



RESEARCH PAPER 1/2016

The effect of age on Australian small-to-medium enterprises

Roger Smith and Luke Hendrickson

April 2016

Abstract

Using the Australian Bureau of Statistics' Business Characteristics database cross-referenced for firm age, younger Small to Medium Enterprises (SMEs) in Australia are found to be more likely to report increases across a range of growth variables. This includes annual growth in employment and training, income from sales, profitability, productivity and product range. Start-up SMEs are also more likely to engage in collaborative product, process and marketing innovation and to engage in new-to-market innovation. These results are consistent with international evidence and suggest that innovation capability is one of the endogenous characteristics driving higher growth outcomes for young Australian SMEs. The findings lend weight to policy initiatives that can facilitate optimal conditions for innovative entrepreneurship and start-up activity in support of growth, innovation and skills development in the Australian economy.

JEL Codes: L26, L25, M13, D21, D24, O31, O32, E24

Keywords: entrepreneurship, firm age, firm performance, new firms and startup companies, innovation, productivity, firm behaviour, employment



For further information on this research paper please contact:

Manager

Innovation Research

Department of Industry, Innovation and Science

GPO Box 9839

Canberra ACT 2601

Phone : +61 2 6213 6000

Email: innovationreport@industry.gov.au

Have you read the Australian Innovation System report? www.industry.gov.au/innovationreport

 [@economist_chief](https://twitter.com/economist_chief)

Disclaimer

The views expressed in this report are those of the author(s) and do not necessarily reflect those of the Australian Government or the Department of Industry, Innovation and Science.

© Commonwealth of Australia 2016.

This work is copyright. Apart from use under Copyright Act 1968. Requests and inquiries concerning rights should be addressed to innovationreport@industry.gov.au. For more information on Office of the Chief Economist research papers please access the Department's website at: www.industry.gov.au/OCE



Creative Commons Licence

With the exception of the Coat of Arms, this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work. A summary of the licence terms is available from <http://creativecommons.org/licenses/by/3.0/au/deed.en>. The full licence terms are available from <http://creativecommons.org/licenses/by/3.0/au/legalcode>.

The Commonwealth's preference is that you attribute this publication (and any material sourced from it) using the following wording: Source: Licensed from the Commonwealth of Australia under a Creative Commons Attribution 3.0 Australia Licence. The Commonwealth of Australia does not necessarily endorse the content of this publication.

Acknowledgements

This paper is dedicated to my friend and colleague Roger Smith who pass away earlier this year. Roger will be remembered as an enthusiastic and kind-hearted member of the team. -LH

We thank the following colleagues for their comments on the paper: Antonio Balaguer, Paul Steffens, Andrew Lalor. This paper was presented at the Australian Centre for Entrepreneurship Research Exchange conference, Gold Coast 4th February 2016. We are grateful for comments and feedback received at this event.

Key points

- Australian SME performance was assessed by firm age using customised analysis of the Australian Bureau of Statistics Business Characteristics Survey.
- The analysis indicates that young SMEs are more likely to report annual growth and less likely to report annual declines in employment, sales income, profitability, productivity and the range of goods or services offered over the previous year.
- Younger SMEs, particularly start-ups, are more likely to introduce new or significantly improved product, process and marketing methods. These innovations are more likely to be new to the market as opposed to adoption of existing innovations from elsewhere. Start-up SMEs are associated with high collaborative innovation and networking domestically and internationally. These data suggest that innovation capability is one of the endogenous factors driving the observed growth outcomes for young Australian SMEs.
- Many of the skills commonly associated with innovation: science, research, engineering and IT are not more likely to be engaged by young SMEs.

1. Introduction

Since the late 1970s the disproportionate contribution of young firms to growth has been understood.¹ However the characteristics of new firm growth has remained poorly understood due to a lack of age variables in administrative databases around the world.² Very little data exists that hints at the characteristics of young firms or young, high growth firms. Coad et al. (2015) use Swedish firm data from 1997–2010 to show that young firms tend to exhibit high sales growth and beyond five years these growth rates slow down and become more erratic and negative. Hendrickson et al. (2015) demonstrate that as Australian firms age the probability of employment growth diminishes. These results are similar to that of other OECD countries.³ As firms age, their employment growth declines to the extent that young firms contribute disproportionately to net job creation in Australia. Start-ups (firms aged up to two years) added 1.44 million full-time equivalent (FTE) jobs to the economy during the period from 2006 to 2011, whereas older firms (three years or older) shed around 400,000 FTE jobs over the same period.⁴ Start-ups propel most of this growth.⁵

Firms with higher productivity are more likely to survive and therefore contribute to growth.⁶ Loderer & Waelchli (2011), Coad et al. (2013) and Matteo (2014) found that return on assets, profitability and productivity growth rates generally decline with age. Haltiwanger (2012) also found that exiting firms had lower productivity than mature incumbents that in turn had lower productivity than surviving young firms.⁷ Nguyen and Hansell (2014)⁸ made a similar conclusion in respect of Australian data; namely that exiting firms in manufacturing and business service industries had lower productivity than established firms even several years before their exit. They found that productivity growth peaked in the second year of operation.⁹

We are particularly interested in the skills and innovation capabilities of firms of different ages. The entrepreneurial creation of new firm entities and business models is an inherently risky process. An element of market experimentation (innovation) is necessary for firm dynamism and therefore growth — with only the most viable new business models and technological advancement succeeding.¹⁰ In earlier analysis of the Comprehensive Australian Study of Entrepreneurial Emergence in 2007–11, the majority of new ventures (up to four years old) reported that they offered some degree of innovation in some aspect of their firm — whether in respect of the product, the process, market selection, or marketing approach. Close to 75 per cent of new ventures reported some degree of product or service novelty, and over 40 per cent reported that they target markets neglected by other firms.¹¹ In addition, more than 20 per cent of

¹ Evans (1987); De Kok et al. 2006; Haltiwanger et al. (2010); Decker et al. (2014)

² McKelvie & Wiklund (2010); Decker et al. (2014)

³ See Criscuolo et al. (2014)

⁴ Hendrickson et al. (2015)

⁵ *Ibid*, p.42

⁶ Decker *et al* (2014) *op cit*, p.11

⁷ Haltiwanger (2012)

⁸ Nguyen & Hansell (2014)

⁹ *Ibid*, p.14

¹⁰ Haltiwanger (2012)

¹¹ Davidsson & Gordon (2013)

firm founders surveyed reported their venture as being ‘high-tech’ and/or based on new technologies and/or giving R&D a central role.¹²

Studies from other countries have found that the probability of product innovation generally declines with firm age and that new entrants demonstrate the highest probability of innovation. Exiting firms are also least likely to have introduced process innovations.¹³ Bianchini et al. (2015) found that better corporate governance in younger firms is actually negatively correlated with investment in innovation — perhaps due to the riskier nature of some innovation and lack of short term returns.¹⁴

This paper uses customised data from the Australian Bureau of Statistics (ABS) to determine what firm characteristics if any may explain the negative correlation of growth with age in Australian small to medium enterprises (SME).¹⁵ A range of Business Characteristics Survey and financial indicators were examined and cross-referenced by firm age (see Appendix A for methodological notes). The ABS dataset allows the investigation of innovation by firm age not previously conducted with national statistics in Australia. Firm age categories analysed were: less than one year old, one to four years old, five to nine years old and 10 or more years old.

2. Results

2.1 The likelihood of growth declines with age

The results show that as firms age they become less likely to report growth and more likely to report decreases in productivity, profitability, employment, sales, the range of goods and services offered to the market or staff training (Tables 2.1 to 2.3). For example, around one in two young SMEs (aged between one and four years old) report annual growth in sales (Table 2.1). In contrast, only one in three mature SMEs (that are ten or more years old) reported any sales growth in 2012–13.

Although the differences between SMEs of different ages can sometimes appear small, the results are significant¹⁶ and mask a significant counter-veiling age by size effect (Table B1). This age trend is apparent across all SME size classes when separated out (Figures B1 to 3). Figure B1 (panel A) clearly illustrates the firm age by size effect for productivity. Larger firms are more likely to report annual growth in productivity and yet also exhibit the same decline with age.

¹² *Ibid*, p.12

¹³ Huergo & Jaumandreu (2004)

¹⁴ Bianchini et al. (2015)

¹⁵ SMEs are defined as firms with 0–199 employees.

¹⁶ Two-way ANOVA, $p < 0.05$. Results were significant for employment, productivity and profitability measures in Table B1. A significant effect of both firm age and size was detected as well as a significant firm age by size effect.

Table 2.1: SME employment and sales performance, compared to previous year, by age, 2012–13

Firm age (years)	Total number of jobs or positions, per cent			Income from sales of goods and services, per cent		
	Increased	Stayed the same	Decreased	Increased	Stayed the same	Decreased
1–4	21.8	51.0	13.8	45.7	18.0	24.2
5–9	17.4	57.9	15.2	35.8	21.6	37.4
10+	11.7	62.0	16.9	32.2	23.6	39.9

Notes: Given that these measures were of changes in firm performance as compared to the previous year, we did not examine firms aged less than one year. SMEs are firms with 0–199 employees.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

Table 2.2: SME profitability and productivity, compared to previous year, by age, 2012–13

Firm age (years)	Profitability, per cent			Productivity, per cent		
	Increased	Stayed the same	Decreased	Increased	Stayed the same	Decreased
1–4	33.4	37.1	29.5	31.5	57.7	10.8
5–9	28.7	34.0	37.3	23.8	58.0	18.2
10+	23.5	33.4	43.1	19.3	60.4	20.3

Notes: Given that these measures were of changes in firm performance as compared to the previous year, we did not examine firms aged less than one year. SMEs are firms with 0–199 employees.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

Table 2.3: SME range of goods and services offered and structured or formal training, compared to previous year, by age, 2012–13

Firm age (years)	Range of goods and services offered, per cent			Structured or formal training for employees, per cent		
	Increased	Stayed the same	Decreased	Increased	Stayed the same	Decreased
1–4	24.2	57.2	5.8	14.7	31.1	3.6
5–9	18.1	64.4	6.9	12.3	43.8	4.9
10+	13.6	66.4	8.1	8.9	40.5	5.6

Notes: Given that these measures were of changes in firm performance as compared to the previous year, we did not examine firms aged less than one year. SMEs are firms with 0–199 employees.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

Firm age has a less pronounced effect on exports (Table B1). Only a small percentage of Australian SMEs earn income from the export of goods or services and this proportion rises slightly with age. Propensity to export is more a function of size than age.

Median yields on a per firm or per employee basis increase with age (Table B1). Median turnover per employee increase from around \$39,000 to \$83,000 as SMEs age. The margin between turnover and operating expenses per employee also grows as SMEs age. Figure B5 illustrates average operating and capital expenditure per firm or per employee for Australian firms of different ages and sizes from 2006–07 to 2012–13. Unsurprisingly the larger the firm the more likely it is to report greater operating and capital expenditure. For both operating expenditure and capital expenditure, age also has a clear impact. As firms age, they are more likely to have higher expenditures. This trend is most extreme for medium-sized firms (20–199 employees). Average capital expenditure for medium-sized firms of this size aged 10 years plus is nearly three times that of firms aged less than one year (Figure B4 panel B). With respect to annual growth in IT expenditure, declining expenditure with age is only apparent for micro-sized firms (0–4 employees).

2.2 Start-ups display greater product innovation and innovation novelty

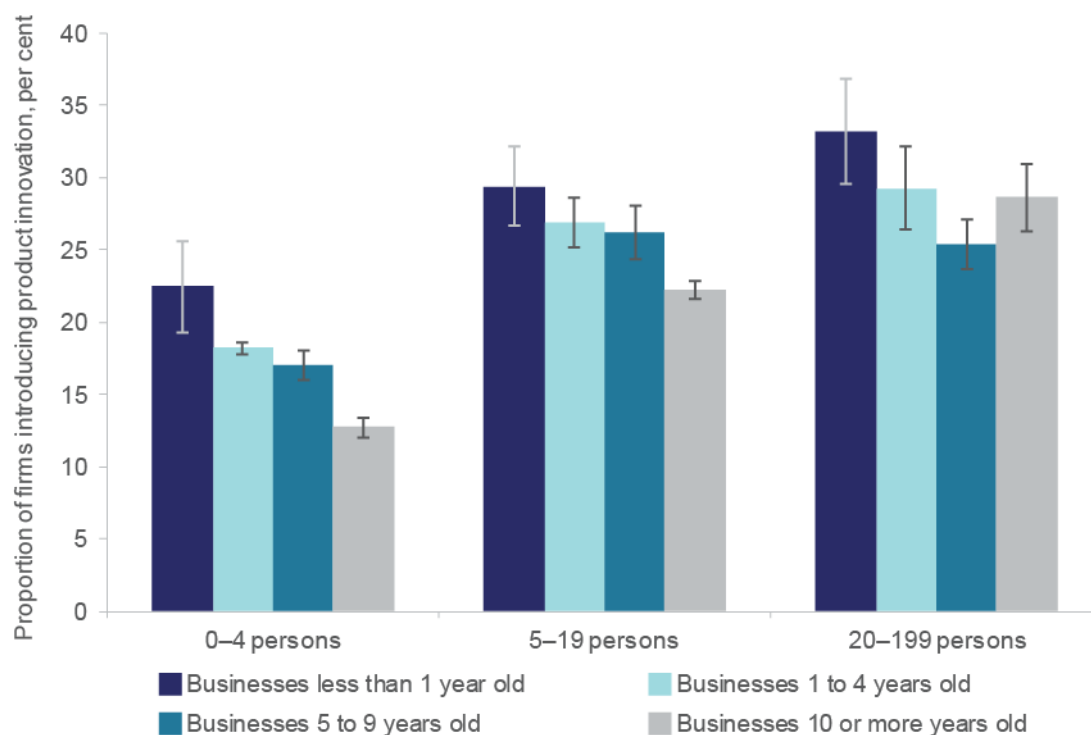
The likelihood of product (goods and services) innovation declines with SME age. SMEs in their first year of operation report that they are significantly more likely than older firms to introduce new or significantly improved goods and/or services (Table B2). Around one in four Australian start-up SMEs (less than one year old) introduced a new good or service in 2012–13. Less than one in five mature SMEs were innovative (Table B2). Once these figures are further disaggregated by firm size (Figure 2.1), the data shows the strongest age effect in small firms (less than 20 employees) (Figure 2.1).

Other types of innovation show a less distinct effect of firm age (Table B2). For example in new or significantly improved operational processes such as new ways of handling logistics or distribution, the positive effect of size is stronger than the age effect (Figure B4). In small mature firms there appears to be a minor reduction in process or marketing innovation activity. However, in the case of process innovation this trend disappears and possibly reverses in larger firms (Figure B4). When examining new or significantly improved organisational or managerial processes, such as knowledge management or managing relations with external entities, there is very little distinction based on firm age. Around one in five SMEs invested in this type of innovation at all firm ages (Table B2).

There were relatively high proportions of innovative start-up SMEs introducing ‘new-to-market’¹⁷ product (39 per cent), process (22 per cent) and marketing innovations (17 per cent) in 2012–13 in their first year of operation (Table B2). This declined significantly after their first year and appears to increase marginally with age.

¹⁷ New to Market innovation includes innovations that are new to the world, new to Australia and/or new to Australian industry.

Figure 2.1: Firms undertaking product (goods and service) innovation, by firm age, by employment size, 2008–09 to 2012–13



Notes: Values are annual averages \pm standard errors.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 12 (unpublished)

It is clear that young SMEs are lean innovators with innovation expenditure influenced more by firm size than age (Figure B6). Most SME innovators spend less than \$50,000 per annum on innovation and this is typically adoption of new capital and training over R&D. It appears that small firms with less than 20 employees tend to spend more on innovation per firm in their first five years of operation. There is no apparent effect of firm age on medium-sized firms. Limited R&D expenditure data is available by age (Table B3). Of the \$18 billion spent in Australia in 2010–11, the majority (\$12.3 billion) was spent by large firms. Of the remaining \$5.7 billion R&D expenditure, only \$0.89 billion was spent by young SMEs (0–5 year old) with annual turnover less than \$20 million. Given the categorical nature of the ABS's innovation expenditure data it was not possible to estimate total innovation expenditure on a per firm or per employee basis. However, median R&D expenditure on a per employee basis was highest in firms less than 5 years old (between \$38,000–50,000 per employee; Table B1).

2.3 Start-ups more likely to engage in international collaboration for innovation

Collaboration¹⁸ is an important means for firms to gain an advantage in the marketplace, to develop capabilities, share risks and resources, innovate and to maximise performance outcomes. We examined the extent to which SMEs in Australia had collaborative arrangements in place in 2012–13. Such collaborative arrangements are, in fact, relatively rare in Australia.¹⁹ The small number of collaborative firms in the sample we analysed led to confidentiality restrictions being imposed by the ABS or very high variation in the responses making it difficult to extract robust results.

Given the positive relationship between innovation novelty and collaboration²⁰ it was not surprising to find that SME collaboration on innovation is highest for start-ups or young SMEs in general (Table B2). For example approximately one in three start-up SMEs will have developed their innovation in partnership with another firm. This frequency drops to one in five for older SMEs. Some measures of collaboration show that start-ups SMEs in Australia may be significantly more likely (almost one in three) to partner internationally with firms in their sector. By contrast, in mature SMEs the likelihood of international collaboration on innovation with firms in the same sector is around one in fifty.

For most types of collaboration partners, collaboration for innovation tends to be higher in the earlier years of operation. This is particularly the case for collaboration with firms that belong to the same business group (both in Australia and overseas), clients, competitors and universities (Table B2). In 2012–13, start-up SMEs aged under one year were, in fact, three times more likely to collaborate with overseas firms owned by the same company than firms aged over 10 years and twice as likely to collaborate with competitors. However, collaboration with suppliers was more common for older firms and this may reflect the fact that supply chain relationships are better developed for more established firms.

Innovation active firms were asked from where they derive their ideas for innovation. Use of public sources of information like websites, research journals and articles were more common for younger firms reflecting perhaps the lower costs in accessing them. Older firms were slightly more likely to use consultants, conferences and industry associations as sources of ideas for innovation (Figure B6).²¹ One of the most concerning age-related trends was the decline in the percentage of SMEs that source ideas and information for innovation from their clients, customers and buyers (Figure B7). Innovation appears at first glance to become less customer-oriented as SMEs age. Interestingly large firms start very low and increase marginally as they age. This may reflect their reliance on indirect sources of customer intelligence.

¹⁸ Collaboration is defined as the arrangement where firms work together for mutual benefit, including some sharing of technical and commercial risk. Each participant in the collaboration did not need to benefit commercially. This could include joint buying, joint production, joint marketing or distribution, joint R&D activities or an integrated supply chain.

¹⁹ Australia ranks 24th out of 31 countries in the OECD for the proportion of SMEs collaborating on innovation: Australian Government (2015) *Australian Innovation System Report 2015*, Department of Industry, Innovation and Science, Office of the Chief Economist, Canberra

²⁰ Soriano F & Abello R (2014).

²¹ The other sources not listed in the charts were: within this business or another business owned by the same company; clients; suppliers, competitors; government agencies; private non-profit research bodies; and commercial laboratories.

2.4 Skills

In SMEs the most commonly used skills are management, marketing and trades (Figure B9). Very few firms (less than one in ten) use science and research skills at all. As SMEs age they tend to become more diversified with respect to the science, technology and engineering skills used by the firm (Table B2). This may reflect the fact that the ratio of working proprietors, partners and salaried directors to other employees gets lower as SMEs age and the fact that in the early years of operation SMEs are more focussed on skills development. By contrast the use of financial and business management skills is constant with age.

3. Discussion

The findings in this paper on the negative correlation between age and the incidence of sales, product range, productivity and profitability growth are consistent with the international literature. Studies from other countries show that start-ups initially have a lower than average productivity level for their sector but exhibit a fast rate of productivity growth which declines as the firm matures.²² This may be attributable to the higher learning rates needed at initial stages of firm development to catch up with or exceed average industry productivity levels. Further work is needed to establish when, and in which sectors, these new entrants exceed their sectors' productivity frontier. Start-ups are highly disparate in their growth performance and only a small proportion of high growth firms are driving the bulk of start-up job creation in Australia.²³ How much these young SMEs are playing catch-up or pushing the boundaries is fundamental to our understanding of where and how productivity growth is occurring in the economy. Our data suggests that start-ups are more likely to introduce a good or service innovation that is new to their market suggesting that initial growth of start-ups is driven by growth in market share rather than efficiency-driven productivity growth.

Our innovation results are consistent with the study of Spanish firms by Huergo & Jaumandreu (2004): young SMEs, particularly start-ups, are more likely to innovate and introduce more novel innovations. Two studies of US firms found that while older firms have a higher quantity of innovation output, young firms tend to outpace their older rivals with higher impact from their innovation investments. Innovations were only fully exploited in the initial stages of investment, with returns on investment declining as the firm aged.²⁴ Our data is consistent with the argument that older firms have greater difficulties in adapting their strategies to changing market conditions despite greater experience,²⁵ perhaps related to failure to retain key innovative people and their ideas.²⁶ As Australian SMEs age the ratio of owner to staff tends to get larger and the evidence we provide on staff training, sourcing ideas and information and collaboration suggests that young firms are in a more flexible learning phase enabling them to better exploit new ideas and changing market conditions. In the quest for market share, younger firms may be more willing to allocate their

²² Coad et al. 2013; Matteo 2014

²³ Hendrickson et al. 2015

²⁴ Kotha et al. (2011); Loderer & Waelchli (2011)

²⁵ Coad et al. (2015); Loderer & Waelchli (2011)

²⁶ Loderer & Waelchli (2011)

scarcer resources to developing new goods and services that customers want and to considering how to deliver and market these innovations.²⁷ It is important to note that that many of the skills commonly associated with innovation: science, research, engineering and IT are not more likely to be used by young SMEs. The data may instead suggest that growth in these firms may be more reliant on how these scarce skills are being combined and utilised in the commercialisation process rather than the relative number of employees with these skills. Future research should investigate the impact of skills diversity on innovation and high growth in Australian firms.²⁸

It is interesting that start-up SMEs are significantly more likely to be engaged internationally for innovation activities than older SMEs and yet they are less likely to be exporting (Table B2). Future research should consider the degree to which foreign ownership influences this trend.

Productivity may not be high in absolute terms in the first years of an SME's operation as they seek to achieve a minimum efficient scale (see Table B1).²⁹ However, Davidsson et al. (2009) found that start-ups with higher profitability were more likely to be able to sustain higher rates of growth later.³⁰ If young SMEs are significantly more willing to take higher risks through new to market product, process and marketing innovation then innovation policy should perhaps focus on de-risking the commercialisation process for entrepreneurs in the nascent stages of firm set-up rather than in more mature, larger SMEs.³¹

Younger firms have a critical role to play in economic development. Firm age is a matter of increasing international interest among researchers and policymakers. Using a broad range of firm variables, this paper has sought to examine how an array of firm characteristics change with firm age. By investigating for the first time Australian data on this subject, the paper adds to the body of international evidence supporting the importance of young firms to growth. The findings of this paper are, however, limited by data availability and potential selection bias. The international literature and evidence from Australia shows that innovation is highly correlated with firm survival and growth. It therefore follows that when we compare firm size or age classes we are comparing firms with a highly uneven distribution of firms with respect to innovation. Our start-up or young firm category for example will include a mix of innovators and non-innovators. The results, while showing results consistent with the international literature, may be stronger by comparing the performance of young innovative SMEs with young non-innovative SMEs.

Future research on this data should also include large firms in an age by size regression analysis. The fact that we excluded large firms may introduce a selection bias to the analysis as young high growth firms may quickly leave an SME data set as they become large firms. The SME category is quite large with respect to employment (0–199 employees). As surviving firms age they grow³² without necessarily changing a size class thus skewing financial data towards older firms. Future research should investigate the frequency distributions and their skewness and kurtosis similar to Coad et al. (2015).

²⁷ See Pellegrino (2015)

²⁸ See Hewlett et al. (2013)

²⁹ See Hansell & Nguyen (2014); Coad et al. (2015)

³⁰ Davidsson et al. (2009); Steffens et al. (2009)

³¹ See Alinejad et al. (2015) for a discussion of financing issues for young innovative SMEs.

³² Criscuolo et al. 2014

Appendix A Methodology

The data in this paper is based on analysis of the Australian Bureau of Statistics Business Characteristics Survey (BCS) between 2006–07 and 2012–13. The question on firm age was used to split firms of different sizes into the following age cohorts: *Start-up firms* (less than one year old), *young firms* (one to four years old), *mature firms* (five to nine years old) and *old firms* (10 or more years old). The majority of firms (57 per cent) in the analysis are old firms (Table A1).

In the BCS, specific inputs (i.e. R&D, training and ICT investment), outputs (innovation) and outcomes (e.g. productivity and profitability growth) of firm production are recorded either as financial information (such as capital expenditure, ICT investment and wages) or as dummy variables (such as R&D, innovation and skills use). In some cases respondents did not complete an entire question. In this case results do not always add to 100 per cent.

A range of these specific variables were cross-tabulated with firms age and size class combinations (AGE X SIZE) to evaluate the importance of firm age on the above input-output-outcome firm production logic. Unfortunately the declining number of observations in the BCS prevented us from running a three-way interaction model (AGE X SIZE X INNOVATION). Two-way analysis of variance was used to determine the significance of mean differences and factor analysis on a select number of indicators on a year by year basis. Data is presented on an average annual basis to represent the consistency of differences between cohorts. Standard errors therefore represent variation between years rather than within cohort variation.

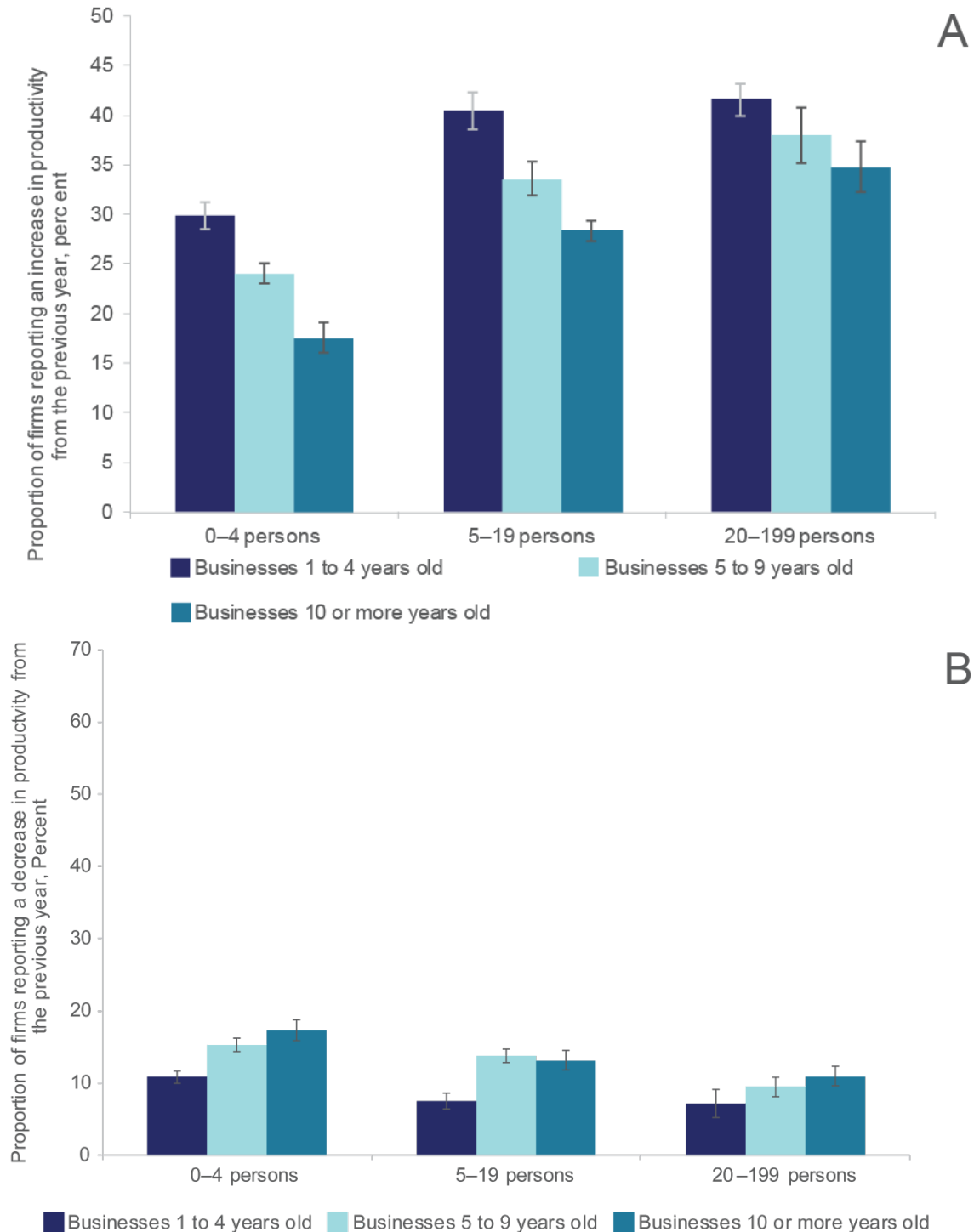
Table A1: Estimate of firm counts for each firm age, by employment size, 2012–13

2012–13	<i>Firms less than 1 year old</i>	<i>Firms 1 to 4 years old</i>	<i>Firms 4 to 9 years old</i>	<i>Firms 10 or more years old</i>
Employment size	'000	'000	'000	'000
0–4 persons	28.4	98.0	93.0	242.4
5–19 persons	7.9	37.0	46.8	149.2
20–199 persons	0.7	8.5	8.5	39.3
Less than 200 persons	37.1	143.5	148.2	430.9

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report (unpublished)

Appendix B Supplementary data

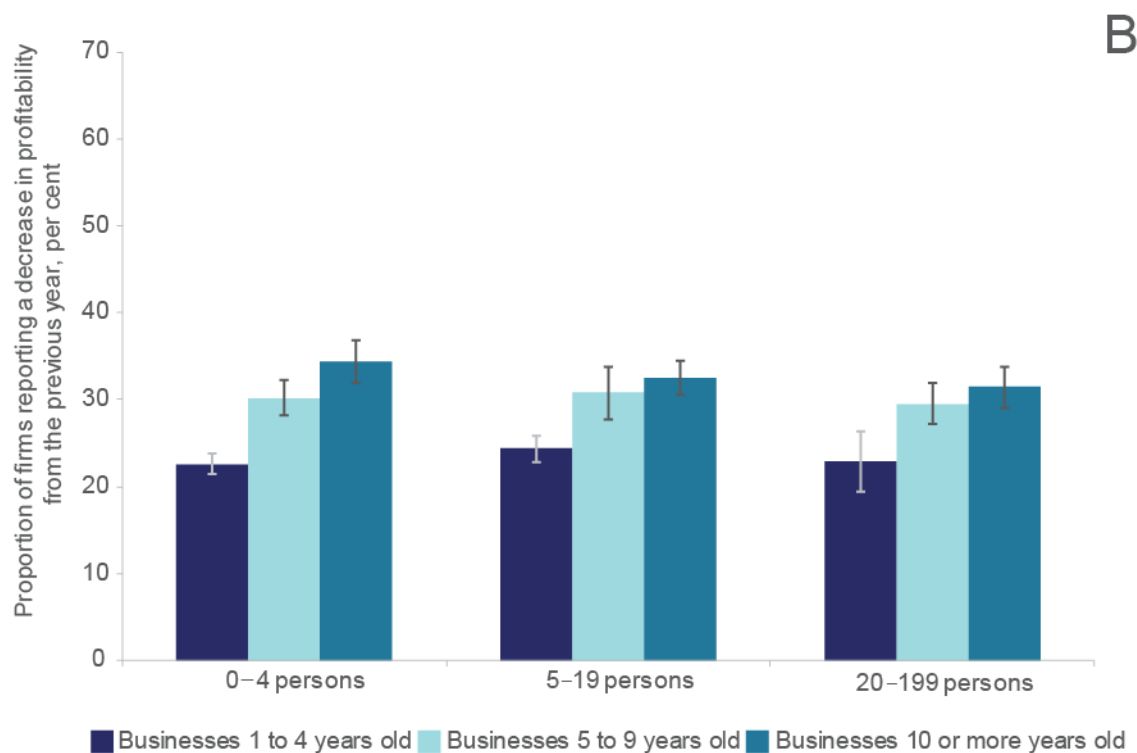
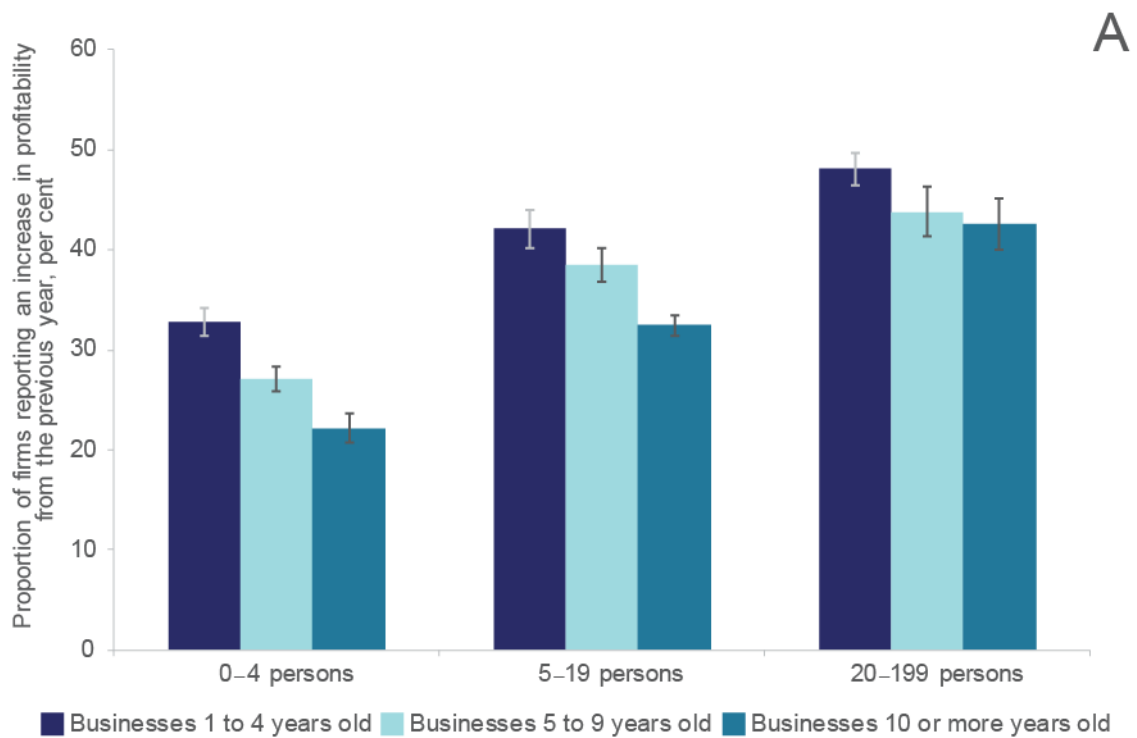
Figure B1: Likelihood of reporting productivity increases (panel A) and decreases (panel B) by firm age, by firm size, 2006–07 to 2012–13



Notes: Values are annual averages \pm standard errors

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

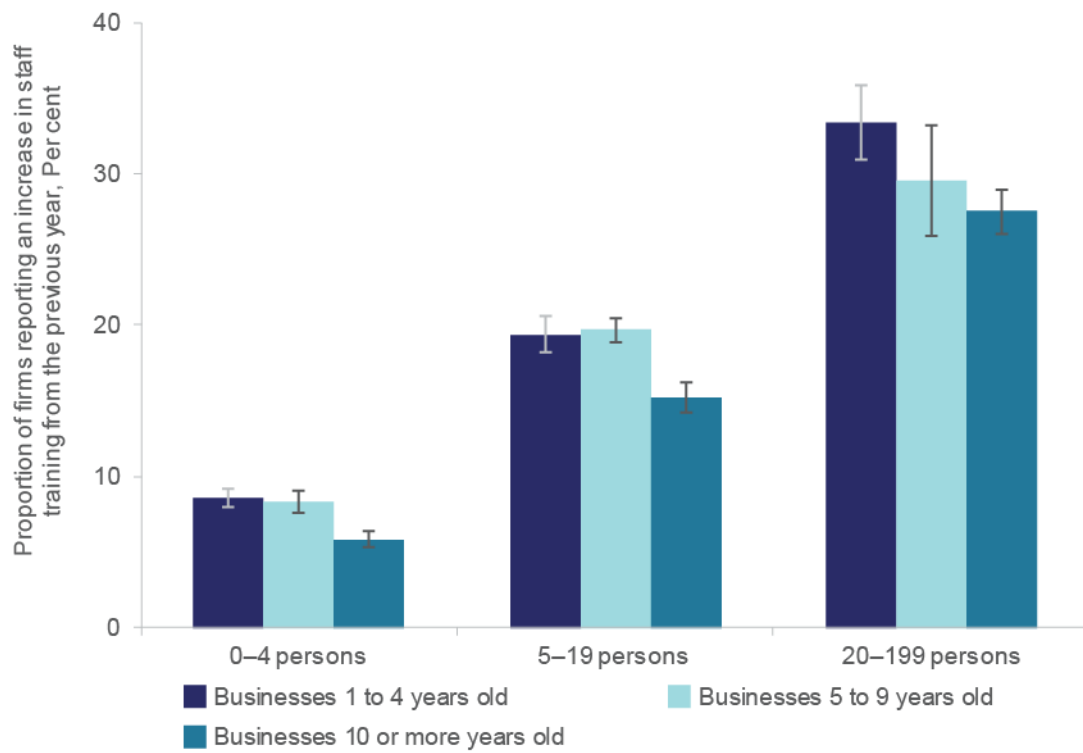
Figure B2: Likelihood of reporting profitability increases (panel A) and decreases (panel B) by firm age, by firm size, 2006–07 to 2012–13



Notes: Values are annual averages \pm standard errors

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

Figure B3: Likelihood of reporting increases in structured or formal training offered to employees, by firm age, by firm size, 2006–07 to 2012–13



Notes: Values are annual averages \pm standard errors

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 6 (unpublished)

Table B1: SME financial characteristics by age, 2006–07 to 2012–13

<i>Firm age, years</i>	<i><1</i>	<i>1–4</i>	<i>5–9</i>	<i>10+</i>	<i>F value</i>	<i>P value</i>
Median yield ^A per firm, \$000s ^{*i}	0	25	40	45	5.1	0.0016
Median yield ^A per employee, \$000s ^{*i}	1	8	12	11	16.7	<0.0001
Median turnover per employee, \$000s ^{*i}	39	85	101	109	56.6	<0.0001
Median operating expenses per employee, \$000s ^{*i}	38	69	79	85	64.9	<0.0001
Firms reporting annual productivity growth*, per cent	–	39.7	34.8	30.0	36.0	<0.0001
Firms reporting annual profitability growth*, per cent	–	43.1	40.1	35.9	53.51	<0.0001
Firms reporting annual employment growth*, per cent	–	38.0	35.4	25.9	987.86	<0.0001
Firms receiving export income, per cent	2.7	5.0	6.3	7.6		
<i>Firm age, years</i>	<i><2</i>	<i>2–4</i>	<i>5–9</i>	<i>10+</i>		
Median R&D per employee ^B , \$000s ^{**}	38	50	29	18	7.2	<0.0001

Notes: ^AYield = [Income – (Operating expenditure + CAPEX)], ^B Reference period for R&D data is 2006–07 to 2011–12. Age categories for R&D data had to be grouped differently to ensure data could be released for confidentiality reasons. ⁱWinsorised results for 0.5th and 99.5th percentiles within each stratum.

Source: ABS customised data from the *Business Characteristics Survey & **Business Research and Experimental Development Survey (several years)

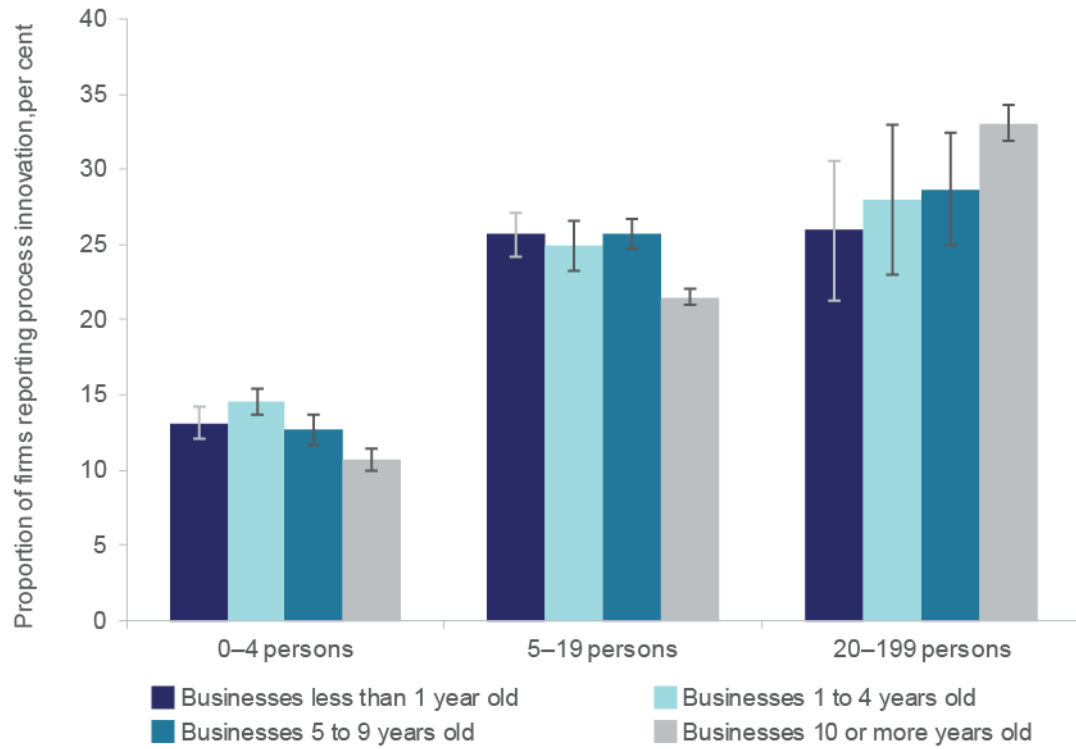
Table B2: Selected SME non-financial characteristics by age, 2006–07 to 2012–13

<i>Firm age, years</i>	<i><1</i>	<i>1–4</i>	<i>5–9</i>	<i>10+</i>
<i>Innovation</i>				
Product (goods & services) innovation, per cent	24.0	21.0	20.1	17.5
Product innovation novelty, per cent innovative firms ^{A,B}	39.1	19.8	23.8	26.0
Operational process innovation, per cent	15.8	17.9	17.8	16.5
Process innovation novelty, per cent innovative firms ^{A,B}	22.1	11.3	16.3	14.9
Organisational/managerial innovation, per cent	20.6	20.7	22.5	19.4
Organisational/managerial innovation novelty, per cent innovative firms ^{A,B}	9.5	4.2	9.0	9.9
Marketing innovation, per cent	18.0	20.1	18.8	16.6
Marketing innovation novelty, per cent innovative firms ^{A,B}	17.2	7.7	11.2	6.9
Clients, customers or buyers as a source of ideas or information for innovation, per cent ^A	50.9	47.7	42.2	36.8
At least one method used to protect intellectual property, per cent of firms	20.4	19.4	22.0	20.0
Joint R&D, per cent of firms	3.7	3.2	3.3	3.3
Innovations developed in cooperation with another firm, per cent ^{A,B}	30.2	19.4	19.4	20.2
Domestic collaboration on innovation with another firm owned by the same company, per cent ^{A,B}	27.3	21.4	22.4	13.8
International collaboration on innovation with another firm owned by the same company, per cent ^{A,B}	12.7	3.3	4.5	3.0
International collaboration on innovation with competitors and firms from the same industry, per cent ^{A,B}	28.6	8.6	2.5	2.2
Domestic collaboration on innovation with clients customers or buyers, per cent ^{A,B}	55.8	61.5	41.3	35.0
<i>Skills and employment</i>				
Working proprietors, partners and salaried directors, per cent of employment	26.7	21.1	17.7	15.6
Paid parental leave offered, per cent of firms	2.8	3.8	5.5	5.0
Firms reporting annual increases in structured or formal training, per cent	–	12.6	13.0	11.2
Engineering skills used, per cent	9.8	18.2	15.1	20.2
Scientific and research skills used, per cent	4.3	5.1	6.3	8.8
IT professionals skills used, per cent	19.9	25.6	25.5	31.4
IT support technicians skills used, per cent	13.1	16.6	21.2	23.7
Trades skills used, per cent	25.4	23.8	25.3	27.1
Transport, plant and machinery operations skills used, per cent	9.7	11.2	13.7	16.7
Marketing skills used, per cent	20.2	22.1	22.4	21.7
Project management skills used, per cent	11.1	12.0	12.6	11.0
Business/Financial management skills used, per cent	43.0	44.5	43.3	48.2

Notes: ^AData only available every second year from 2006–07 to 2012–13, ^BData for 2012–13 only.

Source: ABS customised data from the Business Characteristics Survey (several years)

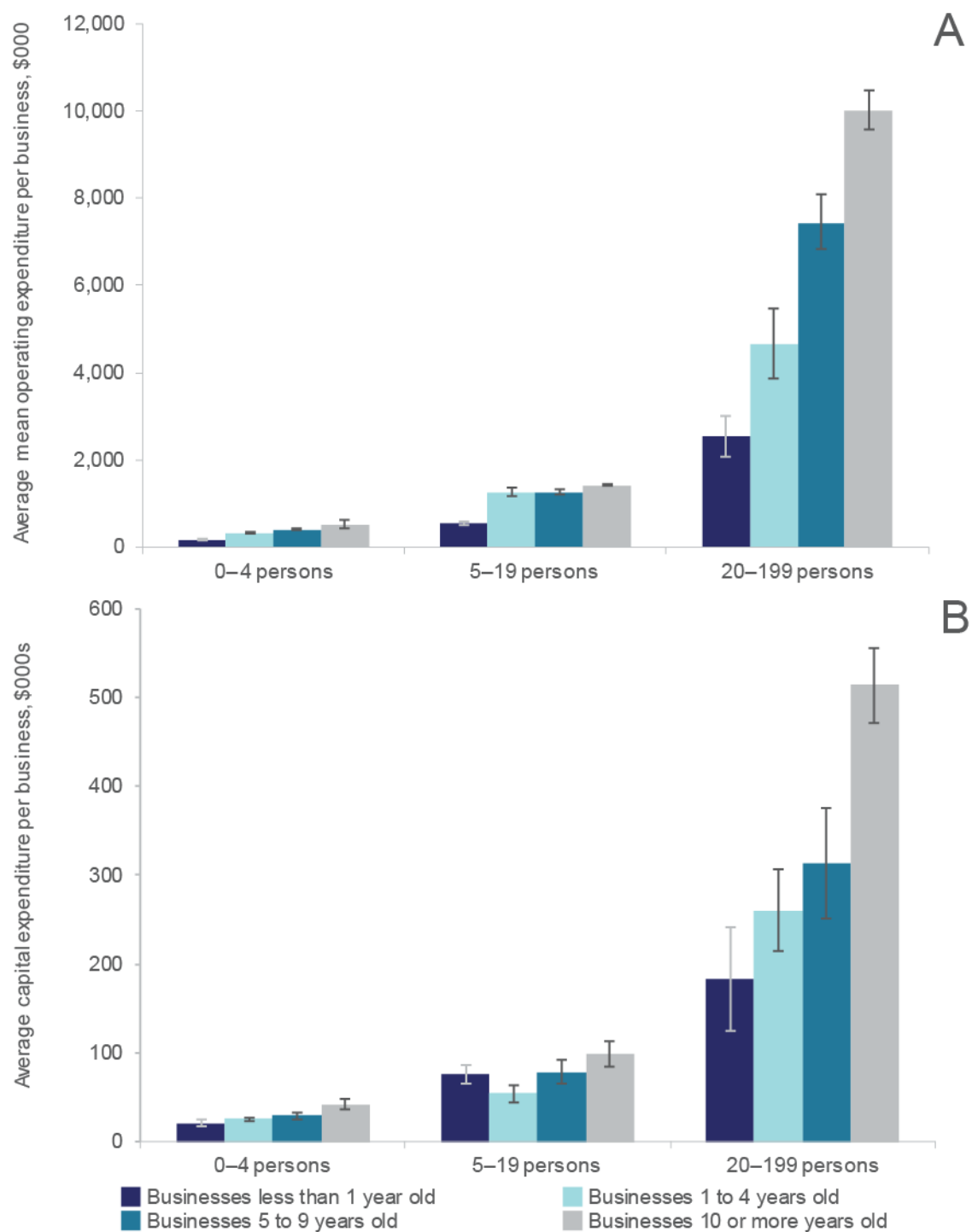
Figure B4: Firms undertaking operational process innovation, by firm age, by employment size, 2008–09 to 2012–13



Notes: Values are annual averages \pm standard errors. Lower columns represent the proportion of firms introducing 'new to market' goods and services.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 12 (unpublished)

Figure B5: Operating and capital expenditure per firm by firm age and size, 2006–07 to 2012–13



Notes: Values are annual averages \pm standard errors.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 2

Figure B6: Innovation expenditure by firm age, by firm size, 2010–11 to 2012–13



Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 12

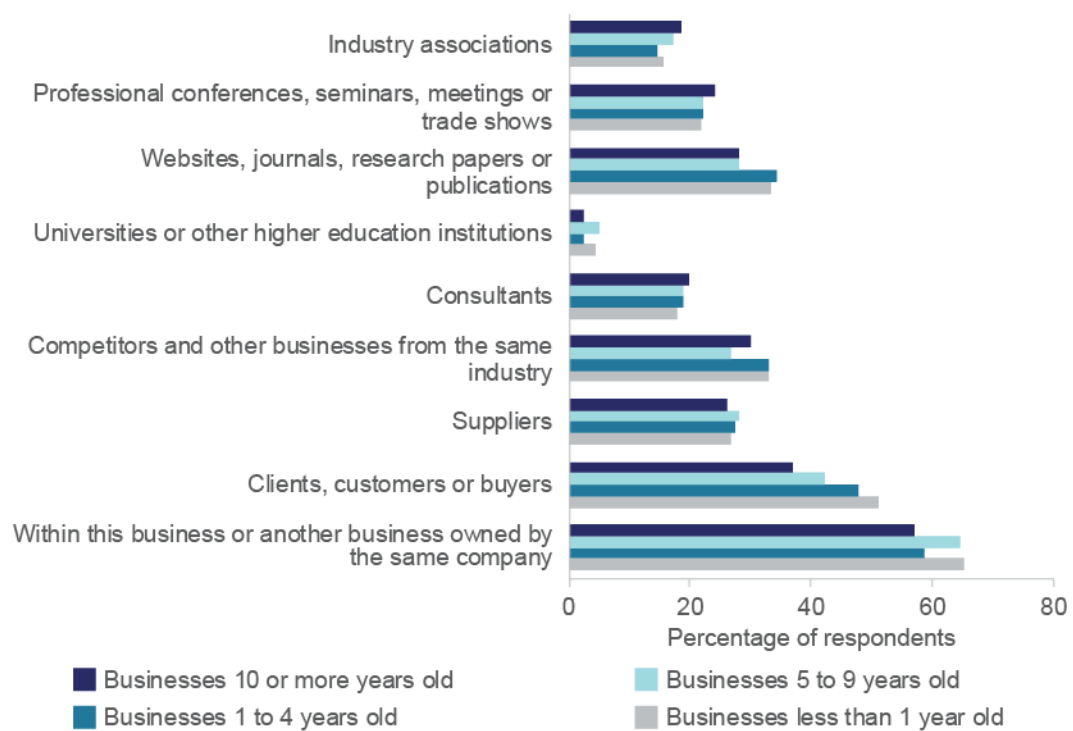
Table B3: Firm expenditure on R&D, by turnover, by age 2010–11

Turnover Range, \$million	<\$2 M		\$2–19 M		\$20–99 M	\$100 M+	Unknown	Total
	0–5	6+	0–5	6+	All	All		
Age, years								
Employment Size	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
0–4	183,749	366,158	23,212	58,813	93,450	85,812	11,451	822,645
5–19	218,700	608,040	121,723	398,944	45,297	59,398	28,246	1,480,348
20–199	108,276	n.p.	226,609	1,250,105	878,773	584,364	n.p.	3,438,741
<200	510,725	n.p.	371,544	1,707,862	1,017,520	729,574	n.p.	5,741,734
200+	39,105	n.p.	49,724	161,536	676,828	11,291,429	n.p.	12,265,153
Total	549,830	1,321,858	421,268	1,869,398	1,694,348	12,021,003	129,182	18,006,887

Notes: n.p. indicates that the data is unavailable due to ABS confidentiality restrictions.

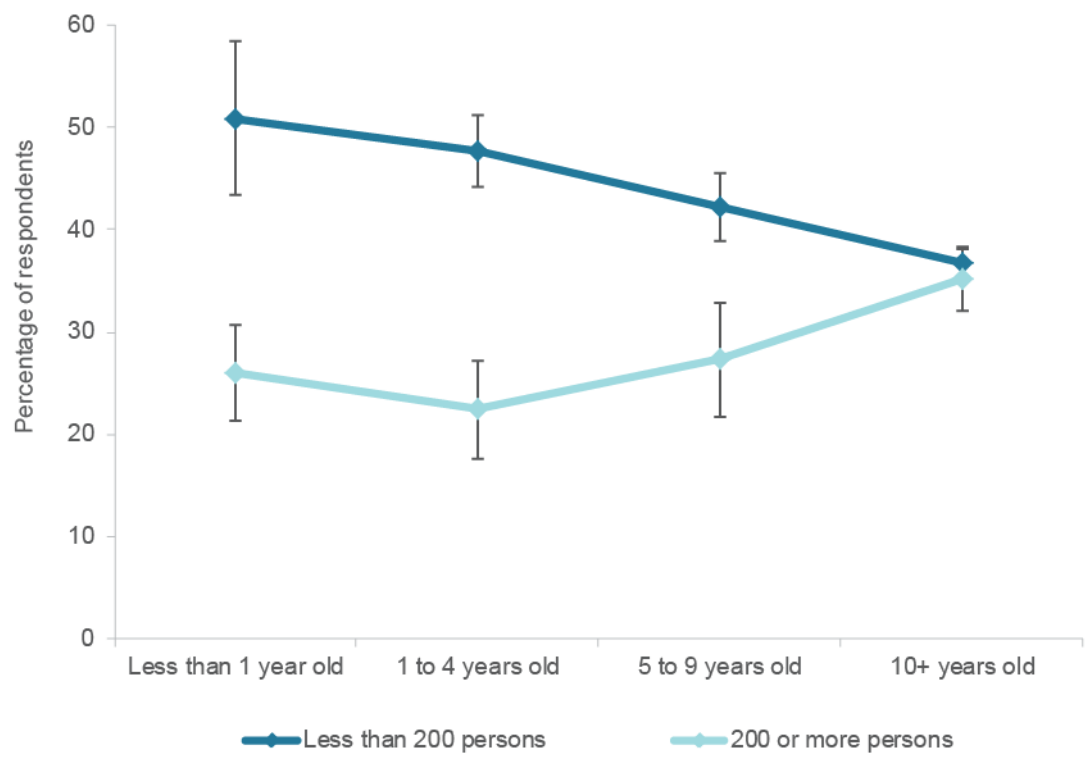
Source: ABS (2015) Customised data from 8104.0 Research and Experimental Development, Businesses, Australia

Figure B7: SME sources of ideas and information for innovation, 2012–13



Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 15

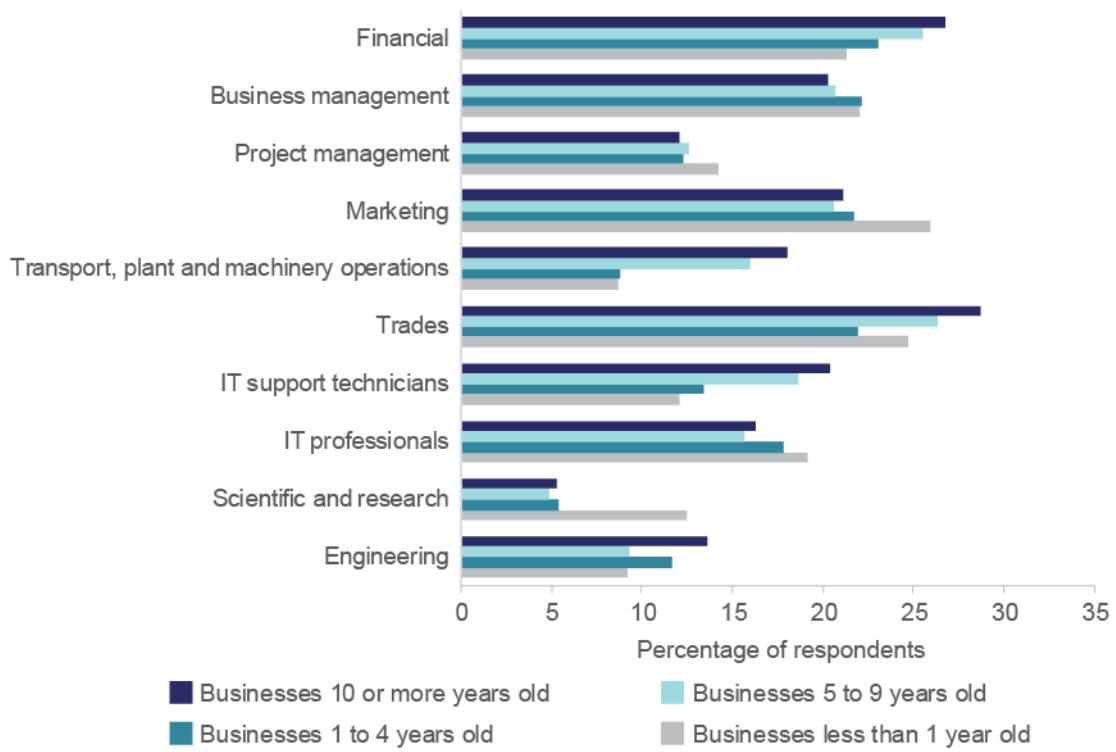
Figure B8: Percentage of firms sourcing ideas or information from clients, customers or buyers for innovation, by size, by age, 2012–13



Notes: Values are averages ± standard errors.

Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report

Figure B9: Skills used in core activities, by skills type, by firm age 2012–13



Source: Australian Bureau of Statistics (ABS) Business Characteristics Survey: Customised Report, Table 20

References

- Alinejad M, Balaguer A & Hendrickson L (2015) *Financing innovative entrepreneurship in Australia*, Office of the Chief Economist, Department of Industry, Innovation and Science, Canberra
- Bianchini S, Krafft J, Quatraro F & Ravix J (2015) *Corporate governance, innovation and firm age: Insights and new evidence*, The Department of Economics and Statistics "Cognetti de Martiis" Turin, Working Paper 04/15
- Coad A, Segarra A & Teruel M (2013) Like milk or wine: Does firm performance improve with age? *Structural Change and Economic Dynamics* 24: 173–189
- Coad A, Daunfeldt S-O & Halvarsson D (2015) *Bursting into life. Firm growth and growth persistence by age*, Available at SSRN: <http://dx.doi.org/10.2139/ssrn.2616759>
- Criscuolo C, Gal PN & Menon C (2014) *The Dynamics of Employment Growth: New Evidence from 18 Countries*, OECD Science, Technology and Industry Policy Papers, No. 14, OECD Publishing, Paris
- Davidsson P, Steffens P & Fitzsimmons J (2009) Growing profitable or growing from profits: Putting the horse in front of the cart? *Journal of Business Venturing* 24(4): 388–406
- Decker R, Haltiwanger J, Jarmin R & Miranda J (2014) 'The Role of Entrepreneurship in US Job Creation and Economic Dynamism', *Journal of Economic Perspectives*, 28 (3): 3–24.
- De Kok J, Fris P & Brouwer P (2006) 'On the relationship between firm age and productivity growth', *Scales Research Reports* H 200617
- Evans DS (1987) The relationship between firm growth, size and age: Estimates for 100 manufacturing industries, *The Journal of Industrial Economics* 35 (4): 567–581
- Haltiwanger J, Jarmin R & Miranda J (2010) *Who creates jobs? Small vs. large vs. young?* Working Paper 16300, National Bureau of Economic Research, Cambridge, Massachusetts
- Haltiwanger J (2012) Job Creation and Firm Dynamics in the United States, In, *Innovation Policy and the Economy*, Volume 12 by Lerner J & Stern S (Eds), University of Chicago Press, pp.17–38
- Hendrickson L, Bucifal S, Balaguer A and Hansell D (2015), *The Dynamics of Australian Employment*, Office of the Chief Economist, Department of Industry, Innovation and Science, Canberra
- Hewlett SA, Marshall M & Sherbin L (2013) [How Diversity Can Drive Innovation](#), *Harvard Business Review*, December 2013 Issue
- Huergo E & Jaumandreu J (2004) 'How does probability of innovation change with firm age?' *Small Business Economics* 22 (3–4): 193–207
- Karlsson C, Gråsjö U and Wixe S (2014) *Innovation and entrepreneurship in the global economy*, CESIS Electronic Working Paper Series Paper No. 385

Kotha R, Zheng Y, and George G. (2011) Entry into new niches: the effects of firm age and the expansion of technological capabilities on innovative output and impact, *Strategic Management Journal*, 32(9): 1011–1024

Loderer C, Neusser K & Waelchli U (2011) *Firm age and survival*, Available at SSRN 1430408

Loderer C and Waelchli U (2011) 'Firm age and performance', Available at SSRN: <http://ssrn.com/abstract=1342248>

Matteo R (2014) Firm age and performance: A literature review, In Vrontis T, Weber Y & Tsoukatos E (Eds) *The Future of Entrepreneurship*, 7th EuroMed Conference of the EuroMed Academy of Business, September 18–19, 2014 pp.1326–1336

McKelvie A & Wiklund J (2010) Advancing firm growth research: A focus on growth mode instead of growth rate. *Entrepreneurship Theory and Practice* 34(2): 261–288

Nguyen T & Hansell D (2014) *Firm Dynamics and Productivity Growth in Australian Manufacturing and Business Services*, Australian Bureau of Statistics, Canberra (ABS Catalogue no. 1351.0.55.052)

Pellegrino G (2015) *Barriers to innovation: Can firm age help lower them?* Barcelona Institute of Economics (IEB) Working Paper 2015–03

Soriano F & Abello R (2014) *Modelling the relationship between the use of STEM skills, collaboration, R&D and innovation among Australian businesses*, Report for the Office of the Chief Scientist.

Steffens P, Davidsson P & Fitzsimmons J (2009) Performance configurations over time: implications for growth-and profit-oriented strategies, *Entrepreneurship Theory and Practice* 33(1), 125–148