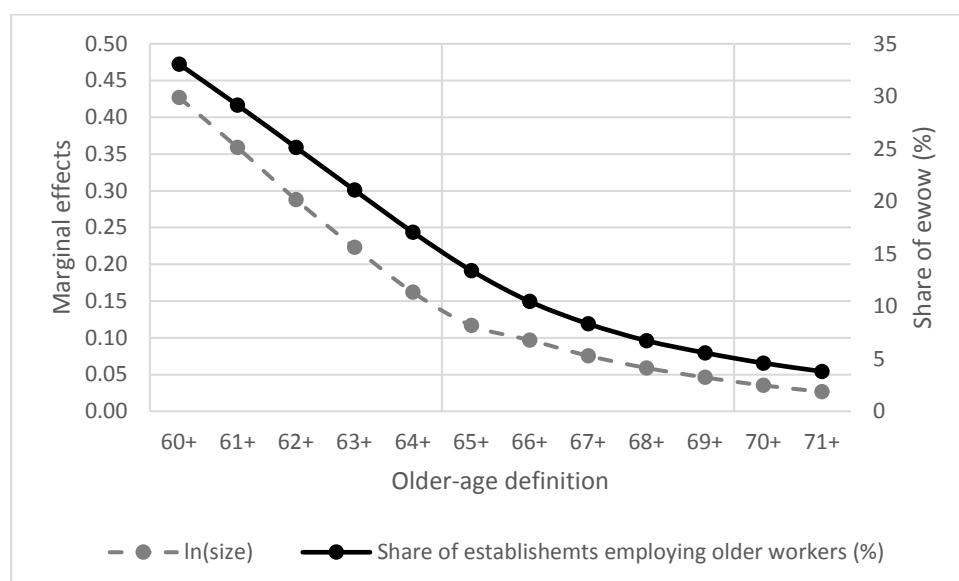


Figure 4 The marginal effects of the establishment *size* (on the primary axis) and the share of establishments employing older workers (on the secondary axis) by definition of older workers.

Table 3 Marginal effects. Probability of employing workers aged 65+; establishment *size* and *age*, their interaction and polynomial specification

	M1 Establishment size only	M2 + micro	M3 + small	M4 + medium	M10 + establishment age	M14 +polynomials & interactions
Ln(size)	0.224*** (0.000870)	0.204*** (0.00141)	0.196*** (0.00149)	0.196*** (0.00149)	0.147*** (0.00323)	0.124*** (0.00302)
Size-dummies (Ref: big, 45+)						
Micro (1)		-0.0636*** (0.00345)	-0.200*** (0.00890)	-0.213*** (0.0565)	-0.105 (0.0892)	-0.0929 (0.0849)
Small (2-9)			-0.131*** (0.00795)	-0.145** (0.0562)	-0.111 (0.0884)	-0.103 (0.0841)
Medium(10-44)				-0.0136 (0.0565)	-0.0862 (0.0883)	-0.0858 (0.0841)
Ln(age)					0.0631*** (0.000685)	0.0939*** (0.00425)
Polynomials (establishment size and age) and interactions						
	No	No	No	No	No/No/Yes	Yes

Table 4 Marginal effects. Probability of employing workers aged 65+, establishment size and age, *organizational variables added*

	M15	M16	M17	M20	M29
	Self-employed	Enterprise-gr	Ownership	Legal	SNI
Ln(size)	0.120*** (0.00579)	0.128*** (0.00593)	0.127*** (0.00592)	0.127*** (0.00595)	0.134*** (0.00606)
micro	-0.101 (0.0830)	-0.101 (0.0833)	-0.104 (0.0829)	-0.103 (0.0821)	-0.0834 (0.0838)
Small	-0.112 (0.0825)	-0.112 (0.0828)	-0.114 (0.0824)	-0.113 (0.0816)	-0.0937 (0.0833)
Medium	-0.0957 (0.0821)	-0.0960 (0.0824)	-0.0965 (0.0820)	-0.0932 (0.0811)	-0.0850 (0.0828)
Ln(age)	0.0926*** (0.00446)	0.0943*** (0.00448)	0.0961*** (0.00447)	0.0978*** (0.00447)	0.100*** (0.00451)
Polynomial & interactions	Yes	Yes	Yes	Yes	Yes
Self-employed	-0.00969 (0.0113)	-0.00981 (0.0113)	-0.0109 (0.0112)	-0.00815 (0.0112)	-0.00648 (0.0113)
Enterprise-gr		-0.0288*** (0.00191)	-0.0397*** (0.00421)	-0.0308*** (0.00418)	-0.0287*** (0.00418)
Ownership (Ref: state & municipality)					
private, no group affiliation			0.0221*** (0.00521)	-0.186*** (0.0117)	-0.180*** (0.0117)
private, group affiliation			0.0444*** (0.00371)	-0.161*** (0.0113)	-0.160*** (0.0113)
other			0.0314*** (0.00421)	-0.183*** (0.0115)	-0.177*** (0.0115)
Legal form (CG: Limited liability establishment except B&I)					
Joint and limit. partnership				0.256*** (0.0123)	0.259*** (0.0126)
Non-profit organization				0.398*** (0.0135)	0.408*** (0.0139)
Other				0.239*** (0.0119)	0.244*** (0.0121)
Swedish Standard Industrial Classification (SNI),					
d_sni02b2					-0.00376 (0.00485)
d_sni02b21					-0.0563*** (0.00343)
d_sni02b24					-0.0596*** (0.00346)
d_sni02b25					0.00566 (0.00369)
d_sni02b32					0.0102*** (0.00309)
d_sni02b_other					-0.0138*** (0.00277)

Table 5 Marginal effects. Probability of employing workers aged 65+, establishment size and age, *establishment's human capital* (demographics and education)

	M30	M31	M32	M33	M48
<i>adding</i>	<i>pct male</i>	<i>pct 1624</i>	<i>pct 2539</i>	<i>pct 4054</i>	ALL
Ln(size)	0.0456*** (0.00363)	0.0591*** (0.00412)	0.0943*** (0.00543)	0.117*** (0.00642)	0.115*** (0.00672)
micro	-0.00302 (0.0141)	-0.00450 (0.0144)	-0.00967 (0.0155)	-0.0161 (0.0157)	-0.0180 (0.0158)
small	0.00175 (0.0137)	0.00178 (0.0140)	-0.00116 (0.0151)	-0.00527 (0.0152)	-0.00648 (0.0152)
medium	-0.00688 (0.0128)	-0.00662 (0.0131)	-0.00959 (0.0141)	-0.0129 (0.0142)	-0.0141 (0.0143)
Ln(age)	0.0277*** (0.00259)	0.0250*** (0.00262)	0.0136*** (0.00275)	0.00298 (0.00287)	0.00228 (0.00288)
Polynomials (size and age), interactions, ownership, legal form, SNI	Yes	Yes	Yes	Yes	Yes
Men (%)	9.34e-05*** (1.02e-05)	8.69e-05*** (1.03e-05)	8.63e-05*** (1.12e-05)	4.78e-05*** (1.17e-05)	0.000151*** (1.73e-05)
16-24 years old (%)		-0.00149*** (5.91e-05)	-0.00192*** (7.29e-05)	-0.00283*** (0.000106)	-0.00279*** (0.000106)
25-39 years old (%)			-0.00167*** (5.88e-05)	-0.00252*** (9.07e-05)	-0.00241*** (8.78e-05)
40-54 years old (%)				-0.00199*** (7.13e-05)	-0.00192*** (6.97e-05)
More demographics: percentage employees by country of birth; Socio-economic: percentage employees by educational level, wages by gender, education, country of birth	No	No	No	No	Yes

Table 6 Probit estimates, Marginal effects by definition

VARIABLES	60+	61+	62+	63+	64+	65+	66+	67+	68+	69+	70+	71+
lnsize	0.427***	0.359***	0.288***	0.223***	0.162***	0.117***	0.0969***	0.0756***	0.0590***	0.0461***	0.0352***	0.0266***
Ownership (CG: state & municipality)												
private, no group affiliation	-0.0797***	-0.0565***	-0.0346***	-0.0215***	-0.0122**	-0.00171	0.0108***	0.0144***	0.0125***	0.00980***	0.00616***	0.00561***
private, group affiliation	-0.0990***	-0.0763***	-0.0579***	-0.0449***	-0.0352***	-0.0250***	-0.0122***	-0.00619*	-0.00491*	-0.00510**	-0.00620***	-0.00490***
foreign	-0.125***	-0.103***	-0.0880***	-0.0800***	-0.0718***	-0.0640***	-0.0567***	-0.0489***	-0.0441***	-0.0389***	-0.0340***	-0.0279***
Legal form (CG: Limited liability establishment except B&I)												
Joint and limited partnership	-0.0101	0.000836	0.00475	0.0155**	0.0221***	0.0312***	0.0447***	0.0382***	0.0357***	0.0329***	0.0299***	0.0247***
Non-profit organization	0.0211	0.0196	0.00652	0.00971	0.0156**	0.0251***	0.0373***	0.0350***	0.0335***	0.0318***	0.0305***	0.0266***
Other	0.0775***	0.0733***	0.0600***	0.0606***	0.0601***	0.0614***	0.0709***	0.0613***	0.0559***	0.0502***	0.0444***	0.0367***
Swedish Standard Industrial Classification (SNI)												
Skogsbruk och service	-0.0196***	-0.0143***	-0.00845**	-0.00196	-0.00472*	-0.00672***	-0.00687***	-0.00603***	-0.00491***	-0.00529***	-0.00388***	-0.00492***
Paper industry	-0.0486***	-0.0473***	-0.0446***	-0.0390***	-0.0361***	-0.0324***	-0.0326***	-0.0307***	-0.0277***	-0.0238***	-0.0196***	-0.0165***
Chemicals	-0.0190***	-0.0158***	-0.0108***	-0.00806***	-0.00861***	-0.00940***	-0.0144***	-0.0145***	-0.0134***	-0.0118***	-0.00898***	-0.00764***
Platic	0.00379	0.00133	0.00104	0.00198	0.00272	0.00532**	0.00316*	0.000714	-0.00101	-0.00195	-0.00336***	-0.00416***
Tele-products (production)	-0.00770**	-0.00459	-0.000153	0.00310	0.00211	0.00413**	0.00303*	0.000865	1.16e-05	-0.000601	-0.000827	-0.00103
Other	-0.00506	-0.00278	0.000933	0.00435*	0.00470**	0.00646***	0.00492***	0.00401***	0.00357***	0.00354***	0.00354***	0.00336***
d_sektor30	-0.0144***	-0.0168***	-0.0174***	-0.0190***	-0.0201***	-0.0179***	-0.0205***	-0.0196***	-0.0174***	-0.0166***	-0.0147***	-0.0126***
d_sektor31	-0.166***	-0.139***	-0.116***	-0.100***	-0.0878***	-0.0775***	-0.0625***	-0.0538***	-0.0473***	-0.0413***	-0.0362***	-0.0313***
d_sektor32	0.157***	0.143***	0.128***	0.110***	0.0905***	0.0720***	0.0602***	0.0508***	0.0430***	0.0360***	0.0282***	0.0219***
d_sektor_other	0.0675***	0.0455***	0.0371***	0.0319***	0.0268***	0.0251***	0.0236***	0.0227***	0.0198***	0.0177***	0.0153***	0.0129***

(Table X container)

VARIABLES	60	61	62	63	64	65	66	67	68	69	70	71
Men (%)	0.000160***	0.000190***	0.000190***	0.000187***	0.000175***	0.000167***	0.000157***	0.000134***	0.000107***	8.34e-05***	6.21e-05***	4.72e-05***
Age groups (CG: 55+), %												
pct_1624	-0.0106***	-0.00871***	-0.00682***	-0.00518***	-0.00372***	-0.00264***	-0.00207***	-0.00158***	-0.00120***	-0.000933***	-0.000720***	-0.000541***
pct_2539	-0.00854***	-0.00693***	-0.00546***	-0.00417***	-0.00304***	-0.00219***	-0.00175***	-0.00134***	-0.00104***	-0.000825***	-0.000640***	-0.000490***
pct_4054	-0.00757***	-0.00604***	-0.00467***	-0.00350***	-0.00250***	-0.00177***	-0.00141***	-0.00106***	-0.000800***	-0.000616***	-0.000467***	-0.000349***
Educational level (CG: low)												
High-school	-0.000594***	-0.000541***	-0.000513***	-0.000450***	-0.000382***	-0.000316***	-0.000280***	-0.000252***	-0.000232***	-0.000216***	-0.000201***	-0.000180***
More than high-school	-0.000792***	-0.000645***	-0.000533***	-0.000422***	-0.000327***	-0.000228***	-0.000160***	-0.000146***	-0.000144***	-0.000149***	-0.000150***	-0.000140***
Country of birth (SG: SE)												
pct_norden	-0.000388***	-0.000308***	-0.000195***	-0.000105***	-7.74e-06	-2.92e-05	-4.33e-05*	-3.27e-05	-2.61e-05	-3.44e-05**	-2.74e-05*	-2.90e-05**
pct_other_europa	-0.000227***	-8.73e-05*	-1.34e-05	3.67e-05	2.06e-05	-1.44e-05	-3.72e-05	-3.23e-05	-2.60e-05	-2.73e-05*	-2.45e-05*	-3.09e-05**
pct_other	-0.00165***	-0.00148***	-0.00128***	-0.00104***	-0.000821***	-0.000674***	-0.000525***	-0.000432***	-0.000335***	-0.000261***	-0.000202***	-0.000176***
Earnings (10 thsd SEK)												
men	-0.0293***	-0.0300***	-0.0262***	-0.0237***	-0.0198***	-0.0159***	-0.0167***	-0.0144***	-0.0120***	-0.00969***	-0.00749***	-0.00570***
women	-0.0140***	-0.0126***	-0.0116***	-0.00922***	-0.00705***	-0.00462***	-0.00511***	-0.00411***	-0.00333***	-0.00212***	-0.00150***	-0.000841**
Observations	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226
Standard errors in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												
NOTE: All predictors at their mean values												

5 Discussion and concluding remarks

While both researchers and politicians increasingly view active aging as a potential problem, the relatively large variation in employment of older workers across firms and establishments remains poorly understood. An array of possible explanations exists. The most straightforward are differences in rules and laws that regulate the age when the individuals can be employed, but also an expectation of different attitude among employers to avoid investing in older workers. This paper presented an explorative analysis of the characteristics of the firms employing older workers with a focus on the definition of older workers, since this varies across studies. For example, even though Hutchens (1986)'s model builds on Lazear (1979)'s study and also uses US data, the definition of older workers in these two papers is different, but for understandable reasons. Lazear's paper offers both theoretical explanation and empirical evidence of the use of mandatory-retirement clauses in labor contracts. The data used in the empirical analysis came from the Longitudinal Retirement History Survey, 1969-71, a panel study of about 11,000 individuals who were **58-63 years old** in 1969, with a follow-up survey in 1971. Maybe the most important aspect in the design of Lazear's empirical analysis is the presentation of the institutional setting and the importance of mandatory retirement. However, at the end of the 1970's the Congress has enacted legislation that extended coverage to workers up to age 70 in contrast to the previous age 65. Essentially, this outlaw the use of mandatory retirement at age 65, a previous common practice. Most explanations for this age rely on the notion that a worker's productivity declines significantly after age 65, and therefore it may be viewed as optimal to terminate workers at a certain age rather than to reduce their wages accordingly. Therefore, employers could use the human capital of older workers as long as these people are able and willing to work to a satisfactory productivity.

Our results are important for policy makers confronted with increasing demand for government spending on pension, healthcare, and other social insurance programs for the

elderly, and shortcuts of human capital in various occupations. Our results may therefore help policy makers to design a more effective policy for prolonging peoples' work life. However, as suggested by Birch (1979), it seems that policymakers should focus on job replacement rather than reducing the rate of job loss. Pleasant physical environment and strong local government are important incentives for establishment location, and should be further investigated in relation to job generation. Nonetheless, the focus should mostly be on supporting people to continue to work according to their capacities and preferences as they grow older.

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Table A1 Probit estimates 65+

a) Specification 1-14: establishment size, age and their polynomial and interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Insize	0.465***	0.474***	0.415***	0.413***	0.267***	0.231***	0.584***	1.566***	1.566***	1.481***	1.679***	1.683***	1.690***	1.682***
micro		0.0265**	-0.388***	-0.553***	0.234***	0.172*	0.227***	-0.101	-0.101	-0.0897	-0.0942	-0.0921	-0.0903	-0.0984
small			-0.357***	-0.517***	0.214***	0.142	0.237***	-0.0831	-0.0831	-0.0774	-0.0806	-0.0786	-0.0784	-0.0886
medium				-0.166***	0.314***	0.245***	0.275***	-0.0650	-0.0650	-0.0587	-0.0759	-0.0755	-0.0738	-0.0945
Polynomial and interaction variables														
c.Insize#c.Insize					0.0435***	0.0619***	-0.173***	-1.011***	-1.011***	-0.955***	-1.106***	-1.107***	-1.105***	-1.144***
c.Insize#c.Insize#c.Insize						-0.00245	0.0534***	0.355***	0.355***	0.337***	0.382***	0.382***	0.381***	0.376***
c.Insize#c.Insize#c.Insize#c.Insize							-0.0042***	-0.0516***	-0.0516***	-0.0488***	-0.0548***	-0.0546***	-0.0544***	-0.0521***
c.Insize#c.Insize#c.Insize#c.Insize#c.Insize								0.0026***	0.0026***	0.0024***	0.0027***	0.0027***	0.0027***	0.0025***
Inestablishment_age										0.0301***	-0.318***	-0.169***	1.189***	0.858***
c.Inestablishment_age#c.Inestablishment_age										0.114***	-0.0238	-3.194***	-2.613***	
c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age											0.0304***	2.533***	2.037***	
c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age												-0.816***	-0.637***	
c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age#c.Inestablishment_age													0.0945***	0.0712***
c.Insize#c.Inestablishment_age														0.0770***

b) Specification 15-23

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
Ln(size)	0.635*	0.575	0.605*	0.679*	0.629*	0.540	0.545	0.547	0.471
Ln(Age)	0.855***	0.934***	1.075***	1.077***	1.079***	1.151***	1.150***	1.149***	1.159***
Ln(size)'Ln(Age)	0.0770***	0.0814***	0.0886***	0.0907***	0.0893***	0.0921***	0.0919***	0.0920***	0.0883***
Polynomials; size, age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
self_e	-0.106***	-0.107***	-0.103***	-0.104***	-0.106***	-0.0922**	-0.0913**	-0.0911**	-0.0950***
ent_group		-0.223***	-0.199***	-0.204***	-0.203***	-0.173***	-0.173***	-0.173***	-0.173***
d_agkat5			0.202***	0.284***	0.264***	-0.379***	-0.377***	-0.379***	-0.395***
d_agkat6			0.253***	0.242***	0.194***	-0.451***	-0.451***	-0.453***	-0.456***
d_agkat_other			0.0330**	0.0288**	0.0321**	-0.600***	-0.600***	-0.600***	-0.596***
c.micro#c.d_agkat5				-0.142***	-0.0718***	-0.0585***	-0.0602***	-0.0563***	-0.0448**
c.micro#c.d_agkat6					0.124***	0.136***	0.135***	0.140***	0.140***
d_jurform4						0.761***	0.683***	0.686***	0.721***
d_jurform12						1.206***	1.206***	1.201***	1.219***
d_jurform_other						0.709***	0.709***	0.712***	0.417***
c.micro#c.d_jurform4							0.0815	0.0717	0.0498
c.micro#c.d_jurform_other								-0.0104	0.298***
c.small#c.d_jurform_other									0.372***

c) Specification 24-42

	(24)	(30)	(34)	(36)	(39)	(40)	(41)	(48)
lnsize	0.587	0.621*	3.015***	2.960***	2.942***	3.064***	2.980***	2.951***
lnestablishment_age	1.216***	1.214***	-0.109	-0.152	-0.171	-0.193	-0.160	-0.145
self_e	-0.0875**	-0.0869**	-0.0747*	-0.0776**	-0.0850**	-0.0852**	-0.0860**	-0.0885**
ent_group	-0.162***	-0.166***	-0.125***	-0.126***	-0.128***	-0.126***	-0.125***	-0.126***
d_agkat5	-0.336***	-0.340***	-0.105***	-0.108***	-0.102***	-0.106***	-0.103***	-0.121***
d_agkat6	-0.416***	-0.411***	-0.218***	-0.215***	-0.212***	-0.214***	-0.217***	-0.225***
d_agkat_other	-0.565***	-0.555***	-0.465***	-0.449***	-0.444***	-0.448***	-0.458***	-0.462***
d_jurform4	0.722***	0.707***	0.575***	0.557***	0.551***	0.589***	0.591***	0.588***
d_jurform12	1.192***	1.171***	0.876***	0.865***	0.851***	0.882***	0.879***	0.881***
d_jurform_other	0.411***	0.378***	0.288***	0.266***	0.250***	0.288***	0.296***	0.290***
d_sni02b_other	0.0377***	0.0253	-0.0549*	-0.0531	-0.0465	-0.0518	-0.0522	-0.0520
Interactions								
pct_male		0.000675***	0.000328***	0.000161**	0.000190**	0.000550***	0.000984***	0.00101***
pct_ages			-0.0186***	-0.0189***	-0.0186***	-0.0188***	-0.0186***	-0.0186***
pct_egymn				-0.00181***	-0.00186***	-0.00179***	-0.00192***	-0.00152***
pct_flandovr					-0.00511***	-0.00522***	-0.00518***	-0.00588***
lmanloneink10tkr						-0.0302***	-0.0209***	-0.00990
lkvloneink10tkr							0.0487***	0.0611***
All income groups								0.0247***
Constant	-1.629***	-1.654***	-2.018***	-1.852***	-1.815***	-1.919***	-1.916***	-1.906***
Observations	473,226	473,226	473,226	473,226	473,226	473,226	473,226	473,226