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The Relationship between Firm Size and Age of Workforce: A Cross-industry Analysis for Canada

by Jiaosheng He, Derek Messacar, and Yuri Ostrovsky

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The Relationship between Firm Size and Age of Workforce: A Cross-industry Analysis for Canada

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Analytical Studies: Methods and References

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Abstract

Using an employer–employee matched dataset of administrative tax records on most Canadian firms and the full populations of their workers, this paper documents relationships between firm size, industry, and the typical ages of firms' workforces. In particular, the paper considers both differences in levels for the calendar years 2003 to 2010 inclusive, as well as changes in the age composition of firms' workforces over this time as observed in a longitudinal analysis. The results indicate that there is substantial heterogeneity in the ages of firms' workforces across both firm size and industry. In addition, the extent to which the age composition of firms' workforces changed over time is strongly correlated with the size of firms, where smaller firms saw the largest increases in age composition. The implications of these findings for Canadian research and policy are briefly discussed.

Executive summary

This study assesses the relationship between firm size, primary industry of operation, and the typical age of firms' workforces. To this end, the analysis uses a matched employer–employee dataset of administrative tax records on most Canadian firms and the full populations of their workers. The study's key findings include the following:

1. Small firms comprised the majority of firms in Canada during the period from 2003 to 2010, but large firms were still significant employers of Canadian workers.

    a. Approximately 92.2% of firms employ 1 to 19 workers, whereas 6.5% of firms employ 20 to 99 workers, 1.1% of firms employ 100 to 499 workers, and 0.2% of firms employ 500 or more workers.

    b. Although large firms were few in number, they employed a large share of the Canadian workforce across most industries. On average, 20.2% of workers belonged to firms with 1 to 19 workers, whereas 61.5% of workers belonged to firms with 100 workers or more.

    c. The industry that employed the most workers within firms of 1 to 19 workers is agriculture.

2. There was substantial heterogeneity in the ages of firms' workforces across both firm size and industry.

    a. The industries with the lowest median ages were accommodation (36.3 years), arts (37.6 years), construction (39.9 years), and retail trade (39.9 years).

    b. The industries with the highest median ages were management (49.0 years), finance (48.0 years), and real estate (47.0 years).

The extent to which the age composition of firms' workforces changed over time is strongly correlated with firm size, where smaller firms saw the largest increases in age composition.

1 Introduction

A large literature in economics assesses the relationships between observed characteristics of firms and their workforces, and examines how these relationships affect firm performance. Much of this research centres on how worker heterogeneity affects firm productivity. For example, several studies have found that an educationally diverse workforce has mixed to positive effects on productivity, but that cultural or ethnic diversity has an opposite effect (Parrotta, Pozzoli, and Pytlikova 2012, 2014; Garnero, Kampelmann, and Rycx 2014). Other studies have focused on the effects of gender diversification; for example, Pfeifer and Wagner (2014) showed that firm profitability increases slightly with the share of female workers.

There have also been many empirical studies on the relationship between the age of firms' workforces and firms' productivity and innovative use of new technologies (see, for example, Dostie 2011). A survey of this literature suggests that the relationship between worker age and creative performance tends to follow a hump-shaped profile (Frosch 2011). In addition, greater age diversification within firms can have positive effects on productivity (Backes-Gellner and Veen 2013). Firms with a larger proportion of young workers can be more likely to adopt new technologies, but the overall age dispersion of the workforce does not always have significant impact on technological innovation (Meyer 2008, 2011). In contrast, firms with a large share of older workers or a wider age dispersion tend to have relatively low survival rates (Kuhn 2013).

Despite the breadth of this literature, few studies have investigated the relevance of the age of firms' workforces by firm size or industry. A recent study by De Meulenaere, Boone, and Buyl (2016) is a notable exception; it shows that the negative effect of age polarization on productivity is emphasized by firm size. Taken together, the well-documented effects of age characteristics of firms' workforces on various firm outcomes suggest that a better understanding of existing relationships between firm size, industry, and the ages of workers in Canada has significant policy implications. This is especially true given the trend of an aging workforce.

Against this background, the objective of this paper is to assess the relationship between firm size and the age of firms' workforces. In particular, the paper makes two contributions in this regard. The first is to provide new estimates of this relationship for firms of different sizes, and to document the extent to which differences exist across industries. The second is to assess changes over time in the age composition of firms' workforces for the years from 2003 to 2010, a time period that coincides with the economic recession that began in 2008. To this end, the analysis uses a novel linked dataset based on longitudinal administrative tax records from both workers and employers. A unique characteristic of this dataset is that every incorporated and unincorporated business that issued at least one T4 *Statement of Remuneration Paid* slip in any tax year since 1991 is observed. In addition, among these firms, every T4 slip recipient is also observed. This permits the age of firms' workforces to be calculated with precision.[1] It is important to note that the longitudinal analysis focuses on changes in the composition of firms' workforces only for those firms observed in both 2003 and 2010.

Hence, this analysis centres on a subset of all firms that operated over this time period, namely those that existed in 2003 and survived to 2010. The purpose of this sample restriction is to allow the analysis to consider how the age of specific firms' workforces changed by size and industry (i.e., the unit of analysis is the firm) rather than how the ages of workers across firms changed by size and industry. A limitation of this approach is that firm dynamics, such as entry decisions and

1. An interesting characteristic common to every study cited above is that they used employer–employee matched data from European countries, notably Belgium, Denmark, and Germany. Few studies have been carried out in the Canadian context. This is likely due to the lack of data on firms matched to information about the full populations of their workers. This study provides a unique look at the relationships between firm size, industry, and the age of firms' workforces using a recently-constructed data file, with the goal of providing useful statistics to support research on productivity, profitability, survival rates, and other economic outcomes of interest in Canada.

survival rates, are not taken into account. These issues are interesting but ultimately outside the scope of the present analysis, instead representing a promising direction for future work on this topic.

A limitation of administrative data is that it is not possible to identify whether a worker was employed by a firm on a full-time or part-time basis, or for only part of the calendar year. This is problematic because the inferred age of a firm's workforce may not reflect the value that would be obtained from a full-time-equivalent-adjusted workforce, which provides a better measure of actual labour input—especially for firms operating in industries that typically employ a large number of part-time or seasonal workers. To overcome this issue, auxiliary information from the Labour Force Survey (LFS) is used to impute individuals' hourly wages and hours worked across groups by age, sex, industry of employment, and firm size.

Several key findings are reported here. First, the age composition of a typical workforce was found to vary substantially across both industries and firm sizes. Second, in some cases, the age composition of firms' workforces changed significantly from 2003 to 2010, as observed in the longitudinal analysis. Third, the magnitude of the change in age composition over this time period is highly correlated with firm size: for example, firms with fewer than 100 workers experienced large increases in the average ages of their workforces. This may be due to the fact that many smaller firms are owner-operated. Firms with 500 or more workers, in contrast, experienced only slight increases in the average ages of their workers, although the general trend, irrespective of firm size, was towards an aging workforce.

This paper proceeds as follows. Section 2 describes the data and sample selection used in this study, including the restrictions needed to carry out the longitudinal analysis. Section 3 describes an empirical method used for adjusting the data to a full-time equivalence scale. Section 4 presents the main findings on the relationship between firm size, industry, and the age of firms' workforces, based on pooled data from 2003 to 2010. Section 5 shows the results of the longitudinal analysis with respect to changes in age compositions over this time period. In Section 6, results of a robustness check on the method of adjusting for a full-time-equivalent workforce are briefly described. The last section, Section 7, concludes.

2 Data and sample selection

This project is based on components of the Canadian Employer–Employee Dynamics Database (CEEDD), namely the Longitudinal Employment Analysis Program (LEAP), the T4 Supplemental Files and the T1 Family File (T1FF). To provide context for the analysis, each of these datasets is briefly described in turn.

First, the LEAP is an administrative dataset based on records from the Business Register and the Survey of Employment, Payrolls and Hours, and is designed to provide data on trends in the employment levels of Canadian firms. These data cover the entire Canadian economy, and include all incorporated and unincorporated businesses that issued at least one T4 slip in any tax year since 1991. Second, the T4 Supplemental Files are records of supplementary tax forms issued by employers for any earnings that either exceeded a certain amount or triggered income tax, Canada Pension Plan or Quebec Pension Plan contributions, or Employment Insurance benefits.[2] Third, the T1FF is a yearly file of the individuals represented and their census families. This dataset provides a wide range of information about demographics, employment, income, taxes, allowances, and transfers from individuals' income tax records.

2. The earnings threshold changed over time; for example, this threshold was $500 in 2010 (Canada Revenue Agency 2010).

The CEEDD spans the time period from 2003 to 2010. These data have two key characteristics that facilitate a study of the relationship between firm size, industry, and the age of firms' workforces. First, the employee records in the CEEDD are deterministically linked to firm tax data from the LEAP; this results in a credibly matched employer–employee dataset. Second, the CEEDD contains a 100% sample of all T4 slip recipients, which makes it possible to identify every T4 slip recipient employed in a firm in any year over the relevant time period. Since the entire workforce of each firm is observed, the ages of that firm's workers are known; consequently, descriptive statistics for every workforce are both reliable and precise.

The empirical analysis proceeds in two stages. The first stage is an analysis of the relationship between firm size and the age of firms' workforces by industry based on a pooled dataset for the years 2003 to 2010 inclusive. The number of observations in this analysis is 8,409,627, which corresponds to a count of the number of firms and the number of times that each firm is observed (each firm is observed at least one time and a maximum of eight times). The second stage is a longitudinal analysis of changes in the ages of firms' workforces over time, from 2003 to 2010. This longitudinal approach restricts the analysis to firms that existed in both years, in order to draw comparisons over time. There are 583,173 firms in this analysis; this number represents approximately 58% of all firms in 2003 and 55% of all firms in 2010. To analyze changes over time by firm size, firms are assigned into one of four firm-size categories according to the number of workers comprising each firm's workforce in 2010.

3 Adjustment for full-time equivalence

This study uses date-of-birth information from workers' administrative tax records to calculate the age distribution within a firm. This approach offers a snapshot of the age distribution of a firm's workforce as of December 31 of the reference year. This is an imperfect, but time-consistent, reflection of labour input. However, a more accurate calculation of the age of a firm's workforce based on total labour inputs used during the reference year would take into account the length of time that each worker spent with the firm. For example, a firm may commonly employ young workers on a part-time basis, whereas the majority of middle-aged and older workers are full-time workers. Failing to take this characteristic of the firm's workforce into account by assigning less weight to part-time workers relative to full-time workers would bias downwards the true average age of the labour input used by the firm over the course of the year. A limitation of administrative data is that the length of time each worker spent working at a firm is not observed.

To overcome this issue, workers' hourly wages are imputed from the LFS on the basis of workers' observed age, their sex, their industry of employment, and the firm size. More precisely, calculations for average hourly wages in the LFS are performed across 912 cells; these are based on the interaction of the following categories: age (six groups), sex (two groups), industry (19 groups), and firm size (four groups). The average hourly wage across all individuals in each cell is subsequently assigned to the individual in the CEEDD corresponding to that cell. Note that six cells were dropped as a result of insufficient sample sizes in the LFS; these cells correspond to only approximately 0.01% of the CEEDD sample. The annual hours worked, h_{icjt}, for each individual i of cell c in firm j for reference year t were computed as follows:

$$h_{icjt} = \frac{y_{icjt}}{w_{cjt}}, \tag{1}$$

where y_{icjt} is annual earnings and w_{cjt} is the imputed hourly wage. For compactness, the rest of this paper will drop the cell grouping notation; for example, $h_{icjt} \equiv h_{ijt}$.

The variable denoting annual hours of work, h_{ijt}, can be used as a weight of the relative importance of individual i in the production process of firm j throughout the reference year. This is done by expressing h_{ijt} as a fraction of the total labour hours used by the firm: $H_{jt} = \Sigma_i h_{ijt}$. Hence, this weight factor is denoted by $\lambda_{ijt} = h_{ijt} / H_{jt}$.

To see how λ_{ijt} adjusts the calculation of a firm's age distribution when a measure of full-time equivalence is used, consider the following example. In a particular firm j at time t, there are three workers, whose ages are $a_{1t} = 20$, $a_{2t} = 30$, and $a_{3t} = 40$. Let us suppose these workers' hours worked are $h_{1jt} = 500$, $h_{2jt} = 1{,}000$, and $h_{3jt} = 2{,}000$. Then, the unweighted average age in firm j at time t is $A^u_{jt} = (20 + 30 + 40) \div 3 = 30$. In contrast, the weighted average is the following:

$$A^w_{jt} = \sum_i \left(a_{it} \times \lambda_{ijt} \right) = \left(20 \times \frac{500}{3{,}500} \right) + \left(30 \times \frac{1{,}000}{3{,}500} \right) + \left(40 \times \frac{2{,}000}{3{,}600} \right) = 34.3. \quad (2)$$

The weighted approach for calculating the average age of workers in a firm assigns more value to individuals who worked for longer in the firm throughout the year. In this case, the calculated value of the average age in Equation (2) is shifted upward relative to the unweighted average. This reflects the fact that this firm used more labour input from workers who were comparatively older.

In addition, the weight λ_{ijt} can be used to compute the share of older workers—defined herein as those 50 years of age and older—in a firm. The share of older workers in firm j at time t is computed as follows:

$$S_{jt} = \sum_i \left\{ 1(a_{it} \geq 50) \times \lambda_{ijt} \right\}, \quad (3)$$

where $1(a_{it} \geq 50)$ is the indicator function for whether individual i is at least 50 years old in year t, which takes the value of "1" if this argument is true and the value of "0" otherwise.

4 Primary findings

The primary analysis of the relationship between firm size, industry, and the age of workforce is presented here. These results are based on employer–employee matched tax records pooled over the time period from 2003 to 2010.

4.1 Distributions of firms and workers, by firm size and industry

This section documents differences in the distributions of firms and workers across four firm size categories: very small (1 to 19 workers); small (20 to 99 workers); medium-sized (100 to 499 workers); and large (500 or more workers). The variation documented in this section will play an important role in explaining the findings presented in the remainder of this paper.

Table 1 shows the percentages of firms and workers belonging to each of the four firm size categories, by industry. In particular, the table presents the average values of the shares of firms and workers in each category, from 2003 to 2010. This timeframe includes the economic downturn that began in 2008, in which the numbers of firms and jobs were negatively affected by the deteriorated economic conditions.

Table 1
Distributions of firms and workers by firm size and industry

	Distribution of firms				Distribution of workers			
	Fewer than 20 workers	20 to 99 workers	100 to 499 workers	500 or more workers	Fewer than 20 workers	20 to 99 workers	100 to 499 workers	500 or more workers
	percent							
All industries	92.2	6.5	1.1	0.2	20.2	18.4	14.7	46.8
Industry								
Agriculture, forestry, fishing and hunting	97.7	2.1	0.2	0.0	63.2	24.6	9.8	2.4
Mining, quarrying, and oil and gas extraction	91.7	6.0	1.6	0.7	10.5	10.8	14.5	64.2
Utilities	75.7	15.3	5.6	3.5	2.2	3.8	6.7	87.3
Construction	94.3	5.1	0.5	0.1	43.8	29.6	14.3	12.2
Manufacturing	78.0	17.2	4.0	0.8	11.1	21.8	23.9	43.1
Wholesale trade	88.0	10.1	1.6	0.3	24.8	28.7	21.4	25.1
Retail trade	89.7	9.0	1.1	0.2	21.2	21.8	11.3	45.7
Transportation and warehousing	92.9	5.9	1.0	0.2	17.7	16.8	13.5	51.9
Information and cultural industries	89.8	7.9	1.8	0.5	9.4	11.5	12.4	66.8
Finance and insurance	93.2	5.1	1.2	0.4	11.7	10.6	11.9	65.8
Real estate and rental and leasing	96.3	3.1	0.5	0.1	40.7	22.4	16.1	20.8
Professional, scientific and technical services	96.6	2.9	0.4	0.1	36.2	19.2	13.9	30.7
Management of companies and enterprises	95.2	3.8	0.8	0.2	23.7	16.4	17.3	42.6
Administrative and support, waste management and remediation services	91.9	6.5	1.3	0.4	19.7	17.5	17.4	45.3
Educational services	85.0	8.7	3.1	3.1	3.3	4.2	7.7	84.8
Health care and social assistance	92.1	6.0	1.5	0.4	18.8	13.7	16.7	50.7
Arts, entertainment and recreation	90.5	8.0	1.3	0.2	24.2	25.0	19.2	31.7
Accommodation and food services	84.6	13.8	1.5	0.1	28.4	37.1	16.7	17.8
Other services (except public administration)	97.1	2.6	0.3	0.0	51.7	22.0	15.4	10.9

Notes: The "Distribution of firms" statistics show the percentage of firms in each industry that belong to each size category. The "Distribution of workers" statistics show the percentage of workers in each industry for each firm size category. The firm size categories are based on national employment data. The percentage distributions may not add up to 100% because of rounding. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

The results of this analysis show that there was significant heterogeneity in the sizes of firms across industries, as indicated by the variation in these shares across firm-size categories. The “Distribution of firms” columns indicate that, in aggregate across all industries, 92.2% of firms were very small (that is, they have 1 to 19 workers), whereas small (6.5%), medium-sized (1.1%), and large (0.2%) firms each accounted for a minor share of all firms. This pattern is consistent with the long-standing statistical regularities observed across industries and countries (Gautier et al. 1999; Bartelsman, Haltiwanger, and Scarpetta 2009). However, the extent of skewness towards very small firms was not uniform across all industries.

The highest concentration of very small firms was found in agriculture (97.7%), other services (97.1%), professional services (96.6%), real estate (96.3%), and management (95.2%). In contrast, the concentration of very small firms was moderate in utilities (75.7%) and manufacturing (78.0%). This pattern is not surprising given that there are often high fixed costs to firms operating in these industries, which require large economies of scale to operate profitably. The corollaries of high and moderate concentrations of very small firms in these industries are the following. First, these industries had fewer medium-sized and large firms; for example, in agriculture, 0.2% of firms were medium-sized firms and 0.0% of firms were large firms. Second, there were more medium-sized and large firms in such industries as utilities (5.6% of firms were medium-sized firms, and 3.5% of firms were large firms), manufacturing (4.0% of firms were medium-sized firms, and 0.8% of firms were large firms), and educational (3.1% of firms were medium-sized firms, and 3.1% of firms were large firms), where the fixed costs of operating can be substantial.

Despite the relative scarcity of large firms, they accounted for a sizeable share of workers across almost all industries, as shown in the "Distribution of workers" columns in Table 1. On average, 20.2% of workers were employed in very small firms, whereas 14.7% of workers were employed in medium-sized firms and 46.8% were employed in large firms. The highest shares of workers employed in medium-sized and large firms (combined) were in utilities (94.0%), educational (92.5%), information (79.2%), mining (78.7%), and finance (77.7%). In contrast, the industries in which very small firms generally accounted for the largest percentages of workforces, ranging from 40.7% to 63.2%, were agriculture, other services, construction, and real estate.

4.2 Distributions of the ages of firms' workforces

In this section, the distributions of the average ages of firms' workforces are assessed. For each firm in the pooled sample for 2003 to 2010, a full-time-equivalent-adjusted average age of its workforce is calculated by means of Equation (2), above. Then, the distribution of the average ages of firms' workforces is calculated at the firm-size and industry levels.

The results of this analysis are shown in Tables 2-1, 2-2 and 2-3. In particular, these tables report various percentiles of the age distributions (10th, 25th, 50th [median], 75th, and 90th) as well as the average (mean) value and the inter-quartile range (IQR). The IQR is calculated as the difference between the 25th and 75th percentiles. The analysis is also carried out for all firms (Panel A) and separately for each of the firm sizes described above (Panels B to E). At the aggregate level (i.e., all industries), the findings demonstrate that there was significant variation in the age composition of firms' workforces. For example, the IQR for all firms was about 14 years; the average age at the 25th percentile was almost 35 years whereas the average age at the 75th percentile was 49 years.

A decomposition of these results by firm size and industry shows additional variation in the ages of firms' workforces. Across industries, the difference between the minimum and maximum median ages among firms of all sizes was 12.7 years. Those industries with the lowest median ages were accommodation (36.3), arts (37.6), construction (39.9), and retail trade (39.9). These findings are perhaps not surprising given that industries such as fast-food services and retail trade tend to employ a large number of young workers—e.g., students—although one should remember that these results are adjusted for time spent working. In contrast, industries with the highest median ages were management (49.0), finance (48.0), and real estate (47.0). Similar patterns were observed across industries for average ages.

Within industries, there was also substantial dispersion in workers' ages. The average of the industry-specific IQR was 13.5 years; this average was largest in real estate (17.5 years), management (17.0 years), and finance (16.0 years). In contrast, the IQR was lowest for manufacturing (10.0 years). The findings from Subsection 4.1 provide useful insight into this result. For example, real estate had one of the highest shares of firms with 1 to 19 workers and one of the lowest shares of firms with 500 or more workers. Because the age of large firms' workforce tends toward the mean, industries with a large share of large firms can be expected to have a low dispersion in the average age of the workforce, and vice versa.

To represent these findings graphically, Chart 1 plots the distributions in the ages of firms' workforces across industries in a box (or whisker) plot. For each industry, the left end of the boxes corresponds to the 25th percentile of the ages, and the right end of the boxes corresponds to the 75th percentile of the ages; the line inside each box corresponds to the 50th percentile. The left and right error bars are the 10th and 90th percentiles, respectively. The industries have been ordered by median age, in ascending order. Indeed, there was significant variation across industries in the dispersion of workers' ages. The median age was generally lowest in accommodation and arts, and highest in the finance and management industries.

Table 2-1
Distributions of the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panels A and B

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel A: All Firms								
All industries	8,409,627	28.3	34.8	41.8	49.0	56.6	42.1	14.2
Industry								
Agriculture, forestry, fishing and hunting	458,830	25.0	33.3	41.0	49.0	57.5	41.4	15.7
Mining, quarrying, and oil and gas extraction	73,039	29.1	35.0	42.5	50.1	58.0	43.1	15.1
Utilities	5,749	31.4	38.0	43.4	48.1	55.3	43.4	10.1
Construction	994,640	26.9	33.3	39.9	46.5	54.2	40.3	13.2
Manufacturing	428,770	32.0	37.4	42.4	47.4	53.0	42.5	10.0
Wholesale trade	429,524	32.7	38.1	43.5	49.3	56.0	44.0	11.2
Retail trade	852,150	27.3	33.4	39.9	46.6	53.5	40.2	13.2
Transportation and warehousing	388,992	31.0	37.0	43.2	50.0	56.2	43.5	13.0
Information and cultural industries	94,532	29.3	34.7	41.0	47.7	54.6	41.4	13.0
Finance and insurance	257,573	34.4	41.0	48.0	57.0	65.8	49.1	16.0
Real estate and rental and leasing	344,557	30.0	38.5	47.0	56.0	64.0	47.2	17.5
Professional, scientific and technical services	1,036,617	31.0	36.6	43.2	51.0	58.5	44.0	14.4
Management of companies and enterprises	111,975	33.9	41.0	49.0	58.0	65.7	49.4	17.0
Administrative and support, waste management and remediation services	399,227	27.0	33.9	40.8	47.7	55.0	41.0	13.8
Educational services	97,135	26.9	33.6	41.0	47.1	54.1	40.7	13.5
Health care and social assistance	663,832	31.8	37.1	43.4	50.1	57.0	43.9	13.0
Arts, entertainment and recreation	144,466	22.8	29.9	37.6	45.4	53.0	38.0	15.5
Accommodation and food services	545,259	25.4	30.0	36.3	43.1	49.5	37.0	13.1
Other services (except public administration)	1,044,112	27.0	33.0	40.6	48.2	55.8	40.9	15.2
Panel B: Firms with fewer than 20 workers								
All industries	7,754,499	28.0	34.6	42.0	49.5	57.0	42.3	14.9
Industry								
Agriculture, forestry, fishing and hunting	448,221	25.0	33.1	41.0	49.3	57.9	41.4	16.2
Mining, quarrying, and oil and gas extraction	67,007	29.0	34.8	42.8	51.0	58.5	43.3	16.2
Utilities	4,366	29.9	36.9	43.8	50.0	57.6	43.7	13.1
Construction	938,332	26.4	33.0	39.8	46.9	54.9	40.3	13.9
Manufacturing	334,556	30.9	36.6	42.3	48.2	54.5	42.5	11.6
Wholesale trade	377,827	32.0	37.9	43.8	50.0	57.0	44.1	12.1
Retail trade	764,750	26.9	33.0	40.1	47.2	54.1	40.4	14.2
Transportation and warehousing	361,368	30.6	36.5	43.1	50.0	57.0	43.5	13.5
Information and cultural industries	84,910	29.0	34.5	41.1	48.3	55.0	41.7	13.8
Finance and insurance	240,187	34.0	41.0	48.7	58.0	66.0	49.5	17.0
Real estate and rental and leasing	331,911	30.0	38.5	47.3	56.3	64.0	47.3	17.8
Professional, scientific and technical services	1,001,394	30.8	36.6	43.6	51.6	59.0	44.2	15.0
Management of companies and enterprises	106,629	34.0	41.2	49.6	58.0	66.0	49.8	16.8
Administrative and support, waste management and remediation services	366,716	26.6	33.5	40.9	48.1	55.5	41.1	14.6
Educational services	82,600	26.0	32.3	40.1	48.0	55.3	40.5	15.7
Health care and social assistance	611,522	31.4	37.0	43.8	50.9	57.3	44.1	13.9
Arts, entertainment and recreation	130,715	22.1	29.3	37.7	46.0	54.0	38.0	16.7
Accommodation and food services	461,301	25.0	30.2	37.0	44.0	50.4	37.5	13.8
Other services (except public administration)	1,013,390	27.0	32.8	40.5	48.4	56.0	40.9	15.6

Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the average age of firms' workforces by firm size and industry. The average (mean) age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 2-2
Distributions of the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panels C and D

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel C: Firms with 20 to 99 workers								
All industries	542,832	31.9	36.2	40.5	44.4	47.8	40.2	8.2
Industry								
Agriculture, forestry, fishing and hunting	9,723	34.1	37.4	40.8	44.2	47.5	40.8	6.8
Mining, quarrying, and oil and gas extraction	4,339	32.2	36.2	41.0	45.4	49.3	40.9	9.2
Utilities	872	34.7	38.6	42.1	44.8	47.4	41.7	6.2
Construction	50,703	34.8	37.5	40.5	43.6	46.4	40.6	6.1
Manufacturing	73,562	36.1	39.1	42.5	45.8	48.8	42.5	6.7
Wholesale trade	43,542	36.8	39.6	42.8	46.1	49.2	43.0	6.5
Retail trade	76,282	31.8	35.1	39.0	42.7	46.0	39.0	7.6
Transportation and warehousing	23,063	36.7	39.9	43.3	47.0	50.4	43.5	7.1
Information and cultural industries	7,432	32.0	35.4	39.2	43.1	46.8	39.3	7.7
Finance and insurance	13,238	37.5	40.8	43.8	46.4	49.3	43.6	5.6
Real estate and rental and leasing	10,736	33.7	38.5	43.4	47.8	51.9	43.3	9.3
Professional, scientific and technical services	30,040	33.4	36.1	39.4	42.8	46.1	39.6	6.7
Management of companies and enterprises	4,177	33.5	38.0	42.7	46.9	50.7	42.3	8.9
Administrative and support, waste management and remediation services	25,752	33.1	36.7	40.6	44.2	47.5	40.5	7.5
Educational services	8,452	34.2	38.2	41.6	44.8	47.6	41.3	6.6
Health care and social assistance	39,576	33.9	37.3	41.2	44.9	48.0	41.1	7.6
Arts, entertainment and recreation	11,493	29.4	32.8	36.8	41.3	45.4	37.2	8.5
Accommodation and food services	75,423	26.7	29.5	33.6	38.7	43.4	34.5	9.2
Other services (except public administration)	26,659	31.8	36.3	41.1	45.5	49.1	40.7	9.2
Panel D: Firms with 100 to 499 workers								
All industries	91,389	33.4	37.5	41.3	44.3	46.9	40.7	6.8
Industry								
Agriculture, forestry, fishing and hunting	840	34.3	37.9	40.3	43.4	46.1	40.2	5.5
Mining, quarrying, and oil and gas extraction	1,160	33.8	37.0	41.7	44.3	46.5	40.9	7.3
Utilities	318	39.7	41.7	43.6	45.1	46.4	43.4	3.4
Construction	5,047	36.2	38.6	41.2	43.6	45.9	41.1	5.0
Manufacturing	17,334	36.9	39.6	42.4	45.0	47.4	42.3	5.4
Wholesale trade	6,991	37.5	39.7	42.1	44.6	46.8	42.2	4.9
Retail trade	9,644	31.1	34.0	37.3	41.0	44.4	37.6	7.0
Transportation and warehousing	3,815	37.8	40.7	43.9	46.8	49.6	43.8	6.1
Information and cultural industries	1,706	32.8	35.6	38.8	41.7	44.6	38.6	6.1
Finance and insurance	3,189	38.3	40.7	43.1	45.0	47.0	42.8	4.3
Real estate and rental and leasing	1,641	35.8	39.5	43.3	46.2	48.8	42.9	6.7
Professional, scientific and technical services	4,245	34.0	36.8	39.6	42.3	44.9	39.5	5.5
Management of companies and enterprises	941	31.2	37.0	41.0	44.2	47.3	40.1	7.2
Administrative and support, waste management and remediation services	5,195	33.2	36.6	40.2	43.6	46.4	40.1	7.0
Educational services	3,052	39.0	41.4	43.4	45.4	47.1	43.2	4.0
Health care and social assistance	9,749	37.3	40.3	43.1	45.5	47.4	42.7	5.2
Arts, entertainment and recreation	1,922	31.7	34.3	37.9	41.2	44.0	37.8	6.9
Accommodation and food services	8,001	26.9	29.5	33.3	37.6	42.2	34.0	8.1
Other services (except public administration)	3,578	34.5	39.2	43.1	46.7	49.7	42.6	7.5

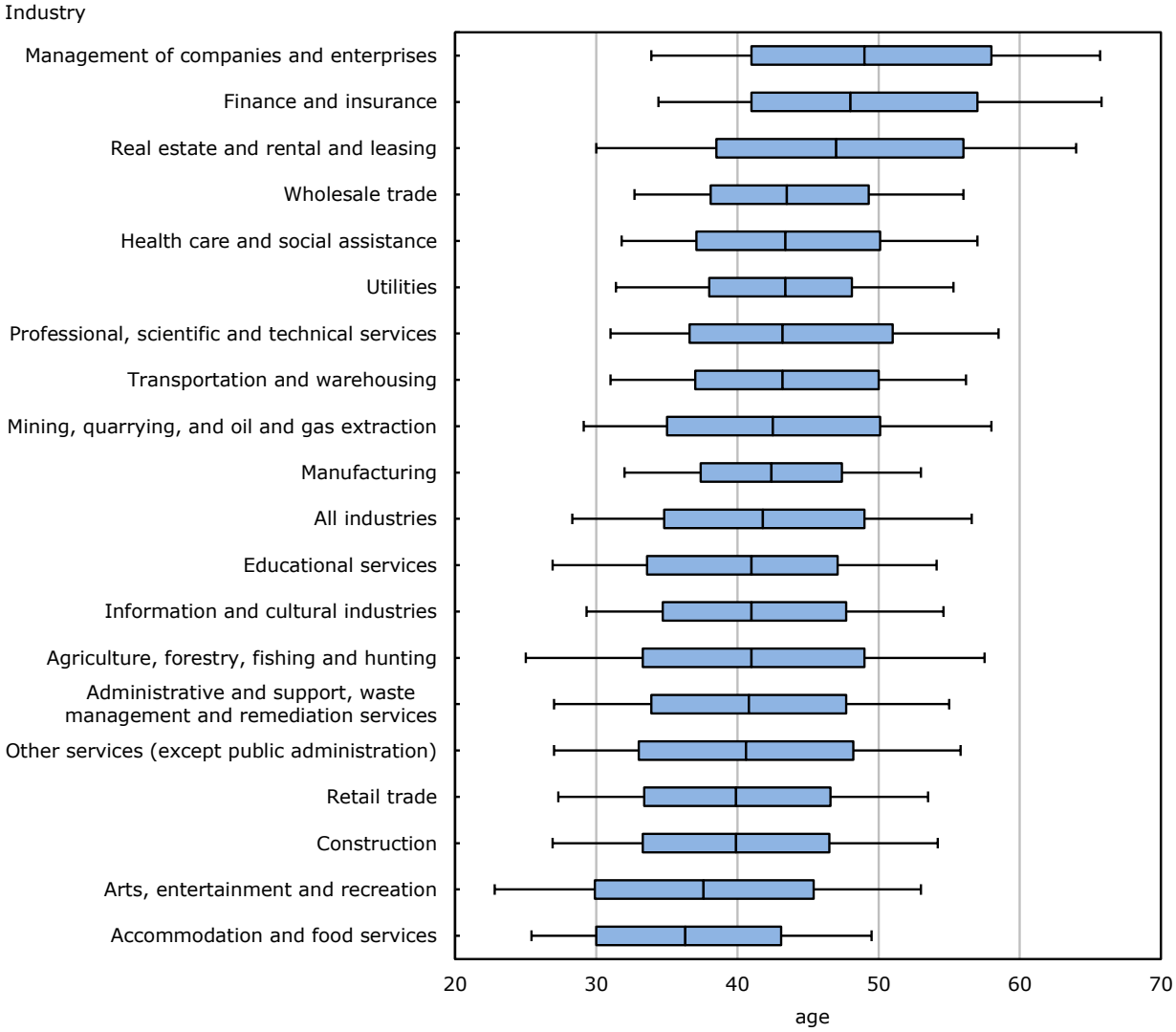
Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the average age of firms' workforces by firm size and industry. The average (mean) age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 2-3
Distributions of the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panel E

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel E: Firms with 500 or more workers								
All industries	20,907	36.0	40.1	42.6	44.5	46.0	41.8	4.4
Industry								
Agriculture, forestry, fishing and hunting	46	33.4	37.4	39.3	41.9	46.3	39.6	4.5
Mining, quarrying, and oil and gas extraction	533	35.1	39.5	43.1	44.8	46.6	42.0	5.3
Utilities	193	41.9	42.8	44.0	45.0	45.8	43.9	2.2
Construction	558	38.5	40.4	42.1	43.5	44.8	41.9	3.1
Manufacturing	3,318	39.3	41.2	43.1	44.8	46.4	42.9	3.6
Wholesale trade	1,164	38.1	40.3	42.4	44.1	45.4	42.1	3.8
Retail trade	1,474	28.4	32.0	36.5	40.1	43.4	36.1	8.1
Transportation and warehousing	746	39.2	41.7	43.7	45.9	47.7	43.6	4.2
Information and cultural industries	484	35.0	38.1	40.9	43.1	44.9	40.3	5.0
Finance and insurance	959	37.7	40.1	41.9	43.1	44.5	41.3	3.0
Real estate and rental and leasing	269	33.0	38.3	41.9	44.4	46.8	40.8	6.1
Professional, scientific and technical services	938	35.2	37.7	39.9	42.2	44.5	39.8	4.5
Management of companies and enterprises	228	36.9	40.2	42.5	44.4	46.1	41.9	4.2
Administrative and support, waste management and remediation services	1,564	32.5	35.8	39.5	42.7	45.0	39.4	6.9
Educational services	3,031	41.9	42.9	44.1	45.6	47.2	44.3	2.7
Health care and social assistance	2,985	40.6	42.3	43.8	45.0	46.0	43.5	2.7
Arts, entertainment and recreation	336	31.4	34.8	39.1	42.2	44.4	38.6	7.4
Accommodation and food services	534	27.9	30.6	35.3	40.5	42.8	35.4	9.9
Other services (except public administration)	485	35.5	39.9	42.5	46.1	48.8	42.6	6.2

Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the average age of firms' workforces by firm size and industry. The average (mean) age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Chart 1
Graphical illustration of the distributions of the average ages of firms' workforces by firm size and industry, 2003 to 2010



Notes: This chart provides a graphical illustration of the distributions of the average ages of firms' workforces by firm size and industry based on the data from Table 2, for all firm sizes. For each industry, a box (or whisker) plot starts at the 25th percentile and ends at the 75th percentile. The line in the centre of the box corresponds to the 50th percentile. The end of the left error bar corresponds to the 10th percentile and the end of the right error bar, to the 90th percentile. The industries have been sorted by median value in ascending order. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

In Panels B to E of Tables 2-1, 2-2 and 2-3, the results are repeated separately for each of the four firm-size categories described above. Among the findings of this analysis are, first, that the age distributions across industries for very small firms were similar to the aggregate-level results. This likely results from the fact that more than 9 out of 10 firms were very small, as shown in Table 1. The IQR for very small firms ranged from 11.6 years in manufacturing to 17.8 years in real estate. In addition, the IQR for most industries exceeded 12 years, and the ages of workforces in very small firms were more dispersed than those in small, medium-sized and large firms.

Second, the median age was lower for small firms (40.5 years) than for very small firms (42.0 years), although this difference is not drastic. On balance, small firms tend to employ a younger workforce than do very small firms; the reason may be the entrepreneurial nature of very small firms, whose workforce often consists only of their owner-operators.

Third, the median age for medium-sized firms is higher (41.3) than the median age for small and very small firms, although the IQR for medium-sized firms was smaller; this indicates that the distribution of ages was more compressed in medium-sized firms. Specifically, the IQR for medium-sized firms was 6.8 years whereas the IQR for small firms was 8.2 years. The industries with the highest median firm workforce ages among medium-sized firms include transportation (43.9 years), utilities (43.6 years), educational (43.4 years), real estate (43.3 years), finance (43.1 years), health (43.1 years), and other services (43.1 years). In contrast, the industries with the lowest median firm workforce ages include accommodation (33.3 years), arts (37.9 years), retail trade (37.3 years), and information (38.8 years). It is worth noting that transportation has both the highest median age and one of the highest ages at the 90th percentile (49.6 years); this suggests that the aging of the workforce may be more acute in this industry than in other industries. For example, this finding is consistent with research on the demographics of the trucking industry, which finds that there is a shortage of younger workers in this industry (Gill and Macdonald 2013).

Fourth, the 20,907 large firms observed in the data had the highest median age (42.6 years) among all size categories. For this size category, the 10th and 25th percentiles were higher than those reported for smaller firm sizes, whereas the opposite was true of the 90th percentile. In addition, the IQR is narrower for large firms than for any other firm-size category. These findings indicate that the distribution of the workforce ages of firms is the most compressed among large firms. The only exception was retail trade, where the IQR for large firms was 1.1 years wider for large firms than for medium-sized firms.

4.3 Shares of older workers in firms' workforces

The correlation between the age of a firm's workforce and its size is assessed in this section by looking at the share of older workers—defined as workers 50 years of age or older—across industries and firm sizes. Recall that the share of older workers in a firm is computed by means of Equation (3), which adjusts each firm's workforce on a full-time-equivalent basis.

In Tables 3-1, 3-2 and 3-3, the results of this analysis show that the share of older workers is below 16.3% for approximately half and 56.3% for approximately three-quarters of all firms analyzed, as shown in Panel A. There is, however, a non-trivial share of firms—more than 1 in 10—consisting entirely of older workers.

Table 3-1
Distributions of the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panels A and B

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	share of older workers (percent)						percentage points
Panel A: All Firms								
All industries	8,409,627	0.0	0.0	16.3	56.3	100.0	31.9	56.3
Industry								
Agriculture, forestry, fishing and hunting	458,830	0.0	0.0	13.0	59.2	100.0	32.1	59.2
Mining, quarrying, and oil and gas extraction	73,039	0.0	0.0	12.9	65.8	100.0	33.3	65.8
Utilities	5,749	0.0	0.0	26.7	50.3	100.0	32.9	50.3
Construction	994,640	0.0	0.0	9.8	44.9	100.0	27.1	44.9
Manufacturing	428,770	0.0	1.5	25.0	47.3	83.9	31.4	45.8
Wholesale trade	429,524	0.0	0.0	26.7	58.1	100.0	35.3	58.1
Retail trade	852,150	0.0	0.0	18.8	47.2	90.3	29.2	47.2
Transportation and warehousing	388,992	0.0	0.0	16.0	59.9	100.0	32.7	59.9
Information and cultural industries	94,532	0.0	0.0	3.4	46.2	100.0	27.0	46.2
Finance and insurance	257,573	0.0	0.0	46.4	100.0	100.0	50.5	100.0
Real estate and rental and leasing	344,557	0.0	0.0	41.4	100.0	100.0	46.8	100.0
Professional, scientific and technical services	1,036,617	0.0	0.0	7.1	87.7	100.0	35.0	87.7
Management of companies and enterprises	111,975	0.0	0.0	51.0	100.0	100.0	52.2	100.0
Administrative and support, waste management and remediation services	399,227	0.0	0.0	13.8	49.6	100.0	29.3	49.6
Educational services	97,135	0.0	0.0	17.1	46.4	100.0	29.2	46.4
Health care and social assistance	663,832	0.0	0.0	22.1	66.4	100.0	35.4	66.4
Arts, entertainment and recreation	144,466	0.0	0.0	8.1	41.9	95.6	25.4	41.9
Accommodation and food services	545,259	0.0	0.0	11.1	34.2	63.1	21.9	34.2
Other services (except public administration)	1,044,112	0.0	0.0	0.0	50.4	100.0	27.7	50.4
Panel B: Firms with fewer than 20 workers								
All industries	7,754,499	0.0	0.0	13.6	60.8	100.0	32.4	60.8
Industry								
Agriculture, forestry, fishing and hunting	448,221	0.0	0.0	11.7	60.6	100.0	32.2	60.6
Mining, quarrying, and oil and gas extraction	67,007	0.0	0.0	8.6	73.4	100.0	33.9	73.4
Utilities	4,366	0.0	0.0	22.8	60.2	100.0	34.4	60.2
Construction	938,332	0.0	0.0	6.3	46.7	100.0	27.2	46.7
Manufacturing	334,556	0.0	0.0	22.5	52.0	100.0	31.9	52.0
Wholesale trade	377,827	0.0	0.0	25.8	63.4	100.0	36.0	63.4
Retail trade	764,750	0.0	0.0	17.2	50.3	97.9	29.6	50.3
Transportation and warehousing	361,368	0.0	0.0	10.7	63.8	100.0	32.7	63.8
Information and cultural industries	84,910	0.0	0.0	0.0	51.3	100.0	27.7	51.3
Finance and insurance	240,187	0.0	0.0	51.7	100.0	100.0	51.9	100.0
Real estate and rental and leasing	331,911	0.0	0.0	42.9	100.0	100.0	47.2	100.0
Professional, scientific and technical services	1,001,394	0.0	0.0	4.2	93.5	100.0	35.5	93.5
Management of companies and enterprises	106,629	0.0	0.0	57.2	100.0	100.0	53.2	100.0
Administrative and support, waste management and remediation services	366,716	0.0	0.0	10.6	52.5	100.0	29.6	52.5
Educational services	82,600	0.0	0.0	8.8	51.2	100.0	28.9	51.2
Health care and social assistance	611,522	0.0	0.0	20.1	71.9	100.0	36.0	71.9
Arts, entertainment and recreation	130,715	0.0	0.0	3.2	44.3	100.0	25.6	44.3
Accommodation and food services	461,301	0.0	0.0	10.3	37.0	68.6	22.9	37.0
Other services (except public administration)	1,013,390	0.0	0.0	0.0	51.3	100.0	27.7	51.3

Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the shares of older workers in firms' workforces by firm size and industry. The average (mean) share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.

Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 3-2
Distributions of the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panels C and D

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	share of older workers (percent)						percentage points
Panel C: Firms with 20 to 99 workers								
All industries	542,832	4.8	12.8	24.2	37.1	50.0	26.2	24.3
Industry								
Agriculture, forestry, fishing and hunting	9,723	7.5	14.9	25.3	37.8	49.8	27.5	22.9
Mining, quarrying, and oil and gas extraction	4,339	3.9	11.2	23.8	39.4	55.4	27.0	28.2
Utilities	872	0.7	11.9	26.3	37.8	48.8	26.5	25.9
Construction	50,703	7.8	14.8	24.4	35.3	46.8	26.2	20.5
Manufacturing	73,562	9.8	17.7	28.4	40.5	52.6	30.0	22.8
Wholesale trade	43,542	8.7	17.4	28.9	41.6	54.3	30.5	24.2
Retail trade	76,282	6.9	13.8	23.5	34.9	46.3	25.4	21.1
Transportation and warehousing	23,063	10.6	19.8	31.6	45.1	58.3	33.3	25.3
Information and cultural industries	7,432	0.0	5.5	16.2	31.5	47.5	20.6	26.0
Finance and insurance	13,238	9.8	20.1	30.8	42.9	55.2	32.1	22.8
Real estate and rental and leasing	10,736	7.6	18.4	32.9	49.0	64.3	34.8	30.6
Professional, scientific and technical services	30,040	1.8	7.6	17.6	30.1	43.0	20.5	22.5
Management of companies and enterprises	4,177	7.0	16.1	29.0	43.9	59.9	31.8	27.8
Administrative and support, waste management and remediation services	25,752	5.6	12.9	23.7	36.5	49.2	26.0	23.6
Educational services	8,452	6.8	15.8	26.5	38.2	50.0	27.8	22.4
Health care and social assistance	39,576	6.2	14.2	25.9	39.0	51.3	27.7	24.8
Arts, entertainment and recreation	11,493	3.2	10.9	21.5	33.8	46.8	23.7	22.9
Accommodation and food services	75,423	0.1	4.3	12.7	25.2	38.4	16.6	20.9
Other services (except public administration)	26,659	4.4	12.9	25.6	40.6	54.3	27.8	27.7
Panel D: Firms with 100 to 499 workers								
All industries	91,389	9.5	16.8	26.3	35.9	45.0	27.0	19.1
Industry								
Agriculture, forestry, fishing and hunting	840	10.6	17.0	25.4	34.3	43.0	26.6	17.3
Mining, quarrying, and oil and gas extraction	1,160	7.8	14.0	26.8	36.4	44.6	26.7	22.4
Utilities	318	17.0	23.7	30.2	36.0	42.6	30.2	12.3
Construction	5,047	13.4	19.5	27.2	35.3	43.4	28.0	15.8
Manufacturing	17,334	12.7	19.1	27.5	36.3	45.5	28.5	17.2
Wholesale trade	6,991	12.7	19.2	27.1	35.5	44.1	27.9	16.3
Retail trade	9,644	9.4	15.3	22.6	31.3	40.6	24.1	16.0
Transportation and warehousing	3,815	15.0	23.3	33.1	43.5	53.7	34.0	20.2
Information and cultural industries	1,706	2.2	6.3	13.8	23.9	36.1	16.8	17.6
Finance and insurance	3,189	11.8	20.2	28.7	36.8	44.4	28.8	16.6
Real estate and rental and leasing	1,641	13.0	21.7	31.3	42.2	52.2	32.6	20.5
Professional, scientific and technical services	4,245	4.5	9.9	17.6	27.2	37.0	19.6	17.3
Management of companies and enterprises	941	7.6	13.6	24.6	35.3	47.3	25.9	21.7
Administrative and support, waste management and remediation services	5,195	9.3	15.1	24.0	33.5	43.8	25.6	18.4
Educational services	3,052	18.0	24.8	33.1	40.8	47.2	32.8	16.0
Health care and social assistance	9,749	15.3	23.1	31.8	40.1	47.9	31.7	17.0
Arts, entertainment and recreation	1,922	8.2	14.8	22.9	32.5	40.2	23.9	17.7
Accommodation and food services	8,001	3.3	7.1	13.7	22.9	33.1	16.3	15.8
Other services (except public administration)	3,578	12.0	20.5	31.6	44.1	55.3	32.7	23.6

Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the shares of older workers in firms' workforces by firm size and industry. The average (mean) share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.

Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 3-3
Distributions of the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panel E

Statistic	Number of observations	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	share of older workers (percent)						percentage points
Panel E: Firms with 500 or more workers								
All industries	20,907	13.2	21.5	29.3	36.1	42.3	28.7	14.6
Industry								
Agriculture, forestry, fishing and hunting	46	11.5	15.2	21.5	29.8	42.2	23.8	14.6
Mining, quarrying, and oil and gas extraction	533	11.5	20.7	29.9	36.6	44.6	29.3	15.9
Utilities	193	24.2	28.1	33.3	36.9	40.3	32.6	8.8
Construction	558	18.9	23.7	29.3	34.7	39.1	29.2	11.0
Manufacturing	3,318	17.2	22.8	29.2	35.5	42.3	29.5	12.7
Wholesale trade	1,164	13.1	19.7	26.8	33.0	38.5	26.4	13.3
Retail trade	1,474	5.1	11.1	19.2	27.2	35.5	19.9	16.1
Transportation and warehousing	746	18.6	25.1	32.6	40.0	47.4	32.7	14.9
Information and cultural industries	484	6.1	13.4	21.3	29.4	38.4	21.8	16.0
Finance and insurance	959	11.7	17.9	24.4	29.8	34.8	23.9	11.9
Real estate and rental and leasing	269	8.7	19.1	26.8	34.6	43.3	27.0	15.5
Professional, scientific and technical services	938	8.9	13.2	19.6	27.6	35.4	21.0	14.4
Management of companies and enterprises	228	14.7	21.7	27.8	34.4	42.0	28.3	12.7
Administrative and support, waste management and remediation services	1,564	9.3	14.3	21.7	30.7	39.5	23.7	16.4
Educational services	3,031	26.6	30.5	35.8	41.5	47.1	36.3	11.0
Health care and social assistance	2,985	23.8	29.1	34.0	38.3	42.1	33.4	9.2
Arts, entertainment and recreation	336	7.9	14.5	21.1	30.5	38.3	23.0	16.0
Accommodation and food services	534	3.9	9.0	16.6	26.2	33.0	17.9	17.2
Other services (except public administration)	485	15.0	22.0	30.5	42.2	51.7	32.1	20.2

Notes: The "Number of observations" is a count of the number of firms analyzed and the number of times each firm is observed over the relevant time period (a firm is counted at least one time and a maximum of eight times). The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the shares of older workers in firms' workforces by firm size and industry. The average (mean) share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007. These statistics are based on pooled data spanning the years from 2003 to 2010.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

The median share of older workers across firms tended to be highest in industries that had comparatively older workforces, as shown in Subsection 4.2, which provides a robustness check of those findings. The median shares of older workers were 24.6% or higher for management and real estate. In contrast, the median falls below 10% in other services, information, and professional services. The analysis across firm-size categories, in Panels B to E, shows that the share of older workers increases with firm size in most cases. Notable exceptions include finance, real estate, and management.

5 Longitudinal analysis

This section considers how the distributions of the ages of firms' workforces documented in Subsections 4.2 and 4.3, above, changed from 2003 to 2010. The objective of the study is to provide new insight into how the workforces within firms of different sizes and industries age over time by making use of the longitudinal nature of the employer–employee data.

Importantly, the results documented here capture net effects from various worker dynamics, including hires, layoffs, quits, retirements, changes in working hours, and other factors. This analysis conditions on relatively successful firms on the basis that the analysis is restricted to those that survived over the period 2003 to 2010. As discussed above, this approach was taken

so that the unit of analysis is the firm, rather than firm size–industry categories. A limitation of this approach is that firm dynamics, such as entry decisions and survival rates, are not incorporated into the analysis.

5.1 Changes in the distributions of the ages of firms' workforces

Tables 4-1, 4-2 and 4-3 show how the distribution of the ages of firms' workforces changed over the time period from 2003 to 2010. Notice that a firm's age would increase by exactly one year in each of the calendar years from 2003 to 2010—or 7 years in total—in the absence of hiring, job separations, and changes in the time spent working (full-time equivalence adjustment). In contrast, this analysis indicates that the median change in the age of firms' workforces was 5.1 years and the average change was 4.2 years, for all firms in Panel A. On balance, some replacement of firms' workers is occurring, but the tendency is toward an aging workforce for these firms.

There is also substantial heterogeneity in the results. For example, the age of firms' workforces decreased by 4.3 years or more in at least 10% of cases, and increased by 7.2 years or more in at least 25% of cases. The cross-industry analysis shows that the aging of firms' workforces is related to the share of smaller firms in that industry. For example, professional services and management—in which very small firms are common—had a median age increase of 7.0 years, perhaps because these firms are often owner-operated.

Interestingly, smaller firms appear to have experienced the largest increases in the average ages of their workforces despite the fact that they are, to some extent, the most likely to be static in many respects as a result of the methodology used herein. This is because 1) smaller firms are more likely to exit than larger firms; 2) smaller firms that grew larger would be classified as larger in these data according to the timing of the assignment used; and 3) smaller firms that were acquired by larger firms are not in the sample. As mentioned above, such firm dynamics as entry or survival as well as mergers and acquisitions are outside the scope of the present study but represent interesting issues to be addressed in future research.

This finding is corroborated by the findings in Panels B to E, which decompose the results by firm size. The largest changes in the ages of firms' workforces occurred in very small firms, while the opposite is true of large firms. For example, the median change in age for large firms was only 1.5 years, and the IQR was smallest in this category. In only two industries, the median age changes were three years or greater for large firms: agriculture (3.4 years) and real estate (3.0 years). However, these industries also had some of the lowest number of large firms in operation.

Table 4-1
Distributions of the changes in the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panels A and B

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel A: All Firms								
All industries	583,173	-4.3	0.7	5.1	7.2	11.4	4.2	6.5
Industry								
Agriculture, forestry, fishing and hunting	35,383	-7.2	0.0	5.8	7.9	13.8	4.2	7.9
Mining, quarrying, and oil and gas extraction	4,551	-3.6	1.5	6.5	7.4	11.3	4.7	5.9
Utilities	426	-4.5	-0.2	2.7	6.8	9.8	2.8	7.0
Construction	66,673	-5.1	-0.2	4.3	7.1	11.5	3.7	7.3
Manufacturing	35,754	-2.7	1.3	4.6	7.1	10.5	4.2	5.8
Wholesale trade	34,259	-3.4	1.1	4.9	7.2	10.9	4.3	6.1
Retail trade	60,137	-4.3	0.3	4.2	7.4	11.9	4.0	7.1
Transportation and warehousing	23,327	-3.1	1.9	6.3	7.6	12.0	5.0	5.7
Information and cultural industries	6,354	-2.7	2.0	6.2	7.1	10.5	4.8	5.1
Finance and insurance	18,374	-3.3	2.0	6.6	7.0	10.8	4.8	5.0
Real estate and rental and leasing	22,815	-6.0	0.8	6.3	7.3	12.1	4.3	6.5
Professional, scientific and technical services	64,486	-2.3	2.8	7.0	7.2	11.0	5.3	4.4
Management of companies and enterprises	6,953	-3.1	3.1	7.0	7.1	11.1	5.3	4.0
Administrative and support, waste management and remediation services	26,461	-4.2	0.9	5.2	7.6	12.1	4.4	6.7
Educational services	7,138	-3.8	0.0	3.1	7.0	10.1	3.2	7.0
Health care and social assistance	51,045	-3.4	1.2	5.3	7.0	10.0	4.2	5.8
Arts, entertainment and recreation	10,968	-4.7	-0.1	4.1	7.0	11.5	3.7	7.1
Accommodation and food services	33,410	-4.2	0.0	3.6	7.0	11.4	3.6	7.0
Other services (except public administration)	70,152	-5.9	-0.2	4.7	7.1	11.8	3.6	7.3
Panel B: Firms with fewer than 20 workers								
All industries	510,323	-4.8	0.8	5.8	7.5	12.0	4.4	6.7
Industry								
Agriculture, forestry, fishing and hunting	34,218	-7.4	-0.1	6.0	8.0	14.0	4.2	8.1
Mining, quarrying, and oil and gas extraction	3,980	-3.9	2.4	6.9	7.7	12.0	5.1	5.3
Utilities	275	-5.5	-0.2	3.9	7.6	11.9	3.3	7.8
Construction	59,868	-5.4	-0.1	4.9	7.4	12.1	3.9	7.5
Manufacturing	25,693	-3.8	1.1	5.2	7.8	11.9	4.5	6.7
Wholesale trade	28,349	-3.9	1.2	5.6	7.6	11.7	4.5	6.4
Retail trade	50,475	-4.9	0.3	4.9	8.0	12.7	4.3	7.7
Transportation and warehousing	20,230	-3.5	2.1	6.9	8.0	12.8	5.3	5.9
Information and cultural industries	5,325	-3.0	2.5	7.0	7.3	11.3	5.1	4.8
Finance and insurance	16,282	-3.7	2.6	7.0	7.2	11.4	5.1	4.6
Real estate and rental and leasing	21,499	-6.3	0.9	6.6	7.4	12.4	4.4	6.5
Professional, scientific and technical services	60,413	-2.4	3.2	7.0	7.3	11.3	5.4	4.1
Management of companies and enterprises	6,511	-3.1	3.7	7.0	7.2	11.3	5.4	3.5
Administrative and support, waste management and remediation services	22,975	-4.7	0.9	5.8	8.0	12.8	4.6	7.1
Educational services	5,382	-4.8	0.1	4.7	7.2	11.4	3.8	7.1
Health care and social assistance	44,595	-3.8	1.6	6.0	7.2	10.5	4.5	5.6
Arts, entertainment and recreation	9,400	-5.3	-0.1	4.8	7.3	12.3	3.9	7.4
Accommodation and food services	25,409	-5.1	-0.3	4.1	7.9	12.8	3.9	8.2
Other services (except public administration)	66,466	-6.1	-0.2	5.0	7.2	12.0	3.7	7.4

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the change in the average age of firms' workforces by firm size and industry, from 2003 to 2010. The average (mean) change in age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 4-2
Distributions of the changes in the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panels C and D

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel C: Firms with 20 to 99 workers								
All industries	59,505	-2.1	0.5	2.8	5.0	7.1	2.6	4.5
Industry								
Agriculture, forestry, fishing and hunting	1,074	-1.6	1.0	3.4	5.7	7.7	3.1	4.7
Mining, quarrying, and oil and gas extraction	365	-3.1	-0.2	2.2	4.9	7.4	2.1	5.1
Utilities	90	-3.9	-0.3	2.6	5.1	7.8	2.2	5.4
Construction	6,097	-3.3	-0.8	1.6	3.9	6.0	1.5	4.7
Manufacturing	7,910	-0.8	1.6	3.8	5.8	7.6	3.6	4.2
Wholesale trade	4,963	-1.7	1.0	3.2	5.4	7.3	3.0	4.4
Retail trade	8,316	-2.3	0.2	2.5	4.8	7.0	2.4	4.6
Transportation and warehousing	2,550	-1.3	1.3	3.7	5.9	8.0	3.5	4.6
Information and cultural industries	772	-1.6	1.0	3.2	5.4	7.5	3.1	4.4
Finance and insurance	1,563	-1.5	0.7	2.8	4.6	6.5	2.6	3.9
Real estate and rental and leasing	1,090	-2.7	0.2	3.0	5.5	7.9	2.7	5.3
Professional, scientific and technical services	3,435	-1.8	0.6	3.0	5.0	7.0	2.7	4.4
Management of companies and enterprises	326	-3.9	0.0	2.8	5.8	7.6	2.5	5.8
Administrative and support, waste management and remediation services	2,725	-1.7	0.9	3.3	5.6	7.9	3.2	4.7
Educational services	982	-2.8	-0.1	1.9	4.2	6.3	1.9	4.3
Health care and social assistance	4,781	-2.3	0.4	2.6	4.7	6.6	2.4	4.3
Arts, entertainment and recreation	1,286	-2.4	0.1	2.6	4.9	7.0	2.4	4.8
Accommodation and food services	7,012	-2.0	0.4	2.7	4.9	7.2	2.5	4.5
Other services (except public administration)	3,169	-2.4	0.0	2.2	4.5	6.5	2.1	4.5
Panel D: Firms with 100 to 499 workers								
All industries	10,783	-1.1	0.6	2.4	4.0	5.5	2.2	3.4
Industry								
Agriculture, forestry, fishing and hunting	87	-0.2	1.2	2.9	4.7	6.3	2.8	3.5
Mining, quarrying, and oil and gas extraction	139	-3.0	-0.5	1.5	3.3	5.2	1.3	3.8
Utilities	38	-2.3	0.0	1.6	2.5	3.7	1.2	2.5
Construction	637	-3.3	-1.0	0.5	2.2	4.0	0.4	3.2
Manufacturing	1,806	0.1	1.9	3.6	5.1	6.4	3.4	3.2
Wholesale trade	811	-0.7	1.1	2.6	4.2	5.7	2.4	3.1
Retail trade	1,151	-1.6	0.6	2.3	4.0	5.5	2.1	3.4
Transportation and warehousing	456	-0.5	1.2	3.0	4.2	5.5	2.6	3.0
Information and cultural industries	195	-0.5	1.6	3.3	4.8	6.1	3.0	3.2
Finance and insurance	407	-1.1	0.8	2.4	3.7	4.8	2.0	2.9
Real estate and rental and leasing	194	-2.6	0.0	2.5	4.2	5.8	1.9	4.2
Professional, scientific and technical services	517	-1.2	0.6	2.4	4.2	5.5	2.3	3.6
Management of companies and enterprises	92	-1.7	0.3	2.6	4.0	5.7	2.4	3.7
Administrative and support, waste management and remediation services	567	-1.6	0.9	3.1	4.9	6.6	2.8	4.0
Educational services	391	-1.4	-0.2	1.1	2.5	3.6	1.2	2.7
Health care and social assistance	1,289	-1.1	0.3	1.8	3.1	4.4	1.6	2.8
Arts, entertainment and recreation	238	-1.4	1.0	2.7	3.8	5.2	2.3	2.8
Accommodation and food services	921	-1.3	0.8	2.5	4.2	5.8	2.3	3.4
Other services (except public administration)	457	-0.7	0.8	2.1	3.4	4.6	2.1	2.6

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the change in the average age of firms' workforces by firm size and industry, from 2003 to 2010. The average (mean) change in age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 4-3
Distributions of the changes in the average ages of firms' workforces by firm size and industry, 2003 to 2010 — Panel E

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	age (years)						age difference (years)
Panel E: Firms with 500 or more workers								
All industries	2,562	-0.7	0.4	1.5	2.9	4.1	1.6	2.5
Industry								
Agriculture, forestry, fishing and hunting	4	3.1	3.2	3.4	3.8	4.1	3.5	0.6
Mining, quarrying, and oil and gas extraction	67	-2.7	-0.8	1.0	2.2	3.5	0.5	3.0
Utilities	23	-1.5	0.0	0.8	1.5	2.6	0.8	1.5
Construction	71	-2.2	-0.7	0.3	1.5	2.7	0.2	2.2
Manufacturing	345	0.6	1.7	2.7	3.9	5.3	2.8	2.2
Wholesale trade	136	0.2	1.5	2.6	3.5	4.8	2.6	2.0
Retail trade	195	-1.7	0.3	2.0	3.3	4.4	1.8	3.0
Transportation and warehousing	91	-0.5	0.9	2.4	3.5	4.3	1.9	2.6
Information and cultural industries	62	0.2	1.0	2.2	3.5	4.8	2.3	2.5
Finance and insurance	122	0.5	1.3	1.9	3.1	4.0	2.1	1.8
Real estate and rental and leasing	32	0.1	1.9	3.0	3.9	5.7	2.9	2.0
Professional, scientific and technical services	121	-0.4	0.7	1.9	3.1	4.0	1.8	2.4
Management of companies and enterprises	24	-0.1	1.7	2.6	3.5	4.3	2.4	1.8
Administrative and support, waste management and remediation services	194	-0.6	1.1	2.3	3.5	4.6	2.1	2.4
Educational services	383	-1.0	-0.2	0.5	1.2	1.9	0.5	1.4
Health care and social assistance	380	-0.9	0.1	0.8	1.8	2.6	0.8	1.7
Arts, entertainment and recreation	44	0.4	1.4	2.5	4.0	5.3	2.4	2.6
Accommodation and food services	68	-1.0	0.9	2.4	3.3	4.4	2.0	2.4
Other services (except public administration)	60	0.1	1.2	2.0	3.0	4.1	1.9	1.8

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the change in the average age of firms' workforces by firm size and industry, from 2003 to 2010. The average (mean) change in age is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

5.2 Changes in the shares of older workers in firms' workforces

Changes in the age structure of firms' workforces are reflected in changes in the shares of older workers. Tables 5-1, 5-2 and 5-3 present results of this analysis over the time period from 2003 to 2010, by firm size and industry. The results of this analysis show that the median change in the shares of older workers was 4.6 years and the mean change was 15.3 years. The fact that the mean is significantly larger than the median arises from the fact that some firms—notably very small firms that have few workers and are often owner-operated—experienced very large increases in the share of older workers over this time. For example, 1 in 10 firms saw their shares of older workers change by 65.3% or more.

Table 5-1
Distributions of the changes in the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panels A and B

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	percent						percentage points
Panel A: All Firms								
All industries	583,173	-14.1	0.0	4.6	29.4	65.3	15.3	29.4
Industry								
Agriculture, forestry, fishing and hunting	35,383	-19.8	0.0	0.0	32.0	71.7	14.5	32.0
Mining, quarrying, and oil and gas extraction	4,551	-8.1	0.0	4.3	34.7	84.4	18.8	34.7
Utilities	426	-16.8	0.0	8.1	27.4	49.1	12.5	27.4
Construction	66,673	-14.8	0.0	4.2	29.1	61.3	14.8	29.1
Manufacturing	35,754	-12.5	0.0	10.8	26.9	50.0	14.8	26.9
Wholesale trade	34,259	-14.6	0.0	9.0	30.6	59.5	15.8	30.6
Retail trade	60,137	-15.7	0.0	8.2	28.8	55.7	14.4	28.8
Transportation and warehousing	23,327	-12.7	0.0	8.6	36.9	81.9	19.2	36.9
Information and cultural industries	6,354	-8.5	0.0	3.4	28.7	80.6	17.1	28.7
Finance and insurance	18,374	-12.6	0.0	1.5	31.9	75.8	16.5	31.9
Real estate and rental and leasing	22,815	-20.8	0.0	0.0	31.3	72.5	14.1	31.3
Professional, scientific and technical services	64,486	-5.1	0.0	0.0	37.1	100.0	20.2	37.1
Management of companies and enterprises	6,953	-9.6	0.0	0.0	36.6	100.0	18.6	36.6
Administrative and support, waste management and remediation services	26,461	-13.4	0.0	6.1	29.8	62.6	15.5	29.8
Educational services	7,138	-12.8	0.0	2.7	20.2	51.4	11.3	20.2
Health care and social assistance	51,045	-12.5	0.0	5.1	29.2	69.1	15.9	29.2
Arts, entertainment and recreation	10,968	-12.4	0.0	2.0	23.4	55.5	12.7	23.4
Accommodation and food services	33,410	-14.3	0.0	5.6	22.6	45.3	11.0	22.6
Other services (except public administration)	70,152	-18.5	0.0	0.0	28.1	68.2	13.2	28.1
Panel B: Firms with fewer than 20 workers								
All industries	510,323	-15.9	0.0	2.5	33.3	71.8	16.2	33.3
Industry								
Agriculture, forestry, fishing and hunting	34,218	-20.8	0.0	0.0	33.2	73.3	14.6	33.2
Mining, quarrying, and oil and gas extraction	3,980	-8.1	0.0	2.2	41.0	93.5	20.2	41.0
Utilities	275	-21.1	0.0	6.7	34.3	59.1	14.7	34.3
Construction	59,868	-15.8	0.0	3.3	32.3	65.6	15.7	32.3
Manufacturing	25,693	-16.8	0.0	9.7	32.6	58.8	15.9	32.6
Wholesale trade	28,349	-16.8	0.0	7.9	35.0	66.6	16.9	35.0
Retail trade	50,475	-18.0	0.0	7.7	32.7	60.8	15.4	32.7
Transportation and warehousing	20,230	-14.8	0.0	6.3	41.9	91.9	20.2	41.9
Information and cultural industries	5,325	-9.3	0.0	0.0	35.2	100.0	18.8	35.2
Finance and insurance	16,282	-14.1	0.0	0.0	36.0	83.7	17.1	36.0
Real estate and rental and leasing	21,499	-21.7	0.0	0.0	33.1	75.7	14.4	33.1
Professional, scientific and technical services	60,413	-5.1	0.0	0.0	40.4	100.0	20.9	40.4
Management of companies and enterprises	6,511	-9.4	0.0	0.0	39.2	100.0	19.2	39.2
Administrative and support, waste management and remediation services	22,975	-15.2	0.0	3.9	33.7	68.9	16.3	33.7
Educational services	5,382	-15.8	0.0	1.4	27.1	61.8	13.5	27.1
Health care and social assistance	44,595	-14.1	0.0	3.7	33.8	76.3	17.0	33.8
Arts, entertainment and recreation	9,400	-13.9	0.0	0.0	27.0	61.4	13.5	27.0
Accommodation and food services	25,409	-18.0	-0.2	5.6	27.5	51.8	12.3	27.7
Other services (except public administration)	66,466	-19.6	0.0	0.0	29.9	71.2	13.5	29.9

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the changes in the shares of older workers in firms' workforces by firm size and industry. The average (mean) change in the share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 5-2
Distributions of the changes in the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panels C and D

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count	percent						percentage points
Panel C: Firms with 20 to 99 workers								
All industries	59,505	-7.6	0.6	9.0	18.5	28.0	9.5	17.9
Industry								
Agriculture, forestry, fishing and hunting	1,074	-5.6	1.8	10.6	20.3	28.6	10.8	18.5
Mining, quarrying, and oil and gas extraction	365	-10.6	0.1	8.3	19.3	31.7	9.2	19.2
Utilities	90	-13.9	0.0	10.6	19.0	36.5	9.1	19.0
Construction	6,097	-10.5	-1.3	7.1	16.3	25.6	7.3	17.6
Manufacturing	7,910	-5.2	3.7	12.2	21.3	30.2	12.2	17.6
Wholesale trade	4,963	-8.3	1.4	10.8	21.0	30.9	11.0	19.6
Retail trade	8,316	-7.5	0.4	9.0	18.0	27.2	9.3	17.6
Transportation and warehousing	2,550	-5.5	3.4	13.1	22.7	32.5	13.1	19.3
Information and cultural industries	772	-7.8	0.1	7.7	16.7	27.9	8.8	16.6
Finance and insurance	1,563	-7.2	2.7	12.2	22.6	33.2	12.6	19.9
Real estate and rental and leasing	1,090	-11.5	0.0	9.9	21.0	32.3	10.1	21.0
Professional, scientific and technical services	3,435	-5.9	0.9	8.0	17.4	26.6	9.1	16.5
Management of companies and enterprises	326	-14.2	0.6	10.7	21.3	36.2	10.6	20.7
Administrative and support, waste management and remediation services	2,725	-6.3	1.8	10.3	20.6	31.3	11.2	18.8
Educational services	982	-10.2	-2.1	5.6	14.2	23.2	6.1	16.3
Health care and social assistance	4,781	-8.5	0.0	8.3	16.9	25.3	8.3	16.9
Arts, entertainment and recreation	1,286	-8.0	0.0	7.6	16.5	26.1	8.2	16.5
Accommodation and food services	7,012	-6.3	0.0	5.7	14.4	23.8	7.1	14.4
Other services (except public administration)	3,169	-8.0	0.0	8.2	17.5	26.3	8.5	17.5
Panel D: Firms with 100 to 499 workers								
All industries	10,783	-3.0	2.7	8.3	14.3	20.1	8.3	11.6
Industry								
Agriculture, forestry, fishing and hunting	87	-1.3	4.2	8.8	14.3	21.7	9.8	10.1
Mining, quarrying, and oil and gas extraction	139	-2.8	2.0	9.0	15.8	25.6	9.2	13.8
Utilities	38	-8.6	-1.3	8.4	15.8	20.2	7.4	17.1
Construction	637	-8.1	-1.0	4.8	10.3	17.5	4.4	11.3
Manufacturing	1,806	-0.1	6.0	11.7	17.5	22.5	11.4	11.5
Wholesale trade	811	-2.5	3.8	9.5	15.2	20.9	9.2	11.4
Retail trade	1,151	-2.2	3.1	8.9	14.3	20.2	8.6	11.2
Transportation and warehousing	456	-1.4	4.7	10.4	16.5	21.8	10.3	11.8
Information and cultural industries	195	-1.1	2.6	7.5	13.7	19.4	7.5	11.1
Finance and insurance	407	-4.8	3.8	11.5	17.8	23.8	10.3	14.0
Real estate and rental and leasing	194	-6.9	2.9	8.5	15.0	23.8	8.3	12.1
Professional, scientific and technical services	517	-4.7	1.6	6.5	12.2	18.1	6.5	10.6
Management of companies and enterprises	92	-5.5	1.6	7.6	13.2	21.6	8.4	11.6
Administrative and support, waste management and remediation services	567	-3.9	3.1	9.3	16.0	21.9	9.1	12.9
Educational services	391	-6.9	-1.4	3.4	8.6	14.0	3.6	10.0
Health care and social assistance	1,289	-2.9	2.4	7.5	12.1	17.6	7.2	9.7
Arts, entertainment and recreation	238	-0.5	3.3	8.6	13.2	19.0	8.4	9.9
Accommodation and food services	921	-2.9	1.3	5.8	11.4	16.6	6.1	10.1
Other services (except public administration)	457	-2.2	3.4	8.1	12.8	19.1	8.0	9.4

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the changes in the shares of older workers in firms' workforces by firm size and industry. The average (mean) change in the share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

Table 5-3
Distributions of the changes in the percentages of older workers in firms' workforces by firm size and industry, 2003 to 2010 — Panel E

Statistic	Number of firms	Percentile					Mean	Inter-quartile range
		10th	25th	50th	75th	90th		
	count			percent				percentage points
Panel E: Firms with 500 or more workers								
All industries	2,562	-1.6	2.7	6.7	10.6	14.4	6.4	7.9
Industry								
Agriculture, forestry, fishing and hunting	4	7.3	7.9	8.7	9.0	9.2	8.5	1.1
Mining, quarrying, and oil and gas extraction	67	-5.2	1.5	7.1	12.5	16.3	5.7	11.0
Utilities	23	2.5	6.0	8.7	12.1	15.9	8.9	6.1
Construction	71	-4.2	0.4	3.2	8.2	12.6	3.2	7.8
Manufacturing	345	2.5	6.9	10.9	14.6	18.9	10.6	7.7
Wholesale trade	136	2.6	5.1	9.5	12.8	15.2	9.1	7.7
Retail trade	195	-2.4	2.0	7.1	11.0	13.8	6.5	9.0
Transportation and warehousing	91	0.9	5.5	9.7	12.6	15.6	8.2	7.1
Information and cultural industries	62	0.5	3.6	7.5	12.5	15.8	8.0	8.9
Finance and insurance	122	2.2	5.1	8.4	11.0	14.6	8.0	5.9
Real estate and rental and leasing	32	2.8	5.1	8.4	14.4	21.0	9.0	9.3
Professional, scientific and technical services	121	0.5	3.2	6.1	10.2	12.4	6.6	7.0
Management of companies and enterprises	24	3.6	6.9	9.7	15.7	20.1	10.2	8.8
Administrative and support, waste management and remediation services	194	0.2	3.7	7.3	10.8	14.4	7.1	7.1
Educational services	383	-6.5	-2.2	1.0	4.9	7.7	0.9	7.1
Health care and social assistance	380	0.0	3.0	5.5	8.3	11.0	5.4	5.3
Arts, entertainment and recreation	44	2.8	5.3	7.2	10.6	14.4	7.0	5.3
Accommodation and food services	68	-2.0	2.4	6.3	10.8	12.8	5.7	8.4
Other services (except public administration)	60	1.0	3.9	7.4	10.3	12.9	7.1	6.4

Notes: The "Number of observations" is a count of the number of firms analyzed. The "Percentile" statistics give the percentiles (10th, 25th, 50th, 75th, and 90th) of the changes in the shares of older workers in firms' workforces by firm size and industry. The average (mean) change in the share of older workers is also shown. The inter-quartile range is calculated as the difference between the 25th and 75th percentiles. Panel A shows the results for all firms analyzed in this study, and Panels B to E repeat the analysis for each firm size group (fewer than 20 workers, 20 to 99 workers, 100 to 499 workers, and 500 or more workers) separately, based on the size of each firm in 2010. Industry is defined by the two-digit North American Industry Classification System (NAICS) 2007.
Source: Statistics Canada, Canadian Employer–Employee Dynamics Database.

On balance, these findings are generally consistent with the results reported in Subsection 5.1. The change in the median and average ages across most industries tends to decrease as the size of the firm increases.

6 Robustness checks

The method of adjusting firms' workforces—via the weight λ_{ijt}—to a full-time-equivalent basis described in Section 3 relies on imputed wage data from the LFS. This adjustment is needed to ensure the age value assigned to each firm accurately reflects the ages of the labour inputs used throughout the calendar year. However, the use of auxiliary data is problematic in that it introduces a degree of imprecision in the results. The purpose of this section is to briefly discuss an alternative approach that was also considered for computing these weights.

Specifically, the alternative approach is to compute the annual hours that a worker spent at a particular firm from the earnings the worker received from that firm, expressed as a percentage of total earnings received from all firms in the calendar year. Denote $y_{it} = \Sigma_j y_{ijt}$ as the annual earnings of individual i in year t from all firms j. Given that individuals can hold multiple jobs during a calendar year, the weight is calculated as $\tilde{\lambda}_{ijt} = \left(y_{ijt} / y_{it} \right) \div \left(\Sigma_i y_{ijt} \right)$. Notice that the first

term, y_{ijt} / y_{it}, determines the percent of income that individual i earned from firm j in the reference year. The second term, $\Sigma_i y_{ijt}$, is the calculated total (relative) amount of labour input used by firm j throughout the year.

The weight $\tilde{\lambda}_{ijt}$ improves on the method discussed in Section 3 by not relying on auxiliary data from another source. However, this new approach assumes that all workers work all year on a full-time basis. However, this assumption is in many cases unrealistic.

Overall, this alternative method produces results that are qualitatively similar to the main findings presented in Sections 4 and 5, above. The median firm workforce age is found to be 40.8 years, only one year less than the previously reported median value of 41.8 years. In addition, the patterns in the distribution of the ages of firms' workforces across industries and firm sizes are all largely unchanged. Among the 19 industries considered in this study, the largest discrepancies in median ages are in arts (1.8 years) and accommodation (2.5 years). The results for the distributions of older workers are also found to be similar in both cases.

7 Conclusion

This study documents the age distributions of firms' workforces by firm size and industry using a novel matched employer–employee administrative tax dataset for Canada. The study's key findings include the following. First, there was considerable heterogeneity across industries in the average ages of firms' workers. Among very small and small firms—very small firms being defined as firms with 1 to 19 workers and small firms being defined as those with 20 to 99 workers—the industries with the highest average ages included finance, real estate, and management. In contrast, the industries with the lowest ages were accommodation, arts, and retail trade. This fact may not come as a surprise given that these industries tend to employ a large number of young, low-wage workers.

Second, the average age of very small firms was typically higher than the average age of large firms. This may result from the fact that very small firms are often owner-operated.

Third, the study calculated changes in firm workforce ages and the share of older workers in firms from 2003 to 2010. These results show that increases in firm workforce ages were small for large firms, whereas the opposite was true of very small and small firms. This result may also be explained by the fact that large firms have turnover rates higher than those of smaller firms, whose owner-operators tend to stay with their firms.

Overall, this study provides useful insight into the relationship between key characteristics of firms and their workers. The studies cited herein indicate that these effects likely matter in explaining firm productivity, profitability, competitiveness, survival rates, innovation, adoption of new technologies, and other factors. The extent to which those findings continue to hold in the Canadian context in light of the results presented in this study is an important question for future research.

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