Innovation, Science and Economic Development Canada
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UNTANGLING THE SEED AND EARLY-STAGE FUNDING ENVIRONMENT IN CANADA

Innovation, Science and Economic Development Canada
Small Business Branch
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Canada

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INTRODUCTION

Access to capital and associated support—including mentorship, network access and business development services—is essential to the growth and success of many Canadian firms. Early-stage, high-potential businesses are often described as progressing through a "funding escalator," with various funding options available at different stages of a company's start to scale journey. This funding may begin with capital obtained from an entrepreneur's own savings or from friends and family, progressing through to access to angel capital, seed capital through business accelerator programs, or government grants or contributions targeted to support early-stage companies. As companies progress through their life cycle, some will seek venture capital (VC) financing to finance further growth, proceeding towards an exit through either acquisition or initial public offering (IPO).

This paper seeks to unpack the funding escalator for early-stage companies in Canada, highlighting the role played by both private capital sources—specifically angel and VC—as well as government innovation programs. In doing so, it examines the key characteristics of small and medium-sized enterprises (SMEs) receiving various types of support. The paper subsequently considers interlinkages between different forms of support. Finally, the paper considers the effect of risk capital support on the performance of recipient businesses.

LITERATURE REVIEW

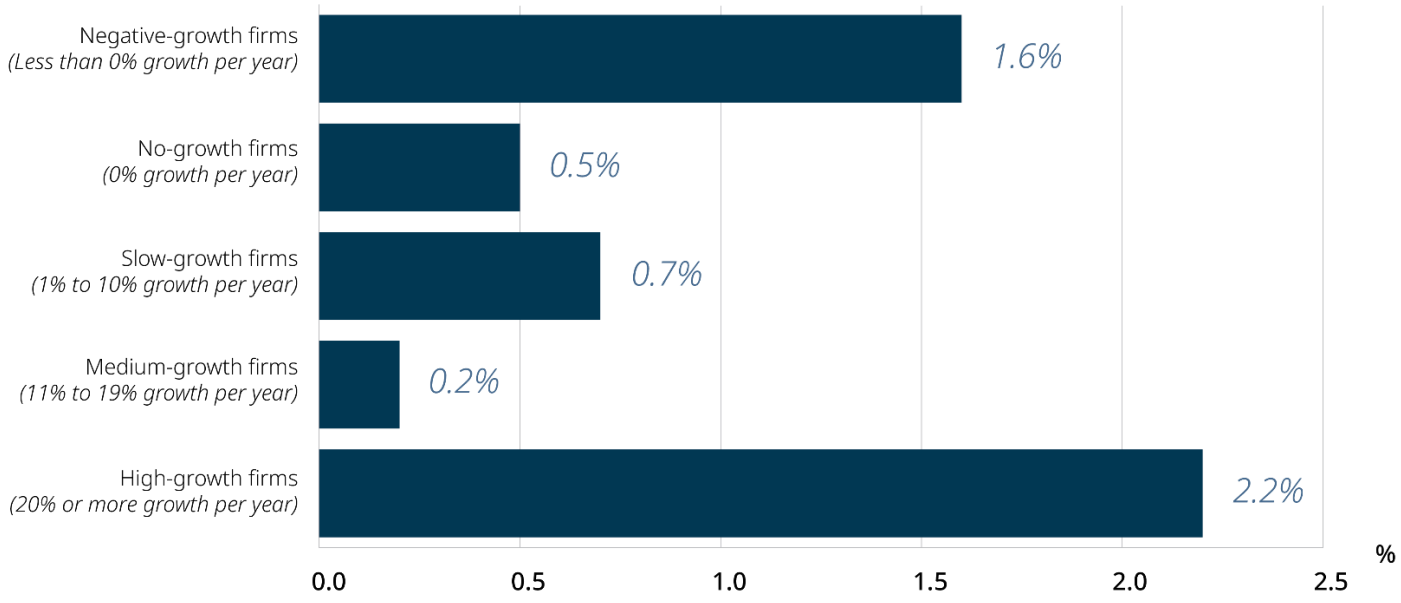
The funding escalator

Young, expansion-oriented companies face widely recognized needs and challenges in accessing external financing to help support their growth. Berger and Udell (1998) developed a financial growth cycle model that highlights how different sources of finance are appropriate and appealing to firms at various stages of their life cycle. As these authors describe, small businesses can be conceptualized as "having a financial growth cycle in which financial needs and options change as the business grows, gains further experience, and becomes less informationally opaque (p. 1)." The model developed by these authors suggests that firms will likely begin with "initial insider financing" provided by family and friends (p. 7). Having exhausted this capital, firms will need to seek external financing to fuel further growth.

Angel investors are high-net-worth individuals (HNWI) who invest their own capital into early-stage ventures. Angels may act alone or as part of an organized angel group. Venture capital has a more formal structure, with limited partners providing capital into a professionally managed fund which invests in early-stage to growth-stage companies in exchange for an equity stake.

Relative to more traditional forms of financing, only a small share of companies pursues equity financing through "risk capital," which encompasses both angel and venture capital investment. According to the *Survey on Financing and Growth of Small and Medium Enterprises,* while 47% of Canadian SMEs requested some form of external financing in 2017, slightly less than 1% (0.8%) sought equity financing. A higher proportion of negative-growth and high-growth firms requested equity financing, compared to the proportions of no, slow, or medium-growth firms that requested it.

Figure 1: Revenue/sales growth profile of companies requesting equity investment, 2017

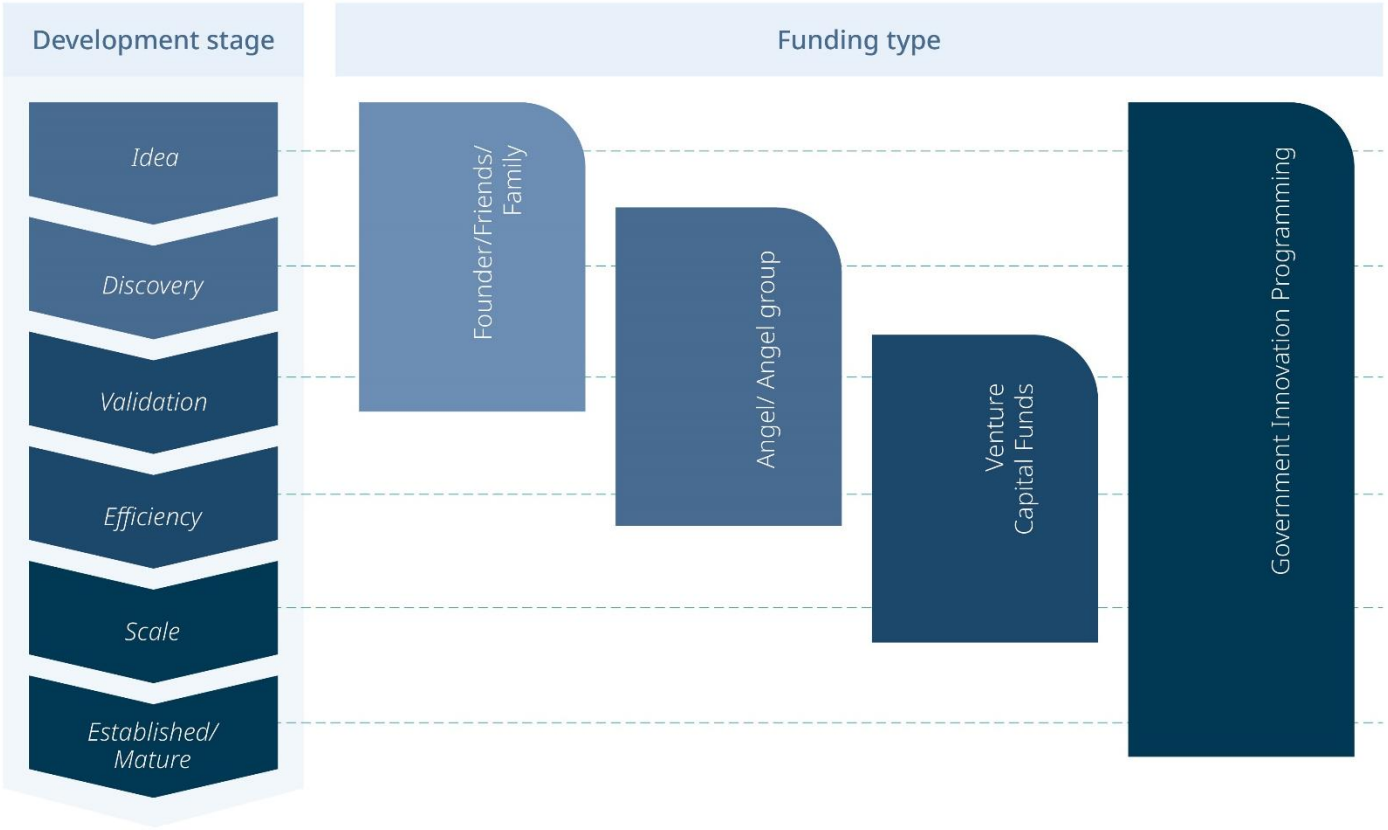


Source: *Survey of Financing and Growth of Small and Medium Sized Enterprises*, 2017.

While entrepreneurs may prefer to obtain debt-based financing rather than providing equity, small early-stage companies—particularly those that are "high risk"—may not have a sufficient track record or collateral to obtain bank financing at this stage. This early-stage financing need can be filled by angel investors, investing either individually or as part of an organized group or consortium, who invest their own capital into early-stage businesses in exchange for an equity stake.

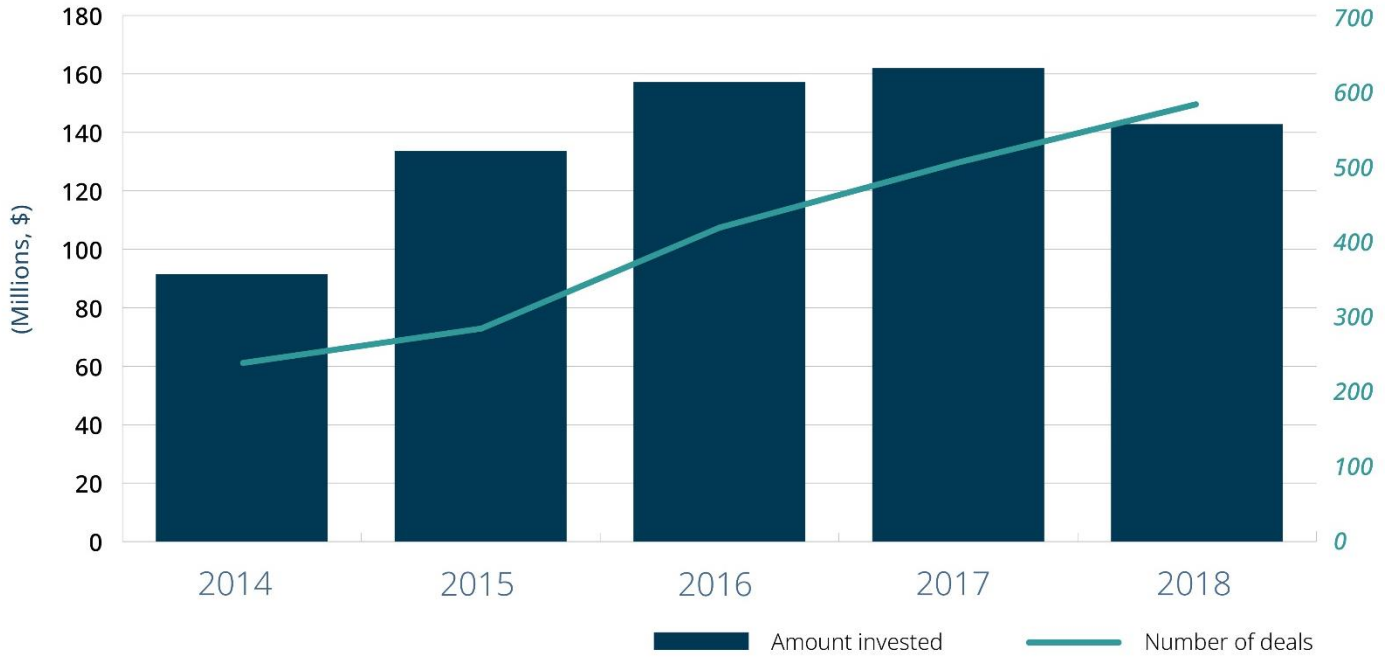
Investing through organized funds, venture capital investors may be able to provide higher amounts of financing. VCs often—but not always—invest in companies following initial rounds financed by angels. As firms continue to grow, they may seek to access additional equity financing—through either growth rounds or an initial public offering—or may turn to more traditional bank lending to meet their capital requirements.

Figure 2: The funding escalator



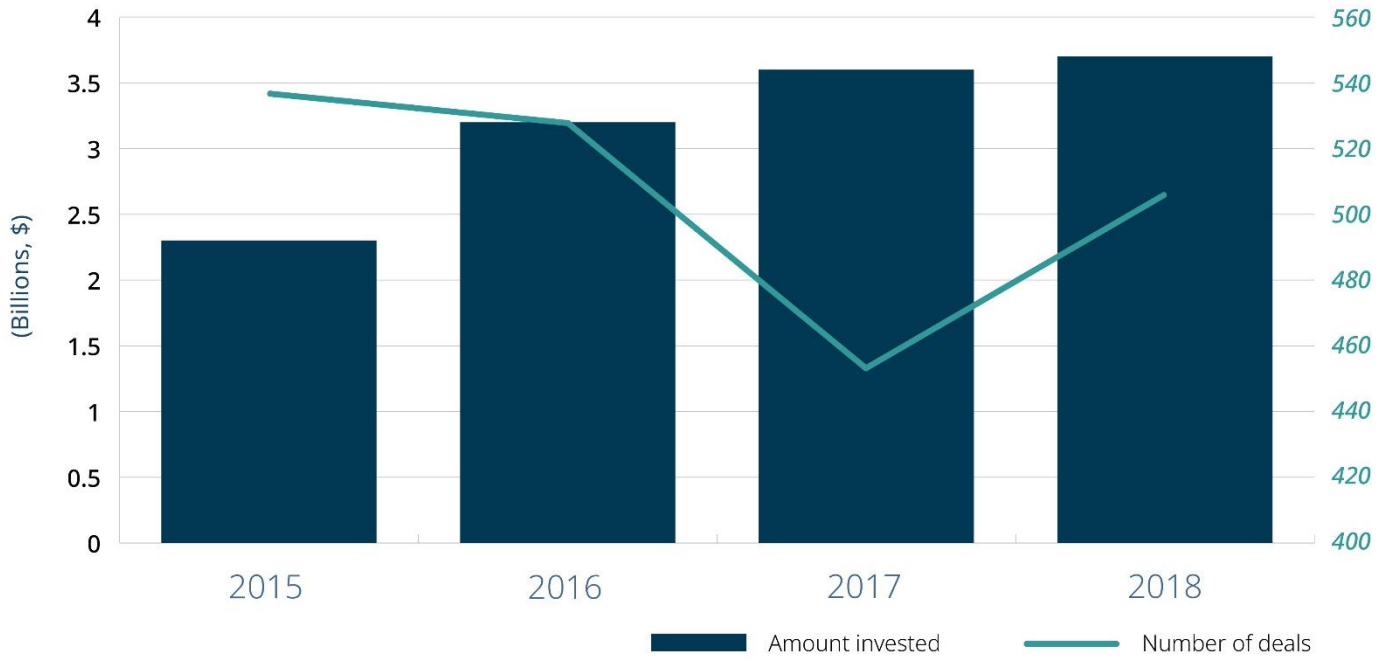
In recent years, the availability of both angel and venture capital in Canada has increased. It should be noted that references to angel capital generally refer only to "visible" angel investment conducted through formal angel groups. A large but unknown percentage of angel investment remains "invisible," occurring directly between private individuals and companies.

Figure 3: Angel investment in Canada



Source: National Angel Capital Organization.

Figure 4: Venture Capital investment in Canada



Source: Canadian Venture Capital and Private Equity Association.

In addition to commercial finance, government innovation programs may play an important role in providing capital to young, innovative businesses. Government capital may be variously able to support pre-commercial research and development (R&D) activities and support early-stage projects and companies that remain too high-risk for private commercial financing. At the same time, government innovation programming is diverse, with programs available to firms of various sizes and stages of development.

Risk Capital and business performance

Previous research conducted by Innovation, Science and Economic Development (ISED) Canada examined the performance of companies backed by VC and angel financing. Research on VC-backed companies drew on data on from Thomson Reuters on VC investment from 1999 to 2009. Comparing this data to a control group composed of otherwise similar, non VC-backed companies, the research found that VC-backed firms showed greater growth across all metrics, including revenue, sales, number of employees, and assets (Industry Canada, 2013).

Similar techniques were used to create an economic profile of angel-backed firms in 2014, drawing on data from the National Angel Capital Organization (NACO). This analysis found that a significant share of angel-backed companies (60%) were engaged in R&D spending. It also found that these companies were small, with an average of 8.6 employees (NACO, 2014). Using data from the Small Business Venture Capital Program in British Columbia, Kelly and Kim (2016) subsequently found that angel-backed companies saw higher growth in R&D, sales, employment, and gross profits than otherwise similar, non-angel-backed firms.

DATA AND METHODOLOGY

Risk capital data for this study was obtained from three primary sources. Data on VC investment was sourced from Thomson Reuters, which provided data on Canadian VC deals between 2000 and 2016. Data on angel group investment in Canada between 2000 and 2016 was obtained from the National Angel Capital Organization's annual survey of member groups. It should be noted that this data pertains only to formal angel groups in Canada, and generally does not provide data on investments by individual angel investors. Finally, data for the province of British Columbia was obtained from the government of British Columbia through their Small Business Venture Capital Tax Credit Program, which provides tax credits to encourage investment in BC-based small businesses.

Data from these three external sources contained approximately 6,000 companies. This data was provided to Statistics Canada via the Electronic File Transfer System and were subsequently linked with the Business Register (BR) and General Index of Financial Information (GIFI) datasets using a probabilistic matching protocol. The data was also linked with government program data obtained via the 2016 *Horizontal Review of Innovation and Clean Technology Programs,* which contains data on firms receiving support from government innovation programming between 2007 and 2016.

Duplicate matches were manually screened and sorted by approved researchers working in the Canadian Centre for Data Development and Economic Research (CDER). Analysis, including the production of descriptive statistics and models, was undertaken at CDER in the summer of 2019.

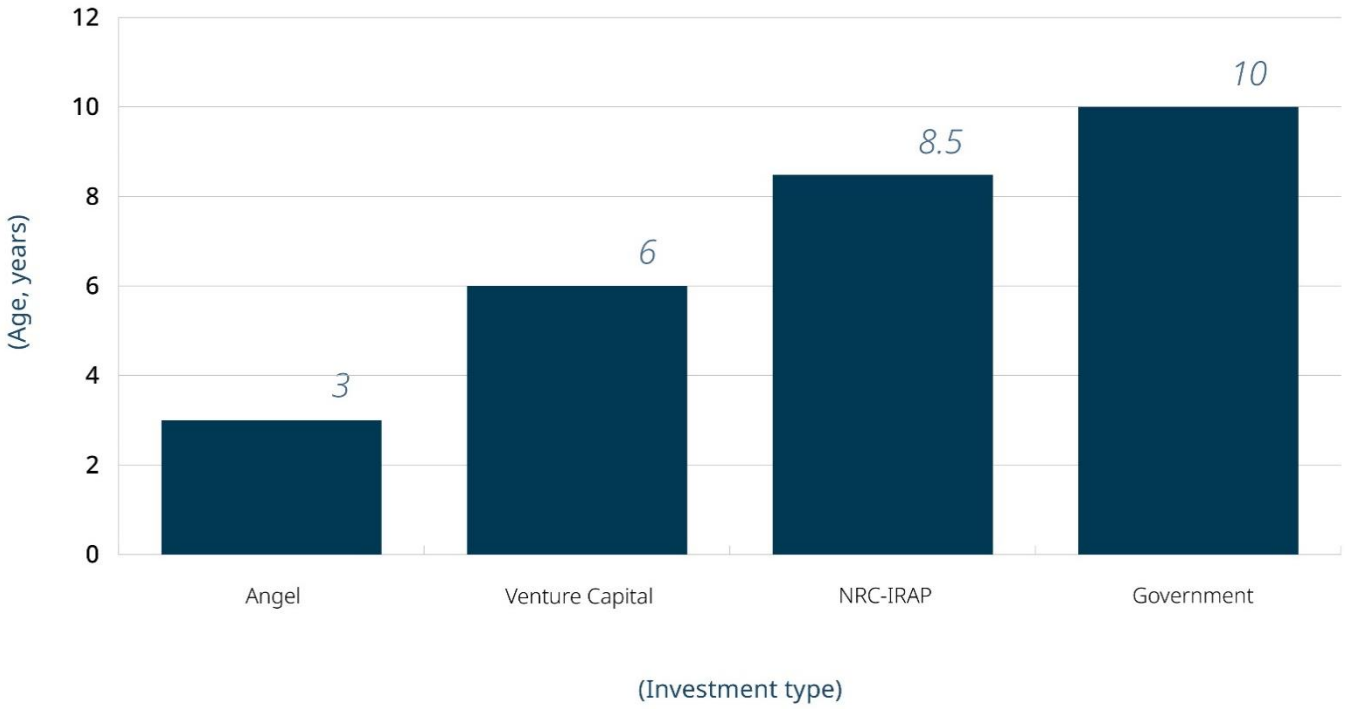
COMPANY CHARACTERISTICS

Company age

The funding escalator model suggests that angel investors are likely to invest earlier than VC investors, providing capital that follows funding received from friends and family. The results presented here appear to provide support for this hypothesis. Amongst risk capital backed companies, the mean age at which companies receive angel investment is three years, while the mean age at which venture capital is received is six years.[1]

The profile of government innovation program support is more complex. The mean age of companies receiving innovation program support for all relevant innovation programs is 10 years, whereas the mean age of companies when they receive support from the National Research Council's Industrial Research Assistance Program (NRC-IRAP) is at eight years. While this may appear to suggest that government innovation programs fund companies at a later stage than either angel or VC investors, the underlying distribution indicates that a significant amount of support is concentrated in the early years following company creation. In contrast to private investors, however, these programs also provide support throughout a company's life cycle, leading to a long tail distribution. In other words, government programs likely support a wider swath of projects and companies when compared to risk capital providers.

Figure 5: Mean firm age at time of investment



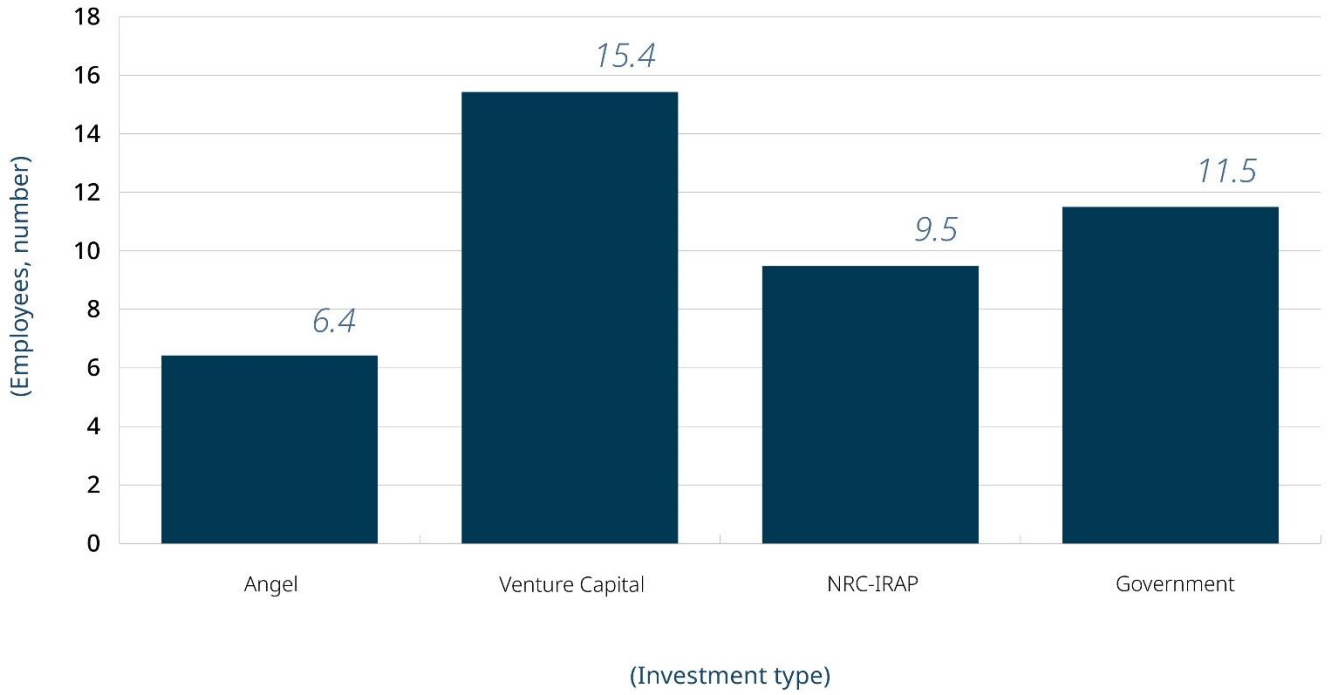
[1] To avoid the positive bias from outliers, the mean is calculated as the average of the middle 2% (i.e., the 49–51 centile) of all observations.

Employees

A similar relationship between angel and VC-backed companies is evident with respect to the size of the company at the time of investment. When companies receive angel investment, they are typically very small, with a mean of just six employees. This confirms the findings of a previous analysis conducted in 2014 using a more time-limited dataset, which found that the average angel-backed firm had 8.6 employees (NACO 2014).

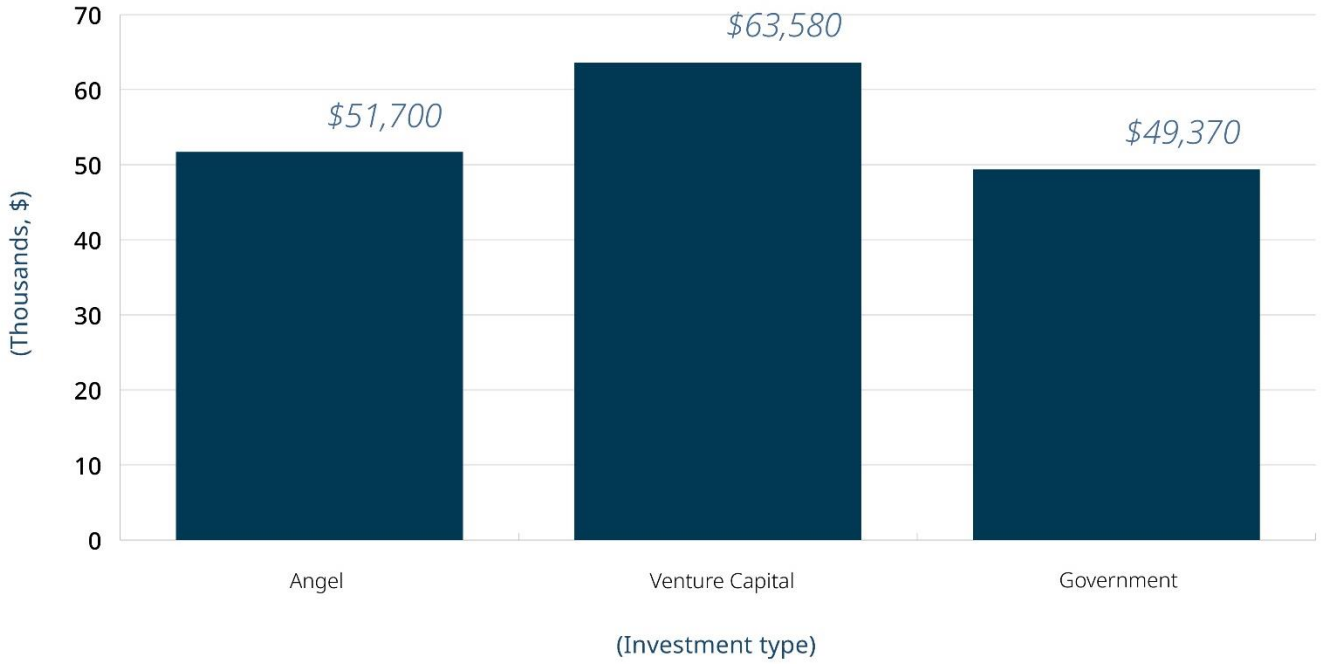
Companies that receive VC are also generally small but are still twice as large as angel firms, with a mean of 15 employees. Government-program-supported companies fall in between, with a mean of 11 employees for companies receiving government program support and a means of nine for companies receiving support specifically through NRC-IRAP.

Figure 6: Mean number of employees at time of investment



Part of the rationale for program support for innovative companies and access to capital is to facilitate the creation of good, well-paying jobs. The mean average salary for workers in companies receiving angel financing is $51,703, which is slightly higher than the mean average for companies receiving government program support ($49,373). The mean average salary for companies receiving VC investment was $63,576, significantly higher than the other categories. It is notable that this figure accounts only for traditional T4 employment income. Other forms of compensation that may be more prevalent in startup firms, such as stock options, are not included in this analysis.

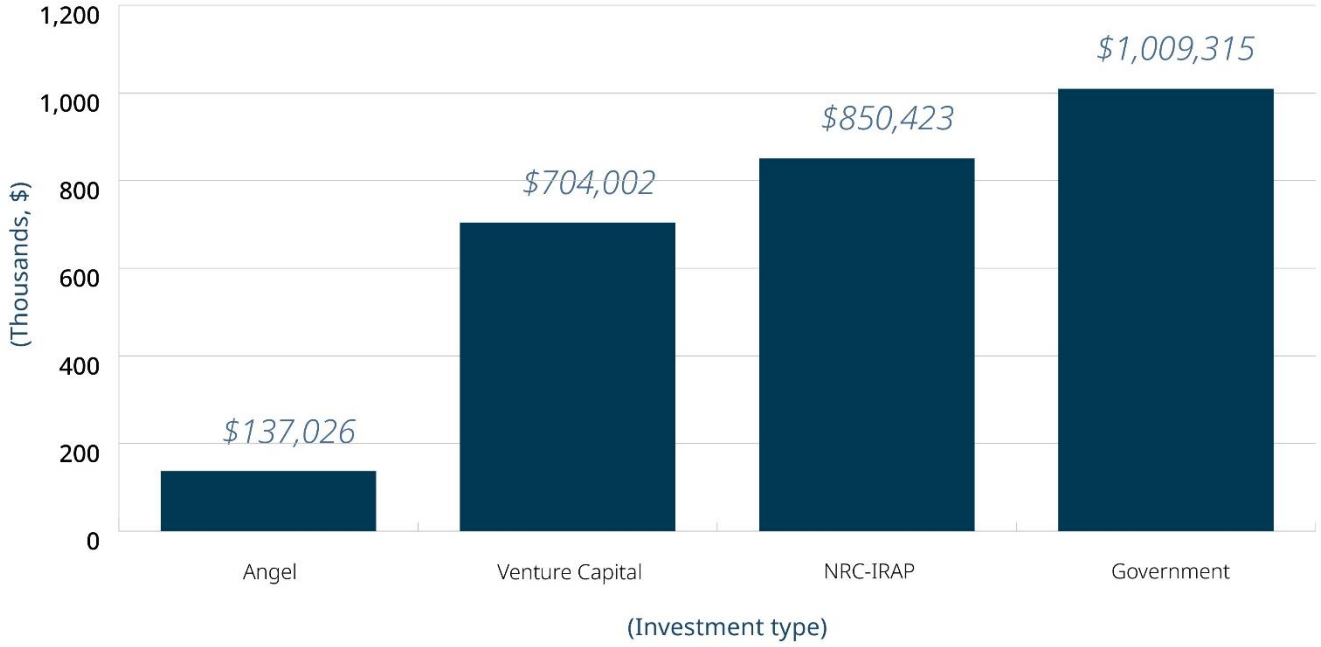
Figure 7: Mean average salary at time of investment



Sales

Along with employees, sales revenue is an important marker of company market growth. Here again, companies receiving angel investment are significantly smaller than those receiving VC. The mean revenue of companies receiving government program support is also higher, reflecting the diversity of companies receiving funding through these sources.

Figure 8: Mean sales revenue at time of investment



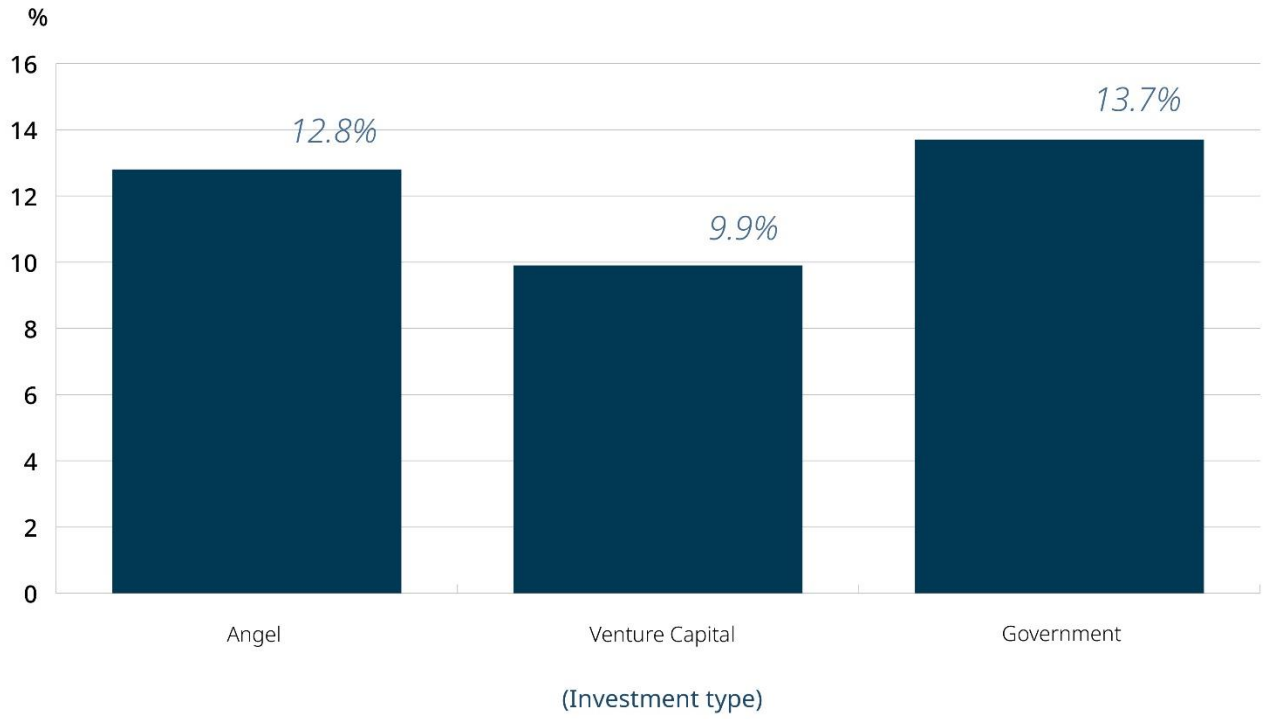
It should be noted that, consistent with their profile as young and growing firms seeking access to external financing for growth, both angel and VC-supported companies registered negative net income in the years they received funding. Though VC-backed firms had significantly higher mean sales revenues than angel-backed companies, they also had significantly higher expenses. Mean net income[2] for government-supported firms, in contrast, was small yet positive, owing to slightly higher revenues and lower expenses.

Women-owned businesses

Significant attention in both the public and private sectors is now focused on ensuring that companies owned by women and other traditionally underrepresented groups have fair access to capital. As companies often have more than one owner, there are several ways that women-owned firms can be defined. Given the data availability, this analysis considers firms to be women-owned if the principal owner of the business, defined as the individual with the single largest ownership share, is a woman. If two owners identified as different genders own equal shares of a business, principal ownership is determined by title and seniority. Based on this definition, just under 13% of firms receiving angel financing were principally owned by women, compared to 9.9% of firms receiving venture capital investment and 13.7% of firms receiving government program support.

[2] To avoid the positive bias from outliers, the mean is calculated as the average of the middle 2% (i.e., the 49–51 centile) of all observations.

Figure 9: Women principal ownership, share of total

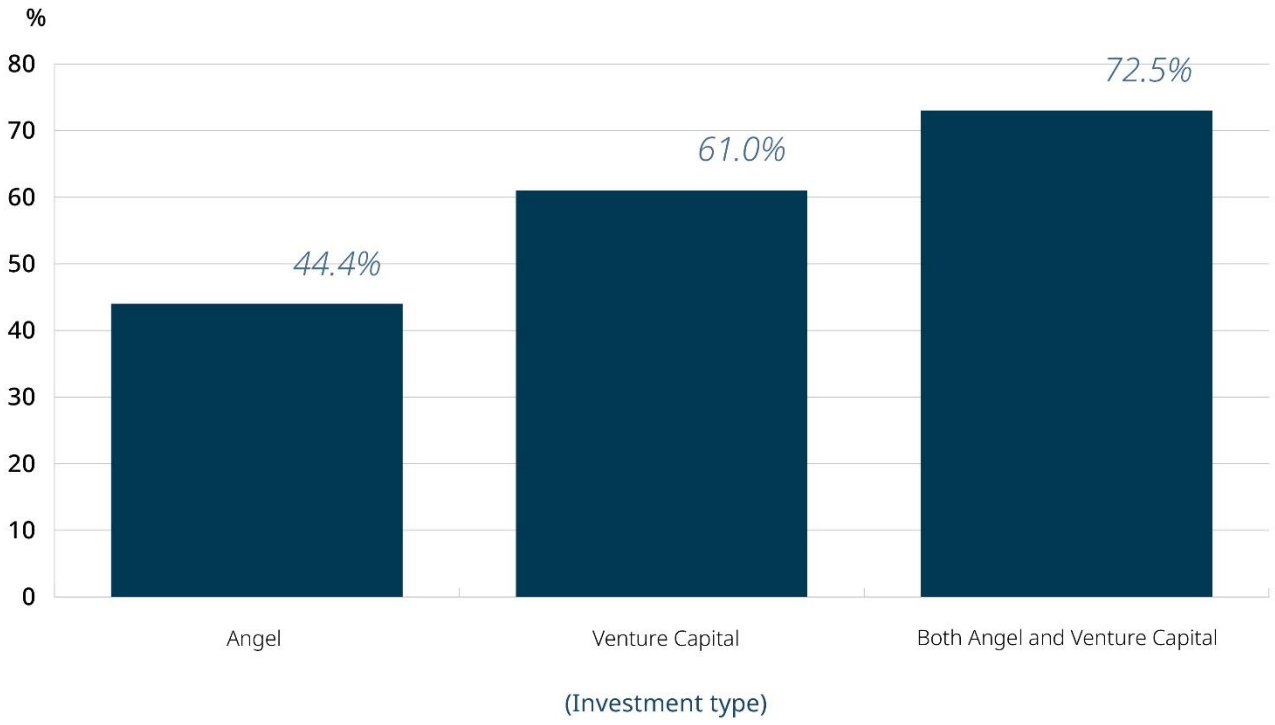


RELATIONSHIP BETWEEN SOURCES OF FINANCING

The funding escalator model suggests not only that firms are likely to exhibit different characteristics at the time they receive various types of capital, but also that specific relationships are likely to exist between different sources of capital over time. The analysis presented here specifically considers the relationship between government program financing and commercial risk capital. While only a small number of firms received government program funding in the same year as they receive risk capital investment (co-investment), a significant share of firms that eventually received angel or venture capital investment had previously received government support, notably through NRC-IRAP. Of firms that received risk capital investment in 2016, 44.4% of angel-backed companies and 61% of VC-backed companies had previously received government support.

Moreover, of firms that received *both* angel and VC investment in 2016—which may have been a co-investment—fully 72.5% had previously received some form of government program support. This suggests that these programs play an important role in supporting firms before they receive equity financing from private sources, potentially providing them with resources to develop their technology and business model and to progress towards investment readiness.

Figure 10: Percentage of risk capital-backed companies that previously received government support, 2016



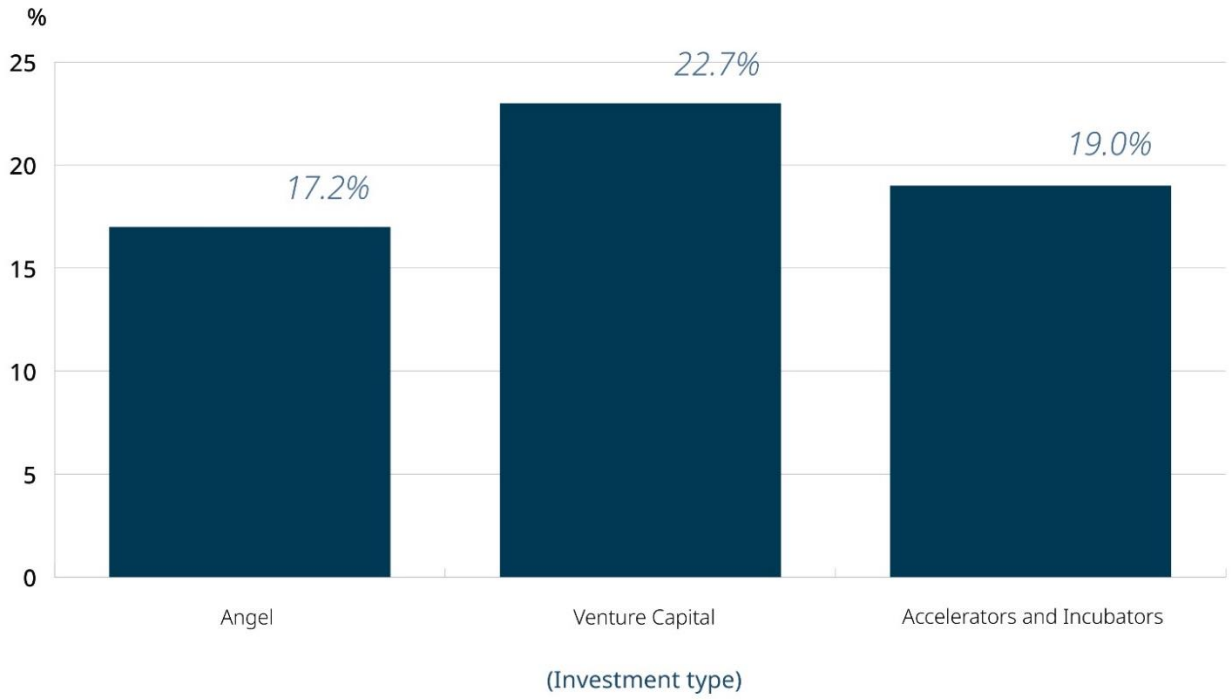
RISK CAPITAL AND COMPANY PERFORMANCE

Across the economy, only a small percentage of firms achieve high-growth status. Nevertheless, high-growth firms have a disproportionate impact on net employment change (Rivard, 2017). With respect to employment change over time, high-growth firms are defined here following the Bureau of Labour Statistics (BLS) definition:

- ✓ For companies with more than 10 employees, growth by eight or more employees over a three-year period or;
- ✓ For companies with 10 or more employees, growth at an average annualized rate of more than 20% over a three-year period.

Based on this definition, in periods when they received support, 17.2% of angel-backed companies and 22.7% of VC-backed companies attained high-growth status. Separate research conducted by Innovation Science and Economic Development Canada found that 19% of companies supported by business incubators and accelerators could be classified as high growth, with this group falling between the angel and VC-backed firms (Business Accelerator and Incubator Performance Measurement Framework, 2019).

Figure 11: High-growth firms—percentage at the period of investment or support, 2007–2016



In addition, at the time they received investment, a significant share of firms were growing, even if this growth was not robust enough to propel them to high-growth status. Of those firms that *did not* meet the criteria for high growth, 40% of angel-backed companies and 36% of VC-backed companies still saw at least some employment growth in the year after they received investment. As such, fully 57.2% of angel-backed companies and 58.7% of VC-backed companies exhibited some degree of growth following their receipt of private risk capital.

Similar trends are visible with respect to revenue growth. Using the definition developed by the Organization for Economic Cooperation and Development (OECD), a high-growth firm of any size by revenue is defined as a company with growth at an average annualized rate of more than 20% over a three-year period. Based on this definition, 9.7% of angel-backed firms attained high growth, with an additional 45.7% seeing at least some growth in the year following investment. Similarly, 8.9% of VC companies achieved high growth measured by revenue, and an additional 41.8% achieved some growth—but not high growth—in the year following investment.

To control for the effect of other characteristics that may be associated with firm performance, a linear regression function was estimated to assess the impact of different types of risk capital investment on business performance:

$$Y_t = X_t\beta + \theta RC_{t-1} + \varepsilon_t$$

where:

Y measures the business performance of a firm, including revenue growth, employment growth, the probability of revenue high growth, and that of employment high growth;

X is a vector of firm characteristic variables, including industrial sector based on two-digit NAICS, geographic region, firm age, assets, and R&D expenditure in the preceding year;

RC is a vector of indicators for different types of investments (venture capital, angel groups);

Subscript $t-1$ refers to the preceding year; and
ε is an independent and identically distributed residual.

Regression results suggest that angel and venture capital investments have a positive impact on firm performance. Receiving both angel and VC investment was associated with increased revenue growth in the following year. Angel investment was associated with a roughly 17% boost in the revenue growth rate, whereas VC investment was linked to an increase in revenue growth rate of nearly 30%. Similarly, angel and VC investment were linked with the achievement of high-growth status in revenue, using the OECD definition, during the investment period.

VC investment was also associated with employment growth and the achievement of high growth in employment based on the BLS definition. In contrast, the effect of angel investment on employment growth, although positive, was not statistically significant.

Table 1: Risk Capital and growth

	Revenue growth	Employment growth	Revenue high-growth	Employment high-growth
Angel	0.178** (0.0705)	0.0404 (0.0501)	0.0104** (0.00442)	0.00725 (0.00747)
Venture Capital	0.296*** (0.0587)	0.0730* (0.0411)	0.0126*** (0.00375)	0.0480*** (0.00655)
Observations	14,030	10,987	27,445	27,445

Notes: Robust standard errors in parentheses. *** p <0.01, ** p <0.05, * p <0.1

R&D AND RISK CAPITAL INVESTMENT

In addition, the following function was estimated to consider the impact of research and development spending on risk capital investment:

$$Prob(RC_t = 1) = F\left[X_t\beta + \theta ln\left(\frac{RD}{EXP}\right)_{t-1}\right] + \varepsilon_t$$

where:
RC indicates the type of received risk capital investment (venture capital, angel groups, or either);
F is a logistic function that guarantees the predicted value of the dependent variable within the [0, 1] range;
RD is the research and development expenditure;
EXP is the total expense;
Therefore, the $\frac{RD}{EXP}$ ratio measures the weight of R&D in the total expenses, ln is the natural logarithm of this ratio, and its marginal effect can be interpreted as a measure of the proportional change.

The marginal effects of the $ln(\frac{RD}{EXP})$ variable are presented in Table 2. The results found positive, statistically significant relationships between all types of investment and the probability that a firm would undertake research and development spending in the following year. For example, a 10% increase in the R&D to total expenses ratio is associated with an increase in the probability of receiving angel investment by 1.66 percentage points.

Table 2: Risk Capital and R&D expenditure, 2007–2016

	Angel	VC	Either Angel or VC
$ln\left(\frac{RD}{EXP}\right)$	0.00166*** (0.000179)	0.00538*** (0.000357)	0.00657*** (0.000428)
Observations	20,084	20,084	20,084

Notes: Robust standard errors in parentheses. *** p <0.01, ** p <0.05, * p <0.1

However, the overall share of risk-capital-backed companies performing R&D is somewhat lower than reported in the previous analysis. Approximately half of angel-backed companies and 55% of VC-backed companies reported R&D expenditures in the year of investment. The percentage of R&D investment was 58% for firms that had received *either* angel or VC investment.

Overall, the analysis highlights the immediate effects of different types of capital investment on firm performance, and on the propensity for firms to become high growth. Both VC and angel investment have clear impacts on revenue growth, while only VC has comparable impacts on employment growth. Higher R&D spending to total expense ratios is associated with a higher probability of receiving risk capital investment. Taken together, these findings highlight the important role played by these types of capital in supporting growth and investment by young, innovative firms.

CONCLUSION

Young, high-growth companies have a disproportionate impact on employment, innovation, and growth. To succeed, these firms often require access to a variety of types of external financing—including angel, venture capital, and government program sources—to fuel their expansion and growth. This brief data overview and analysis has highlighted the degree to which various forms of risk capital play a complementary role in the "funding escalator" for startup firms. Angel investors tend to invest in smaller, younger, and less established firms than venture capitalists. Government innovation programs such as the National Research Council's Industrial Research Assistance Program also support early-stage companies, but have the flexibility to support firms, entrepreneurs, and R&D projects at various stages of development. This analysis also shows that a significant share of companies that eventually receive risk capital financing had previously received support from government innovation programming, potentially indicating that these programs act as an important "market signal" or are useful in helping companies become investment ready.

Previous studies have also highlighted the degree to which risk capital investment supports firm performance. This analysis largely confirms the findings of those studies, highlighting the degree to which various forms of risk capital positively impact company employment growth, the probability of achieving high-growth status, and the probability of undertaking research and development spending. Of the companies analyzed, those firms that received *both* angel and venture financing were also the most likely to be undertaking R&D.

Finally, this study fills an important data gap in providing ownership information by gender for a broad sample of risk-capital-backed companies, using a specific definition of *principal* ownership. Using this definition indicates that just under 10% of VC-backed companies were principally owned by women, in contrast to 12.8% for angel-backed companies and 13.7% for government-program-supported firms. Future research will further analyze this dataset, leveraging other Statistics Canada data to provide information on majority ownership by gender and other demographic characteristics.

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