

RESEARCH

Open Access



The role of venture capital funds in dissemination and development of innovation in Canada

Marat Ressin^{1*}

*Correspondence:
mressin@yedi.ca

¹ York Entrepreneurship
Development Institute, 907
Alness Street, Toronto L4 J1H3,
Canada

Abstract

The aim of this study was to determine the role of venture capital funds in promoting innovative development in Canada and to identify regional features of their effectiveness in developing recommendations for optimizing the venture and innovation ecosystem. The subject matter of the research was limited to an analysis of the activities of Venture Capital Funds affiliated with accelerators. The research methodology is based on calculations of business survival rates, patent approval rates, and overall venture activity for each province in Canada. Data were collected from various sources, including Canadian statistical databases and venture fund reports. Correlation analysis methods were applied to identify dependencies between venture and innovation indicators. To assess regional success, both quantitative (investment volume, patent number) and qualitative parameters (startup survival rates) were used. The results of the study demonstrate a close relationship between the volume of venture capital deals and innovation activity. The analysis revealed a significant concentration of venture capital in the largest provinces of the country (Ontario, Quebec, British Columbia, and Alberta), which leads to regional imbalances and limits the potential of less developed regions. Based on statistical data, key barriers to developing the innovation potential of peripheral provinces were identified, including insufficient support for innovative activities, weak links between patent activity and financing, and limited access to acceleration infrastructure. The study presents recommendations for creating conditions that could ensure the redistribution of financial flows and open prospects for the development of innovative projects in less developed provinces, accelerate the commercialization of promising technologies, and increase the overall sustainability of startups implementing such projects.

Keywords: Business survival, Correlation analysis, Innovation activity, Patents, Regional differences, Technology development

Introduction

Venture capital investments gained popularity in developed countries at the beginning of the twenty-first century, which contributed to the development of research on venture capital in the middle of the first decade of the twenty-first century (Alsuwaidi,

2016). Initially, the main trend in venture capital investment was the desire to increase the return on investment by funding various, often differing, startups (Aldatmaz & Celikyurt, 2023; Yon, 2024). However, at present, with the increasing emphasis on innovative development, ESG standards, and the potential for progress without competition from artificial intelligence, venture capital funds face a multitude of investment limitations. Despite this, venture investments continue to grow rapidly, with the global venture capital market expanding by 143% from 2017 to 2024 (Statista, 2024; Zeng, 2023). Nevertheless, technological progress faces challenges that hinder the advancement of innovation. Research on venture capital and its effectiveness in driving innovation seeks to address these challenges, one of which is the issue of cash availability. Large companies typically have nominally high cash reserves, as their scale is associated with larger amounts of capital. As a result, these companies have more opportunities to invest in their development—they have the financial resources—while smaller companies are forced to economize and gradually implement only the most essential innovative mechanisms (Hill et al., 2022). This leads to the first challenge in advancing innovation: progress can be fully afforded only by large firms with high CAPEX and substantial revenue to cover these investments. Consequently, smaller companies lose competitiveness due to relatively low levels of innovation and exit the market under the pressure of larger, more adaptable players. This results in market oligopolization: only those willing to invest substantial amounts of money in innovative development remain on the market (NBER, 2022).

Among other challenges to steady and long-term innovative development, difficulties with centralization are noteworthy. Major innovations, trends in sustainable development, and the concentration of people and companies are mostly located in regions with a particular innovation environment: Silicon Valley, New York, Denver, London, Shanghai, Beijing, and Toronto (Dealroom, 2024). Such centralization means that companies registered in these “Innovation Zones” have greater opportunities to realize their innovation potential, and consequently, have more advantages (Dessí & Yin, 2012). The five countries with the largest volume of venture investments account for 42.2% of all venture investments, with the United States alone accounting for more than 28% of all venture investments. These two challenges contribute to a gap in the level of innovation across different parts of the world and the “consolidation” of market participants (Silvestrov et al., 2022). This does not benefit the citizens of a country due to the economic gap and the reduced diversity of market players resulting from the exit of smaller firms.

Thus, the contemporary economic system is compelled to constantly adapt to the rapidly changing conditions of technological progress. In such a dynamic environment, innovation becomes the primary tool for achieving the competitiveness of economic systems at both the national and regional levels, while venture capital provides support and defines the directions for their development. In this context, studying the process of establishing connections between venture investments and innovative development is of particular interest.

When considering these issues in the context of Canada’s unique experience, it is evident that the primary catalyst for innovation activity is the role of Venture Capital Funds, which not only provide financial resources to startups but also offer

access to expert mentorship, business networks, and infrastructure. However, the effectiveness of venture capital utilization and its impact on innovation development largely depend on regional characteristics. For example, a significant portion of venture investments is concentrated in large provinces such as Ontario and British Columbia, leading to capital centralization and exacerbating regional inequality. It is also worth noting the uniqueness of Canada's experience in government support for the implementation of innovation processes. Initiatives such as the Venture Capital Action Plan (VCAP) and the Canadian Innovation Solutions Program (ISC) make substantial contributions to the development of innovation ecosystems, promoting capital attraction to small and medium-sized enterprises. In turn, many successful Canadian startups began their journey in incubators, which helped them refine their products and business models before seeking venture capital. For instance, MaRS—one of the largest urban innovation centers in the world—supports startups in sectors such as healthcare, clean technologies, financial technologies, and enterprise software. Based in Toronto, YEDI is one of the world's premier university-based business accelerators, incubators and venture capital funds, providing education, support and resources to entrepreneurs and non-profit leaders.

When examining the characteristics of venture investment in Canada, it is essential to take into account global trends, as the role of venture capital in fostering innovation manifests with varying intensity across different countries. For instance, in the United States, venture capital has traditionally served as the primary mechanism for financing technological startups. According to the National Venture Capital Association, venture investments in the United States in the first quarter of 2024 alone reached \$42 billion, with a substantial portion directed toward artificial intelligence, biotechnology, and green technologies (National Venture Capital Association, 2024). This scale of investment is attributable to the high maturity of the U.S. innovation ecosystem, the dense network of accelerators, and legal incentives such as tax benefits and the Small Business Innovation Research (SBIR) program.

In contrast, the European Union pursues a distinctly different approach to venture investment, primarily emphasizing sustainable development, social entrepreneurship, and regional equity. Programs such as Horizon Europe and InvestEU play a pivotal role in fostering a unified innovation environment and supporting early-stage startups. A notable trend within the EU is the growing decentralization of venture capital and the active promotion of Regional Innovation Systems (RIS) (European Commission, 2025).

In East Asia, venture investment is increasingly employed as an instrument of state industrial policy. In China, government funds actively support early-stage projects, particularly in strategically important sectors such as artificial intelligence, quantum technologies, and renewable energy (Beraja et al., 2024). A similar model is observed in South Korea, where venture policy is structured around government-led programs targeting export-oriented startups (Lee et al., 2024).

Comparative analysis indicates that Canada occupies an intermediate position between the market-driven model of the United States and the state-centered approaches characteristic of China and the European Union. At the same time, akin to the EU, Canada faces the pressing challenge of addressing regional disparities in capital distribution,

making international experience particularly relevant for evaluating and adapting effective venture policy instruments.

In this context, the relevance of this study is determined by the need to examine these regional disparities and explore opportunities for the decentralization of venture capital flows.

The aim of this study is to determine the role of Venture Capital Funds in stimulating innovative development in Canada and to identify regional characteristics that influence their effectiveness. Addressing the tasks outlined in this study will provide practical recommendations for optimizing the venture and innovation ecosystem, taking into account both the achievements of advanced provinces and the potential of less developed regions.

The research will examine the relationship between the volume of venture investments, innovation activity (such as patent applications and approvals), and business survival rates across various Canadian provinces. Special attention will be given to studying the experience of Canadian Venture Capital Funds affiliated with accelerators, which play a critical role in the development of Canada's innovation ecosystem. Accelerators not only provide startups with financial support but also grant access to key resources: expertise, infrastructure, and networks, all of which significantly enhance a company's chances of success. Furthermore, Canadian accelerators, such as Creative Destruction Lab (CDL) and MaRS Discovery District, actively collaborate with government support programs, providing funding to startups in the early stages of development and during the scaling process. This demonstrates the potential for public-private partnerships in fostering innovation development and implementation processes. For example, the Canadian Innovation Solutions Program (ISC) aims to help startups bring their technologies to market in collaboration with government agencies, while the SR&ED program offers tax incentives and benefits for companies conducting research and development in Canada, focusing on technological startups innovating in fields like biotechnology and artificial intelligence.

Overall, this study focuses on addressing the pressing issue of overcoming regional disparities and improving the effectiveness of venture capital utilization, as well as creating conditions for the development of a sustainable innovation environment in Canada. The scientific novelty of this study lies in the combination of macroeconomic and regional analysis, the consideration of post-pandemic changes in the venture capital market, and the focus on emerging investment sectors (including "green" technologies, artificial intelligence, and medical innovations). Thus, the results obtained through this research provide a comprehensive understanding of the specifics of venture capital management processes in Canada and their impact on innovation development. Additionally, they may serve as a valuable resource in shaping policies to support technological entrepreneurship in countries with comparable economic structures.

Literature review

In recent years, scholarly research on venture capital has expanded significantly, encompassing a wide range of its impacts on innovation development. To systematize the extensive body of literature and to identify key research directions, the review is structured into thematic sections, ranging from the institutional characteristics of

venture funds to regional differences in their effectiveness. This approach enables a clearer articulation of the argumentative logic and facilitates a comprehensive assessment of the multifaceted influence of venture capital on the innovation ecosystem.

Government venture funds and their impact on innovation

Venture capital (VC) funds play a key role in the dissemination and development of innovations, as evidenced by numerous studies in the field of global economics and venture investing. For instance, government venture capital funds (GVC), which exist in various forms worldwide, including in Australia, China, France, Germany, Italy, Japan, the United Kingdom, and the United States, were established to overcome issues related to information asymmetry between entrepreneurial firms and investors, as well as to achieve specific political goals. The experience of the Chinese government demonstrates that active investments in GVCs, within the context of clear political objectives supporting startups and entrepreneurial firms, contribute to both economic growth and social development. Research indicates that GVCs have a significant impact on research and development (R&D) investments, financial performance, and corporate social responsibility (CSR) metrics in the companies they invest in. For example, companies backed by GVCs exhibit higher performance in R&D, asset profitability, and Tobin's Q ratio compared to those supported by private venture capital (PVC) or foreign venture capital funds (FVC) (Li et al., 2024). This fact confirms that GVCs not only improve the financial performance of the companies they invest in but also help achieve social goals, such as increased corporate donations and other CSR initiatives.

Mechanisms of interaction between venture funds and startups

Another critical aspect of the interaction between venture funds and startups is the issue of matching, which can significantly affect the timing and effectiveness of investments. A balanced match between VC funds and startups motivates both parties to make more active efforts and improves the outcomes of joint projects. This balance is particularly important during the early stages of startup development, where VC support can substantially increase the chances of success. The experience of China supports this thesis, as startups receiving early-stage VC funding show higher success rates, particularly in the context of an active IPO market (Fu et al., 2024).

Venture capital and the promotion of technological innovation

Furthermore, VC funds are particularly effective in stimulating technological innovation in high-tech industries. The timing of VC entry into a project and their equity share in the company influence innovation activity, while the volume of investment at more mature stages of company development may reduce innovation potential due to a short-term profit strategy. However, suppose VC continues to actively participate in optimizing human capital structure during the commercialization and scaling stages of a project. In that case, companies show significant growth and an increase in the number of employees engaged in R&D, thus enhancing their innovation activity (Xie & Wang, 2025).

Venture capital concentration and innovation inequality

In the global context of technological progress, the venture capital industry serves as one of the key drivers of innovation, particularly amidst the declining effectiveness of research and development in large corporations. Nevertheless, a narrow focus on specific technological innovations and the concentration of capital in the hands of a small number of investors may negatively impact the direction and pace of innovation in the context of a country's economic system development (Lerner & Nanda, 2023).

Models of venture financing and sustainable business development

A distinct area of research is focused on examining the impact of various venture financing models on the sustainable development of businesses, such as the influence of independent venture capital (IVC) and corporate venture capital (CVC) on the financial and environmental performance of companies. Given the increasing attention to environmental issues and the need to combat climate change, this line of research emphasizes the importance of sustainable business practices. Support for sustainable development through venture investments can have significant political implications, such as job creation, reduced dependence on raw material imports, and improved environmental conditions, thus contributing to the achievement of national sustainable development goals (Gucciardi, 2024). Although IVCs are primarily focused on generating high financial returns, while CVCs tend to concentrate on innovation and strategic business development, differences in the motivations and organization of IVCs and CVCs can substantially affect the financial and environmental efficiency of companies. For example, CVCs may contribute to improved environmental performance through the implementation of sustainable practices and innovations, whereas IVCs may focus more on short-term financial gains (Shuwaikh et al., 2025).

The effectiveness of venture capital: public and private funds

Both public and private venture capital funds play a significant role in the dissemination and development of innovations. Their influence is manifested through financial support, strategic management, and involvement in the development of human capital. However, to fully understand their role in the development of innovation processes, it is necessary to consider both the positive and negative aspects of their activities, as well as the specific national and political contexts in which they operate.

Despite the extensive research on the phenomenon of Venture Capital Funds, one of the most common and controversial topics is the study of the effectiveness of venture capital—whether it is indeed the best method for financing small enterprises. This question also extends to the differences in the effectiveness of government versus private funds and international versus domestic markets. Government Venture Capital Funds often show more interest in investing in companies with low innovation potential in the early stages. The higher the competitiveness of the enterprise, the later the government is to invest in them. The lack of a clear connection between the share of investments, capital size, and the stage at which a government venture fund enters a company excludes the factor of selectivity in investment choices for government Venture Capital Funds (Cui et al., 2021; McNabb et al., 2024). As an alternative to government Venture

Capital Funds, researchers consider government R&D subsidies, which are also effective for state-owned enterprises. Regardless of which enterprise received the subsidies, they attract venture capital and stimulate investors to invest in renewable energy sources (Traversa et al., 2014).

Factors influencing the success of venture investments

The existing opinions on the effectiveness of venture capital have been repeatedly contested. The most common contradictions to studies asserting the high effectiveness of Venture Capital Funds are based on identifying sectors and areas where Venture Capital Funds are ineffective. For example, in more religious countries, there is less venture capital. Religious aversion to risk reduces the venture capital market and the number of funds, yet in such countries, venture deals are more likely to succeed, and most of them are backed by domestic capital. Another area where Venture Capital Funds exhibit low effectiveness is micro-venture investors—a phenomenon that has recently been discovered and studied in terms of investment characteristics. The academic community has found that micro-venture investors often invest in less successful startups, resulting in lower success rates for their funds (Amore et al., 2023).

Emerging trends in venture investment and the regional impact of venture capital

New trends in venture capital research are linked to the specifics of venture deals. The question “How to exit venture capital before an IPO?” is posed by many investors and is analyzed from the perspective of their preferences in selecting investment capital: minority or venture (Li et al., 2025). The academic community also studies new types of investors, such as micro-venture investors (Amore et al., 2023) and impact investors. Impact investors, through venture capital, signal to institutional investors the need for significant societal transformations. The scientific community is evaluating the role of impact Venture Capital Funds in driving innovation.

The global success or failure of Venture Capital Funds in certain sectors does not necessarily reflect their success across different regions of the world.

Contemporary research on venture capital increasingly emphasizes its dependence on regional characteristics and institutional differences. Particular attention is given to comparative analysis, which enables the assessment of venture capital's potential to drive regional economic growth. For example, the application of the conceptual model of “social connectedness” between counties and major sources of venture capital has revealed a significant positive impact of venture investment on employment, wages, and the creation of new enterprises in the United States (Poelhekke & Wache, 2023).

Therefore, regional studies on the effectiveness of venture capital for specific countries are important, but they are not as widespread as global studies. Often, such studies focus on countries in the East Asian region, such as South Korea, where venture capital is the most effective means of promoting innovation within the country (Lee et al., 2023). In China, domestic venture capital is more effective, helping companies become more innovative compared to foreign venture capital. Despite the extensive body of research on venture capital, there remain theoretical gaps in assessing the impact of Venture Capital Funds and the number of venture deals on regional innovation development within individual countries, as opposed to the country as a whole. This study addresses these

theoretical gaps by examining the regions of a specific country and the impact of Venture Capital Funds in each region on innovation development.

The Canadian context of venture investment

Despite the extensive body of scientific research dedicated to studying the role of venture capital in innovation management, the majority of studies focus on the experiences of the United States, China, and other countries with developed venture ecosystems. At the same time, Canada, as a country with an active startup environment, infrastructure to support innovation, and a well-developed system of public–private partnerships, remains an insufficiently explored example. This gap highlights the need for a deeper analysis of the mechanisms of interaction between venture capital and innovation activities within the context of Canada’s economic system. This study fills that gap by providing a comprehensive examination of the role of venture funds in the development of innovative entrepreneurship in Canada, considering institutional, geographical, and sectoral characteristics. Unlike previous works, this paper focuses not only on the challenges of securing necessary investment volumes, but also examines the institutional environment, including the participation of public entities such as BDC Capital, as well as the impact of R&D stimulation programs and tax incentives.

Problem statement

By 2025, Canada will have earned a reputation as a leading country in the field of innovation, particularly in areas such as artificial intelligence, data analysis, and software. However, an analysis of the current state of venture capital in Canada reveals that a significant portion of investments is concentrated in large deals at later stages of innovation projects, leaving insufficient funds to support startups in their early stages. As a result, many companies halt the implementation of projects at early stages and cannot transition to the scaling and commercialization phases. According to analytical data presented in the CVCA report, a 64% reduction in investments in the first half of 2024 could potentially lead to a shortage of new innovation projects in the future due to inadequate support for startups seeking to progress from idea to realization. In the second quarter of 2024, venture financing increased to approximately CAD 2.4 billion, distributed across 143 deals. However, these figures still lag behind those of the second quarter of 2023 (CVCA, 2024). At the same time, there has been a rise in investments at later stages of company development, although the number of late-stage deals in the second half of 2024 was the lowest on record. Additionally, investors have clearly developed a trend of focusing on more mature companies with established reputations, which may limit opportunities for growth and innovation among young startups (Leonard, 2024). In this context, a balanced venture capital strategy that takes into account the needs of both early and later stages of development is key to maintaining a dynamic and innovative entrepreneurial landscape in Canada. The lack of early-stage investments may lead to a decline in the number of new innovative companies, which, in the long term, will affect the country’s competitiveness in the global technology market. Therefore, it is essential to focus on the redistribution of venture investments, ensuring sufficient support for startups at all stages of their development in order to preserve and strengthen Canada’s status as a leader in innovation. In this context, the aim of this study is to determine the

role of Venture Capital Funds in stimulating innovation development in Canada and to identify regional features of their effectiveness to develop recommendations for optimizing the venture and innovation ecosystem.

Research objectives:

1. To analyze venture activity and innovation development in Canada.
2. To identify the characteristics of the relationship between venture investments and innovation.
3. To assess regional differences in the effectiveness of venture investments.
4. To determine the factors influencing the success of venture investments.
5. To develop recommendations for the development of Canada's venture and innovation ecosystem.

Methods and materials

Conceptual basis of research

The conceptual framework of the study is based on the ideas regarding the importance of regional innovation development in countries. The trends in the development of Regional Innovation Systems (RIS) have gained wide recognition in Europe. Multifactorial RIS includes the analysis of R&D, policies, and the business environment of the region. Research on multifactorial or unifactorial RIS in Europe, with varying sets of factors, has largely reached its limits. For this reason, the idea of studying a unifactorial RIS with an analysis of the impact of venture investments on regional innovation development outside of Europe emerged. To achieve a more pronounced effect, it was necessary to choose a country with a developed economy and a multifaceted regional structure. Given the availability of extensive data and the relatively small number of studies, it is of interest to examine the impact of unifactorial RIS in Canada.

The search for correlations between venture capital indicators and innovation indicators is crucial as it provides insight into the effectiveness of venture fund activities in a specific region and in the country as a whole. Additionally, such correlations help identify the most favorable provinces in Canada for startup development. The information about these interrelations is valuable for venture investors and regional policymakers, as it highlights which provinces face challenges in promoting venture capital, which in turn are linked to difficulties in advancing innovation. This provides potential for improving regional management policies and investment strategies in the province's financial infrastructure.

Research stages

1. Data collection: Gathering data on the Canadian venture capital market and the country's innovation sector. This data includes the number and volume of venture deals in each province, the number of bankruptcies in each province, and the number of patent applications filed and approved in each province.
2. Calculation of indicators: Calculation of indicators that describe the business environment of Canada and determine the stability of venture investments in the country. These indicators are calculated for each province and for Canada as a whole.

The following coefficients are applied: business survival rate, average patent application approval rate, and the proportion of submitted and approved patent applications, as well as the number and volume of venture deals in the overall Canadian statistics for each province separately.

3. Correlation Analysis: Conducting correlation analysis to examine the relationship between the number of approved patent applications and the volume of venture investments in Canada. The selection of these indicators is based on the fact that the number of approved patent applications is a key indicator of innovation activity. Patents reflect the level of technological development and the willingness of companies to protect their innovations in the market. Analyzing this indicator allows for the assessment of how actively companies engage in the creation and commercialization of new technologies. In turn, the volume of venture capital investments indicates the level of investor confidence in innovative projects and their willingness to invest in the development of new technologies, thereby allowing for the evaluation of prospects for financing startups and innovation projects. It is assumed that an increase in venture capital investments stimulates the growth in the number of approved patents, as venture funds often invest in companies that demonstrate high innovation potential, contributing to increased patent activity. Therefore, the analysis of the correlation between the number of approved patents and the volume of venture capital investments allows for an assessment of how effectively venture funds support innovative projects. A high correlation coefficient may indicate that venture investments indeed facilitate the successful commercialization of innovations.

It should be noted that the limited availability and high level of aggregation of data at the provincial level, as well as the risk of multicollinearity between institutional and economic variables, precluded the application of regression analysis and clustering methods. Furthermore, the construction of a robust regression model would require the inclusion of additional independent variables, such as the number of employees in the innovation sector, the structure of corporate R&D expenditures, and access to acceleration programs—data that are either absent from public sources or presented in an incomparable format. Due to the heterogeneity of the sample, clustering methods were also not employed. In several Canadian provinces, the number of venture deals was too small to ensure the statistical validity of segmentation. Under conditions of small sample size, clustering could produce artificial results that do not accurately reflect real economic processes.

We acknowledge that relying exclusively on correlation analysis does not allow for the establishment of causal relationships and makes the results sensitive to potential omitted variable bias. Variables such as the level of development of university-based research in the regions, the institutional characteristics of venture programs, and the density of accelerators could represent sources of such bias. This limitation has been recognized by the author and should be taken into account when interpreting the findings.

4. Statistical analysis: Based on the coefficients from stages 2 and 3, draw conclusions about provinces demonstrating higher innovation outcomes for venture investments, i.e., those where it is more favorable to start a business.

5. Conclusions on innovation and venture investments: Based on the results from stage 2, draw conclusions about the correlation between venture investments and innovation in Canada.

This research design best enables the achievement of the study's objectives, as it structures and divides the main areas of the study into two primary directions: the correlation between innovation and venture capital indicators and the assessment of the most "successful" province in Canada. The correlation analysis, the result of which is a system of correlation coefficients between venture investment and innovation indicators for each province, allows for a deep evaluation of the interrelationships between Venture Capital Funds, their performance outcomes in each province, and the innovation development in each province. The system of correlation coefficients also includes the calculation of overall correlation coefficients for the entire country based on regional data, providing insights into the average relationships across the country and distinguishing provinces as above or below average.

The assessment of the most "successful" province in Canada for starting a business offers insight into which provinces investors should consider when launching a business, thereby indicating the potential for increased venture investments in future development prospects.

Sampling and research materials

This study is based on a mixed-methods approach, combining both qualitative and quantitative analysis. To ensure the reliability and representativeness of the research, a combination of secondary and primary data collection methods was used. Secondary data provided the quantitative foundation for the analysis and were obtained from venture deal databases (Crunchbase, PitchBook, and CB Insights, which contain information on venture financing deals, investment stages, sectors, funding volumes, geographic distribution, and company profiles) and government sources (open data from the Canadian Ministry of Innovation, Science, and Economic Development (ISED), Statistics Canada, and the OECD, including R&D indicators, the number of registered patents, growth of technology companies, and levels of entrepreneurial activity), as well as industry reports (analytical reviews from BDC Capital, the Canadian Venture Capital and Private Equity Association (CVCA), MaRS Discovery District, and the OECD STI Outlook). To complement the quantitative analysis and gain a deeper understanding of the institutional context, semi-structured interviews were conducted, which provided the context for interpreting the obtained data. Additionally, an analysis of political and programmatic documents was performed, including an examination of federal and regional strategies and programs, such as the Innovation Superclusters Initiative, SR&ED, and the Venture Capital Action Plan, to identify the role of government policy in shaping the venture capital environment.

The sample consists of statistical indicators from the official Canadian statistics for the 2021–2022 and 2022–2023 fiscal years. The representativeness of this period is ensured by its unique characteristics and significant changes in the field of venture investments. The sharp peak and subsequent decline in the volume of venture investments offer a unique opportunity to analyze the factors influencing such fluctuations. This period also witnessed substantial changes in technological trends and investor priorities; specifically,

there was a noticeable increase in interest in startups related to implementing artificial intelligence technologies, which influenced patenting dynamics across various technological fields. Furthermore, a comparison of data from 2021 to 2023 with previous periods reveals that, despite the record figures of 2021, the subsequent decline in investments in 2022–2023 returned the market to pre-pandemic levels, indicating the cyclical nature of the venture market and emphasizing the importance of analyzing the factors driving such fluctuations. Therefore, the analysis of data from this time frame allows for conclusions to be drawn about the impact of global events on venture investments and innovation activity, as well as the identification of key factors shaping market dynamics in the face of significant changes.

The sample excludes the influence of the 2020 crisis and other crises on the data. The following categories were collected:

- Number of patent applications filed in each province and territory, total for the country (Government of Canada, [2024 d](#));
- Number of patent applications approved in each province and territory, total for the country (Government of Canada, [2024 d](#));
- Number of venture capital deals in each province and territory, total for the country (CVCA, [2023](#));
- The total volume of venture capital deals in each province and territory, the total for the country (CVCA, [2023](#));
- Total number of firms registered in each province and territory, total for the country (Government of Canada, [2024c](#));
- Total number of bankruptcies per year among registered firms in each province and territory, total for the country (Government of Canada, [2024b](#)).

Methodological framework, iterations, formulas

The research employed the following methodological tools: calculation of coefficients, analysis of data from Statistics Canada on issued patents, the number and volume of venture deals, and generalization of data regarding the venture capital market in Canada, specifically the number and volume of venture deals in each province and for the country as a whole. Correlation analysis was conducted to examine the relationships between innovation indicators (the volume of issued patents) and venture market indicators (the volume and number of deals) in Canada. At the initial stage of the analysis, Pearson's correlation coefficient was used to assess the linear relationships between the volume of venture investments and key indicators of innovation activity. Data visualization was used to create graphs and charts illustrating the current distribution of financial flows within the country across provinces and the patent issuance situation in each province. This includes the distribution of venture investments within the country, the patent approval rate, and the business survival rate for each province. Data visualization was performed using Excel software, utilizing its chart and graph creation functionality.

For the calculation of coefficients that assess the attractiveness of conducting business in each province, the following formulas were used:

- The “Survival Rate” coefficient is calculated as follows:

$$\left(1 - \frac{\text{Number of bankruptcies}}{\text{Number of firms in the province at the beginning of the year}}\right) * 100\%.$$

- The “Patent Approval Rate” coefficient is calculated as:

$$\frac{\text{Number of approved patent applications}}{\text{Number of patent applications submitted}}.$$

To determine the relationship between issued patents and venture investments, Pearson’s correlation coefficient was used. The choice of Pearson’s correlation coefficient is based on the nature of the underlying data, whose distribution is close to normal, as well as the presumed linear relationship between the variables. At the same time, the author takes into account the limitations of correlation analysis, such as its inability to identify causal relationships and its sensitivity to outliers, which renders it only a preliminary stage in the overall structure of the analysis. The formula employed in the calculations is provided below:

$$\text{Coefficient} = \frac{\text{cov}(X, Y)}{\sigma(X) * \sigma(Y)},$$

where X and Y represent indicators of innovation and venture investments, respectively. The innovation indicators include the number of patent applications filed (in units) and the number of patent applications approved (in units). The venture investment indicators include the total volume of venture deals in each province (in million CAD) and the number of deals (in units). The standard deviation was calculated manually, without using a special Excel function, as follows:

$$\sigma(X) = \sqrt{D(X)}, \sigma(Y) = \sqrt{D(Y)},$$

where X and Y represent the respective indicators of innovation and venture investments. The innovation indicators include the number of patent applications filed (in units) and the number of patent applications approved (in units). The venture investment indicators include the total volume of venture deals in each province (in million CAD) and the number of deals (in units).

The calculations were performed in Excel.

Methodological limitations

Limitations of the temporal scope of the data

The generalizability of the obtained results may be constrained by the limited time frame of the study. Venture investments and patent activity are subject to cyclical fluctuations; therefore, analyses based on short-term data may fail to capture long-term trends.

Lack of causal inference in correlational analysis

Correlational analysis identifies statistical associations between variables but does not provide grounds for establishing causal relationships. This method is sensitive to outliers and does not account for the influence of latent factors such as institutional

characteristics, macroeconomic conditions, or legislative changes, potentially leading to misinterpretation of the results.

Regional disparities and the problem of omitted variables

The analysis does not consider several regional-specific factors, such as the level of infrastructure development, availability of skilled labor, and local market dynamics. Omitting these aspects may affect the assessment of the relationship between the volume of venture investments and the level of innovation activity. Moreover, the model excludes external variables such as global economic trends and international events, which may exert significant influence on the venture capital sector.

Recommendations for future research

To enhance the robustness and validity of future findings, it is recommended to employ more advanced econometric methods. For instance, multiple regression can account for the simultaneous impact of several factors; the Difference-in-Differences (DiD) approach may facilitate the evaluation of policy effects by comparing treatment and control groups. Additionally, the use of instrumental variables can mitigate endogeneity concerns in model estimations.

Limitations in measuring innovation

Measuring innovation through patent counts fails to reflect internal innovations that are not formally patented, such as the implementation of robotics and automated systems within companies.

Insufficient data on northern territories

Due to the lack of reliable statistical data on business operations and company performance in Yukon, Nunavut, and the Northwest Territories, these regions were excluded from the analysis.

Results

Currently, Canada possesses a well-developed infrastructure to support investment activities, which includes venture capital funds, accelerators, incubators, government programs, and private investment companies. This ecosystem is designed to stimulate innovative development, support startups, and attract investments into promising industries. Canadian venture capital funds play a key role in financing startups and innovative companies. The largest of these include BDC Capital (Business Development Bank of Canada), Inovia Capital, Real Ventures, and Lumira Ventures. In turn, accelerators and incubators provide startups with resources such as office space, mentorship, and access to investors. Key players in this area include MaRS Discovery District (Toronto), Creative Destruction Lab (CDL), YEDI (Toronto), and FounderFuel (Montreal).

Government programs and initiatives play a particularly important role in the development of the investment ecosystem. For instance, VCAP is a government initiative that aims to co-finance startups with private funds. SR&ED is a program offering tax incentives to companies engaged in innovation and research. ISC supports companies offering

technological solutions through contracts and grants. Canada's innovative infrastructure also includes clusters and research centers affiliated with universities.

In addition to venture capital funds, private investment groups are involved in investment activities, each addressing different objectives. For example, Thrive Venture Fund specializes in supporting women entrepreneurs, Panache Ventures funds startups in Web3 and blockchain, and Georgian Partners focuses on projects in data and artificial intelligence. The regulation and coordination of processes related to the development and implementation of innovations are managed by two key organizations: CVCA, the association of Venture Capital Funds and private investors representing the industry, and CIPO, the agency regulating issues related to intellectual property protection.

Canada's investment infrastructure represents a balanced ecosystem that integrates public and private efforts. The collaboration of Venture Capital Funds, accelerators, research centers, and government programs creates a favorable environment for innovation development and capital attraction, strengthening Canada's position as one of the global leaders in technology.

However, several key issues related to the functioning of Canada's investment ecosystem exist. Let us examine them in more detail.

One of the main issues is the regional centralization of venture capital. Approximately 95% of venture investments are concentrated in four major provinces: Ontario, Quebec, British Columbia, and Alberta. Less developed regions, such as Manitoba or Prince Edward Island, receive a minimal share of investments. As a result, the competitiveness of startups in regions with low levels of venture capital is reduced, and the migration of intellectual and entrepreneurial capital from less developed provinces to centers of venture activity intensifies.

The second significant issue is the uneven access to infrastructure and support. Innovative clusters and accelerators, such as MaRS Discovery District or Creative Destruction Lab, are concentrated in major cities, limiting startups from remote regions in their access to mentorship, expertise, training, and investment. Consequently, startups without access to accelerators or incubators face the challenge of stagnation or slow development of their innovative projects.

Additionally, there are challenges in commercializing patents and innovations due to insufficient venture funding, weak connections between academia and business, and a lack of effective implementation programs. These issues deprive scientists and entrepreneurs of incentives to bring their developments to market. Moreover, the limited focus of Venture Capital Funds on long-term sustainability, with an emphasis on short-term growth prospects and quick profits, undermines the survival rate of startups. Venture Capital Funds are also more likely to invest in later-stage projects, where risks are lower, making it difficult for startups at the idea or development stage to secure funding. These actions reduce innovation activity, with potentially promising projects remaining underfunded and shutting down in the early stages.

There are also issues related to the integration of public and private support, the limited availability of venture capital in promising industries (e.g., Web3, blockchain), credit market restrictions, and difficulties accessing external debt and credit solutions for startup expansion. Let us now examine in more detail the issues related to the need for addressing the decentralization of venture capital management.

The results of this study are divided into three main groups of data: (1) calculation of statistical success coefficients for businesses by province; (2) calculation of correlation coefficients between various indicators of the innovation environment and the venture capital market; (3) aggregate results with the author's assessment of the provinces demonstrating higher innovation outcomes for starting a business. The results from these three groups are presented in the same order.

Figure 1 is key to understanding Canada's business environment and emphasizes regional differences in the distribution of investment. Nearly half of all venture investments are directed towards Ontario (48%) (BDC, 2024). As the leading economic center of the country, Ontario attracts significant capital due to its high concentration of innovative companies, access to a skilled workforce, and favorable startup infrastructure. Toronto's role as a financial hub, along with the significant concentration of universities and research centers, makes this province particularly attractive to Venture Capital Funds. Quebec, British Columbia, and Alberta (20%, 17%, and 10%, respectively) also stand out as key players in Canada's venture ecosystem (CVCA, 2024). Quebec, particularly Montreal, is an important hub for technology and artificial intelligence, which draws substantial venture investments in IT and tech startups. British Columbia, especially Vancouver, demonstrates a strong innovation culture, with a focus on sustainable technologies and biotechnology. Alberta, historically associated with the energy sector, is also expanding its venture ecosystem through investments in renewable energy and agritech (OECD, 2024).

The concentration of venture capital in four provinces reflects pronounced regional disparities.

The remaining 5% of investments are distributed among six less prominent provinces within the venture ecosystem, highlighting the significant centralization of investments in the "big four" (BDC, 2024). This creates an inequality of opportunities for startups

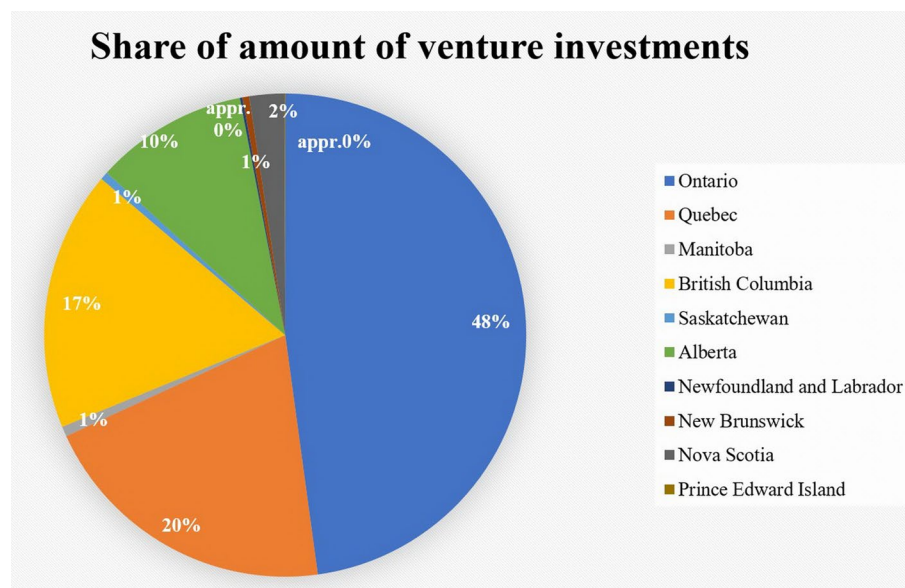


Fig. 1 Share of provinces in the total volume of venture investments. Source: Developed by the authors based on data from Government of Canada (2024a)

and innovative companies in other regions. Since startups in these provinces receive limited resources, they may face difficulties in growth, reducing their competitiveness at the national level.

The centralization of venture investments leads to a “brain drain” from less-invested regions. Young entrepreneurs and talent may prefer to relocate to more investment-attractive provinces, further exacerbating the imbalance between regions. In the long term, this could negatively impact economic development in remote and less-developed areas of the country, raising the important issue of the need for government policies to stimulate investments in these regions. The reasons for the current situation lie in a combination of economic activity, the presence of universities, innovation clusters, and infrastructure, which makes the “big four” a magnet for venture investments. However, such imbalances may result in the untapped potential of other regions, presenting the government with the task of balancing national investment activity.

Figure 2 illustrates each province’s share of patent applications approved by the Canadian Intellectual Property Office (CIPO) (Government of Canada, 2024 d). Tracking this data is crucial for assessing regional differences in innovation activity and the institutional barriers influencing this process.

The data indicate a significant centralization of investments in the provinces of the “Big Four”, while the remaining six provinces account for only 5% of the total investments (BDC, 2024). This imbalance restricts the opportunities for startups in less-funded regions, leading to resource shortages and developmental challenges. Furthermore, there is an observable increase in the migration of young entrepreneurs and scientists to provinces with more developed investment infrastructures. This trend also has a negative impact on the competitiveness of less developed regions. Nevertheless, provinces outside the “Big Four” demonstrate a high level of inventiveness and scientific activity. This fact is corroborated by the volume of patent applications approved by the Canadian Intellectual Property Office (CIPO), as illustrated in Fig. 2.

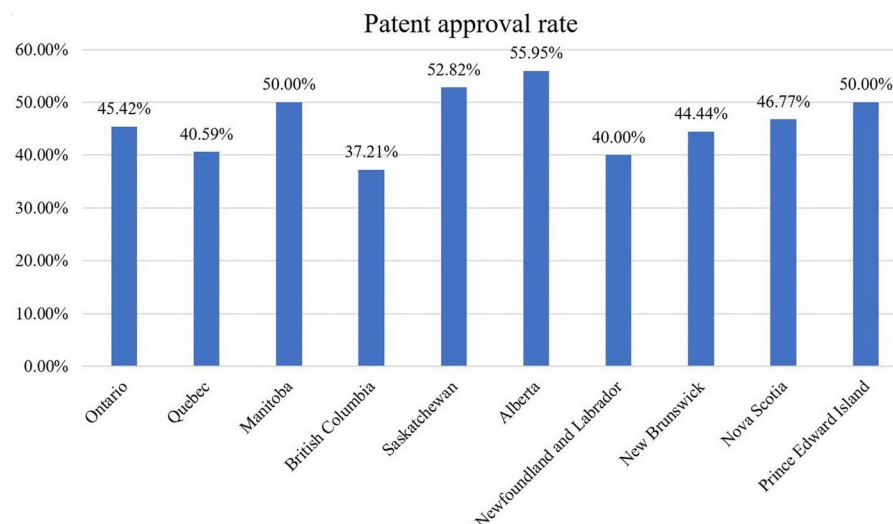


Fig. 2 Patent approval rate by province. Source: Developed by the authors based on data from the Government of Canada (2023b, 2023 d)

High patent approval rates in Alberta and Saskatchewan indicate a favorable regulatory environment that facilitates patent filings and approvals. The highest patent approval rate is observed in Alberta (55.95%), while the lowest rate is recorded in British Columbia (37.21%). This contrast may indicate differences in the level of expertise among patent examiners and the patent review processes in each province. Notably, venture capital investments in these two provinces do not differ significantly in volume (10% in Alberta and 17% in British Columbia), highlighting the presence of internal regional factors that influence the success rate of patent applications (Government of Canada, 2024 d). These factors may include the quality of research centers, support for innovation ecosystems, and the level of collaboration between business and government on intellectual property matters.

The average patent approval rate across Canada is 45.42%, which aligns with the rate in Ontario, the province with the highest venture capital investments (Government of Canada, 2024 d). This suggests a balanced level of patent activity and a high degree of business confidence in Ontario, stimulating the submission of new applications. However, it is important to note that approval rates for smaller provinces, such as Prince Edward Island, Newfoundland, and Labrador, are subject to significant fluctuations due to the small volume of applications submitted. For example, Prince Edward Island submitted only 8 applications, of which 4 were approved (50%), while Newfoundland and Labrador submitted 15 applications, with 6 approved (40%) (NBER, 2022).

The diversity in patent approval rates across regions may result from institutional differences, such as the preparedness and experience of patent committees. In smaller provinces, patent applications are likely evaluated with less expertise and understanding of contemporary technologies, reducing the likelihood of approval for innovative developments. This, in turn, creates institutional barriers for entrepreneurs and startups, forcing them to migrate to more developed regions with better innovation support systems. In the long term, this could further exacerbate the centralization of business activities in larger provinces such as Ontario and Quebec, leading to increased inequality in access to capital and infrastructure for startups.

Thus, differences in patent approval rates may stimulate the internal migration of businesses to more “patent-friendly” regions. Provinces with high approval rates, such as Alberta and Saskatchewan (55.95% and 52.82%, respectively), may attract more innovative companies, which, over time, could influence the redistribution of venture capital investments across the country (Government of Canada, 2024 d). To prevent this imbalance, the Canadian government should consider standardizing the patent review process and improving the training of regional committees, which would help create more equitable conditions for innovative enterprises nationwide.

Figure 3 illustrates the proportion of businesses that survived during the fiscal year in each Canadian province. The highest survival rate is observed in British Columbia, over 93%. (Government of Canada, 2024 d). This indicates the stability of the business environment in this region, where companies are better able to cope with economic challenges. The lowest survival rates are recorded in three smaller provinces: Newfoundland and Labrador, New Brunswick, and Nova Scotia, where the proportion of businesses avoiding bankruptcy is around 85%. These regions may suffer from

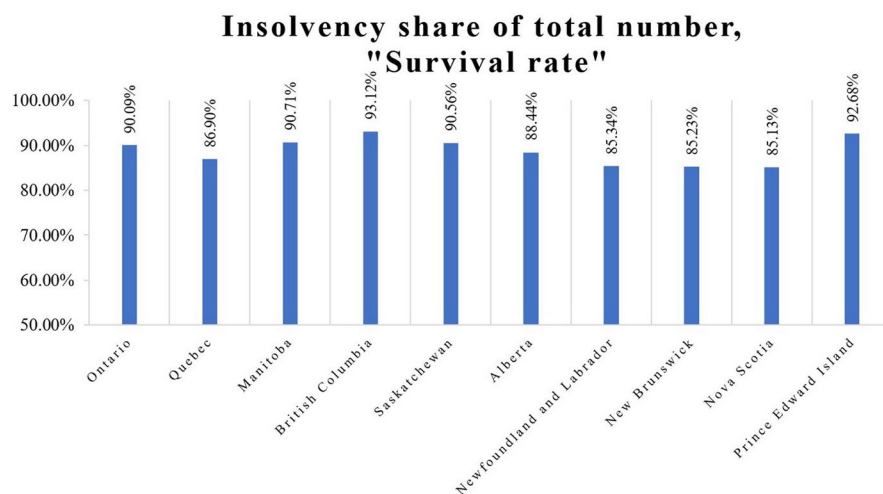


Fig. 3 Startup survival rate for innovation projects by province. Source: Developed by the authors based on data from the Government of Canada (2023a, 2024b)

institutional barriers, such as limited access to credit, low levels of support for small and medium-sized businesses, and restricted venture capital investments.

The data presented in Fig. 2 demonstrate that the volume of venture investments indirectly influences the number of approved patents. The patent approval rate in Canada is 45.4%, which matches the rate in Ontario, the leading province in terms of venture investment volume. These figures indicate a balance between patent activity and business trust. The highest patent approval rate is observed in Alberta (55.95%), while the lowest is in British Columbia (37.21%), despite the fact that the volume of venture investments in these provinces is not significantly different (10% in Alberta and 17% in British Columbia) (Government of Canada, 2024c). Additionally, the approval rates in smaller provinces such as Prince Edward Island, Newfoundland, and Labrador are subject to significant fluctuations due to the small number of applications submitted. For example, Prince Edward Island submitted only 8 applications, 4 of which were approved (50%), while Newfoundland and Labrador submitted 15 applications, 6 of which were approved (40%). Such differences in patent approval rates may prompt internal migration of businesses to more patent-friendly regions. Therefore, in the long term, provinces with high patent approval rates, such as Alberta and Saskatchewan, where the approval rates are 55.95% and 52.82%, may attract innovative startups and influence the process of redistribution of venture investment flows. In general, in addition to the volume of venture investments, the number of approved patents is affected by a number of regional factors: the efficiency of the patent examination process, the level of qualification of patent examiners, the number and activity of research centers, the degree of support for the development of innovation ecosystems, the level of integration of interests and efforts of the business community and the government on intellectual property management issues. And since, in the long term, institutional barriers may intensify the processes of centralization of business activity in large provinces and increase the level of inequality in startups' access to capital and infrastructure, the Canadian government should consider the

possibility of standardizing the patent review process and improving the system of training regional committees. Such measures will create fair conditions for the implementation of innovative startups regardless of territorial affiliation.

Next, we examine the survival rates of innovative startups in Canadian provinces. Figure 3 presents the proportion of businesses that were able to survive throughout the financial year. British Columbia, with its high level of business environment stability, demonstrates the highest survival rate (93%). The lowest survival rates are observed in three smaller provinces (Newfoundland and Labrador, New Brunswick, and Nova Scotia), where institutional barriers, such as restrictions in credit access, low levels of support for small and medium-sized enterprises, and a small volume of venture investments, clearly have a negative impact on the development and support processes of innovative startups.

Startup survival rates in British Columbia signal the presence of a robust entrepreneurial ecosystem.

On average, the startup survival rate for innovation projects in Canada is 89.5%. This figure is quite close to the rates observed in the largest provinces: Ontario (90.09%), Quebec (86.9%), and Alberta (88.44%) (Government of Canada, 2024b). These data suggest that the level of business activity and resilience in the most economically developed regions of Canada is relatively stable; however, there are still significant differences between provinces. The trend observed in the charts (Figs. 1, 2, and 3) reflects a pattern: two provinces from the “big four” (Ontario, Quebec, British Columbia, and Alberta) demonstrate figures close to the national average, while the other two provinces are at the extremes of the coefficients—either with maximum or minimum values.

The business survival rate is an important indicator of the state of the business environment. In this case, the average Canadian survival rate is close to 90%, which suggests that the business environment in the country is not ideal. Approximately 10% of startups working on innovation projects fail within a year (Government of Canada, 2024b). These points point to underlying issues in the Canadian economy, such as excessive regulation, high competition, and possibly a lack of support for small businesses. When companies go bankrupt, a negative chain reaction occurs: their creditors, partners, and suppliers incur losses, which creates risks to their financial positions. This bankruptcy chain leads to a domino effect, where one company pulls others down, forcing them to declare bankruptcy as well. This phenomenon is likely cyclical and may explain why the Canadian economy does not show significant growth in the number of sustainable enterprises.

The reasons for the differences in survival rates between regions may vary. For instance, in British Columbia, the high survival rate (93.12%) may reflect a high level of venture capital investment, an effective business support system, and the availability of skilled labor. In contrast, regions such as Newfoundland and Labrador (85.34%) and New Brunswick (85.23%) may experience weaker performance due to limited access to venture capital, inadequate infrastructure for business development, and low population density, which restricts market opportunities.

In the long term, such regional disparities could have significant consequences for the country's economy. Provinces with higher survival rates, such as British Columbia and Prince Edward Island (92.68%), will attract more investments, new businesses,

and entrepreneurs, enhancing their economic strength and attractiveness. Meanwhile, regions with lower rates may face a decline in business activity and investment flows, leading to stagnation and slower economic growth.

This situation may drive the migration of business and capital to more stable and developed regions. Entrepreneurs, seeing higher chances of success in provinces such as Ontario and British Columbia, will be inclined to establish new companies there, which, in turn, will increase economic inequality between provinces. This will create additional pressure on less developed regions, which will need to implement reforms to improve competitiveness and enhance the business climate. In conclusion, the differences in business survival rates across provinces highlight the need for regional reforms aimed at creating a more favorable business environment in provinces with lower survival rates. Otherwise, Canada risks further centralization of business and increasing economic inequality between regions.

The second set of results on correlation coefficients is presented in Table 1 to allow for a comparative analysis. The correlation coefficient calculations are provided separately for the fiscal years 2021–2022 and 2022–2023.

Various factors can determine the variation in survival rate indicators. For instance, in British Columbia, the high survival rate (93.12%) is attributed to a high level of venture investment, an effective business support system, and the availability of a sufficient number of skilled workers. In regions such as Newfoundland and Labrador (85.34%) and New Brunswick (85.23%), the lower survival rates are due to limited access to venture capital, inefficient infrastructure for startup development, and low population density. This regional differentiation may lead to negative consequences for the economy of Canada. Provinces with higher survival rates will steadily attract new investments, increase business activity, and increase their economic power and competitiveness. At the same time, regions with lower indicators may face a decline in business activity and investment flows, stagnating and slowing economic growth. Next, we will assess the interdependence of the development processes of the venture and the innovation environment. The results of calculating the correlation coefficients are presented in Table 1.

The analysis of the presented data on Pearson correlation coefficients for two fiscal years reveals several key trends in the development of Canada's venture capital and innovation environment. First and foremost, it is evident that there is a strong correlation

Table 1 Correlation coefficients of various indicators of the venture and innovation environment

Parameters of the relationship (X and Y)	Fiscal year 2021–2022	Fiscal year 2022–2023
X: submitted applications; Y: total venture investments	0.934	0.969
X: approved applications; Y: total venture investments	0.965	0.954
X: submitted applications; Y: number of deals	0.969	0.988
X: approved applications; Y: number of venture investment deals	0.979	0.98
X: patent approval rate; Y: total venture investments	0.006	−0.259
X: patent approval rate; Y: average deal size of venture investments	0.156	0.344
X: patent approval rate; Y: survival rate	0.573	0.161
X: survival rate; Y: total venture investments	0.582	0.2

Source: Developed by the authors based on data from the Government of Canada (2023a, 2024b) and CVCA (2023)

between venture capital indicators (volume of venture investments and number of deals) and innovation activity (patent applications submitted and approved).

The correlation coefficient values for two financial years allow us to draw conclusions about the key trends in the development of the venture and innovation environment in Canada.

The correlation coefficients for these relationships remain consistently high, ranging from 0.934 to 0.988, indicating a clear dependence of venture investment volume and the number of deals on the level of patent application submission and approval. This suggests that patents continue to serve as a primary indicator for evaluating the potential of projects by venture capital funds. The increased correlation may also indicate that investors perceive patent applications as a marker of the innovation potential of a region or company, which, in turn, stimulates investment activity in projects with higher chances of technology commercialization.

It is noteworthy that over the past year, the correlation coefficients between these indicators have increased by 1–2 basis points, which can be explained by the general stabilization and growing interest in venture investments in the country. This is likely related to a more favorable macroeconomic environment and the growth of startups focused on the development of high-tech products that can be patented. Government innovation support programs also play a crucial role, as they can stimulate both the submission of patent applications and the attraction of venture capital.

A more complex and interesting picture emerges from the last four calculations of the correlation coefficients. In particular, there is virtually no relationship between the patent approval rate and the amount of venture capital. In the 2021–2022 fiscal year, the coefficient was only 0.006, and in the 2022–2023 fiscal year, it shifted into the weak negative range (-0.259). This may suggest that Venture Capital Funds are paying less attention to patent approval statistics as a factor in investment decisions. It is possible that venture investors are focusing more on other indicators, such as the innovation potential of the team, market prospects, or the uniqueness of the product. Moreover, the negative correlation may indicate that regions with high patent approval rates face market saturation, and new projects are simply not receiving sufficient support from Venture Capital Funds.

Another important aspect is that the weak relationship between the patent approval rate and the amount of venture investment could point to the territorial preferences of Venture Capital Funds. These funds may invest in projects located closer to their geographic location, thereby reducing the importance of patent activity in investment decisions. This is especially relevant for smaller provinces in Canada, where venture investments may be disproportionately high compared to the number of patents, creating the conditions for further decentralization of innovation across the country.

The significant decrease in the correlation between the patent approval rate and the business survival rate (from 0.573 in the 2021–2022 fiscal year to 0.161 in the 2022–2023 fiscal year) indicates that the influence of patents on business survival has weakened in recent years. This may be due to the fact that patent approval does not always guarantee the successful commercialization of a product. In reality, business survival depends on many factors, including access to capital, market conditions, and managerial effectiveness, with patents only supporting this process. The decline in correlation could also

suggest the increasing complexity of the external environment for businesses, where survival is determined not only by innovation, but also by economic and regulatory factors.

An interesting observation is that the correlation between the business survival rate and the amount of venture capital has decreased from 0.582 to 0.2. This suggests that venture investments are becoming less associated with the long-term viability of businesses. Funds may have begun to place greater emphasis on short-term growth prospects and quick profits rather than on the long-term survival of companies. Such a shift in investment approach could be risky, as it creates conditions for the rise of unstable companies that may thrive in the early stages but fail to withstand long-term economic challenges. The sharp decrease in the correlation between the patent approval rate and business survival also suggests that patent approval has ceased to be a reliable indicator of business success.

When analyzing the reasons for the weak negative correlation (-0.259) between the number of approved patents and the volume of venture investments in 2022–2023, it is necessary to consider the fact that industry differences related to management practices, employee qualification requirements, production methods, financial indicators, and legal norms differentiate innovation implementation strategies. In traditionally patent-intensive sectors such as biotechnology and pharmaceuticals, the presence of patents plays a key role in attracting funding, as it serves as a mechanism for protecting intellectual property and reducing risks for investors. However, in sectors such as software, artificial intelligence, fintech, and Web3, the strategic significance of patents is lower, as innovations in these fields develop rapidly, and protection is often achieved through trade secrets, first-mover advantages, and other intangible assets. Furthermore, the dynamics of venture investments indicate a shift in investment preferences: funds may prioritize companies with rapid growth potential and scalable business models, rather than those whose management is focused on long-term R&D processes and patenting. The aforementioned factors explain the diminishing influence of patents on attracting venture capital in certain regions. It is also important to consider that large venture funds tend to invest in later stages of startup development, when patenting is no longer a decisive factor for success, in contrast to earlier stages where patent ownership may be critically important. Thus, the identified weak correlation suggests that venture investments in Canada are distributed not only based on patent activity, but also considering the market potential of companies, their readiness for commercialization, and the startup's ability to rapidly adapt to changing market conditions. It should be noted that such a correlation value may indicate that venture capital is directed toward regions or sectors of the economy with low levels of innovation activity. Considering the economic effects of the imbalance in venture capital distribution, it is important to highlight several negative consequences that may have a destructive impact on the development of the Canadian economy. Firstly, suppose a significant portion of patents is approved in regions that receive relatively low volumes of venture funding. In that case, promising technological developments lacking the necessary support for commercialization will face a shortage of capital for further growth, potentially triggering a "brain drain" or the relocation of startups to other regions or countries. Secondly, the concentration of venture investments in a small number of provinces, where patent activity is relatively lower, may suggest that investors are focused on short-term profitability and business

scalability rather than long-term technological development. For instance, venture capital may be concentrated in sectors such as fintech or SaaS solutions, where patenting is not a priority, while high-tech industries (e.g., biotechnology, nanotechnology, new materials) remain underfunded. Consequently, Canada's economy could experience a slowdown in technological progress and a weakening of its competitiveness within the global economic system.

Thirdly, the weak correlation may also point to systemic barriers, such as inefficient mechanisms for technology transfer, difficulties in collaboration between universities and businesses, or a low level of government support for innovative companies. If venture funds do not consider patents to be an important indicator of investment attractiveness, innovation activities likely lack sufficient integration of scientific research into the entrepreneurial ecosystem. Therefore, the weak dependence between venture investments and patenting signals that capital distribution does not always align with the region's actual innovative potential.

A significant decrease in the correlation between the number of approved patents and business survival rates (from 0.573 in the 2021–2022 financial year to 0.161 in the 2022–2023 financial year) indicates that the influence of patents on business survival has weakened in recent years. Undoubtedly, patent approval does not always guarantee the successful commercialization of a product, as the survival rate of a startup depends on a variety of factors. Access to capital, market conditions, and management effectiveness are primary in ensuring business development stability, while patents serve a secondary role in this process. Furthermore, the decrease in the correlation may reflect the increasing complexity of external environmental development processes and changes in socio-economic and political situations.

The decrease in the level of correlation between business survival and the amount of venture capital from 0.582 to 0.2 indicates that criteria related to the assessment of long-term prospects for the development and viability of startups are not taken into account when making decisions about venture investments. The priority of short-term prospects for growth and quick profit in investment projects creates risks associated with the emergence of a large number of unstable companies that flourish in the early stages of development but are unable to withstand long-term economic challenges.

Patented innovations may be important for short-term competitiveness, but a company's survival depends on a broader range of factors, such as marketing strategy, access to financing, and the ability to adapt to changes in the market.

Thus, the latest data confirm that Venture Capital Funds in Canada are beginning to focus on new criteria when making investment decisions, and patent activity, along with its influence on business survival, is becoming a less significant factor. These changes may impact the long-term prospects of Canada's innovation ecosystem, as diminished attention to patents may reduce the motivation to develop and register new technologies. At the same time, such shifts create opportunities for regions with lower patent activity to attract venture capital based on other factors, such as entrepreneurial culture and market prospects.

Figure 4 illustrates the relationship between granted patents and the volume of venture capital investments across 10 provinces over two years, resulting in a total of 20

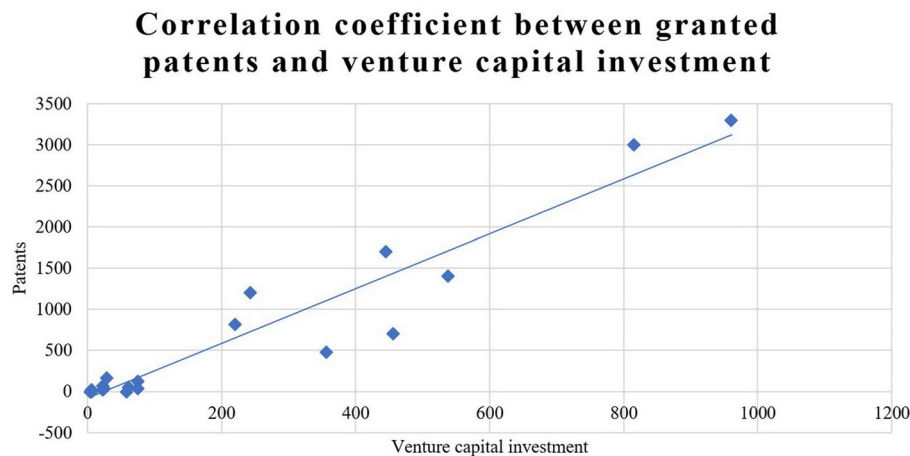


Fig. 4 Correlation coefficient between granted patents and venture capital investment volume with trend.
Source: Developed by the authors based on data from Government of Canada (2023a, 2023b, 2024b, 2024 d) and CVCA (2023)

data points. The large data dispersion indicates the ambiguity of the business climate in the country and its volatility. Additionally, there is a high concentration of resources in the “big four”, which again points to the centralization of investments within the country. The trend reveals the direction of correlation between the indicators and the goal of achieving a balanced volume of venture investments and the number of approved patents. The Canadian government should align its policies with this trend to achieve decentralization goals and optimize the allocation of venture capital resources. It is necessary to address the dominance of the “Big Four” and effectively decentralize its resources for the benefit of the other provinces.

The weak correlation between patent activity and venture capital investment indicates a volatile business environment and highlights the need for decentralizing venture capital allocation.

The analysis of the statistical data collected during the study highlights the importance of decentralizing venture capital in Canada. The presented indicators emphasize the existing disparities in the country’s investment ecosystem and confirm the need for a redistribution of financial resources to unlock the potential of less developed regions. Specifically, this concerns the concentration of venture capital in the “Big Four” provinces. Such an investment structure creates an imbalance, where startups in less developed regions lack access to sufficient funding, thereby exacerbating regional differences and limiting innovative activity. Furthermore, Venture Capital Funds do not use patent activity indicators as a basis for investment decisions, which restricts the commercialization of innovations in regions with high patent approval rates, such as Alberta and Saskatchewan, where the patent approval rates show weak correlation with venture capital investment volumes.

High business survival rates in provinces outside the “Big Four” indicate their relatively stable business environment and investment attractiveness. However, the lack of financial flows limits their scaling opportunities. The analysis of the correlation coefficients between the survival of startups implementing innovative projects and

the volume of venture investments revealed a decreasing significance of this factor, suggesting that Venture Capital Funds are paying less attention to the long-term sustainability of startups. The study's findings confirm that venture capital is focused on short-term profits, negatively affecting the overall resilience of the national innovation ecosystem.

The high level of correlation between the volume of venture deals and the number of patent applications filed and patents granted suggests that decentralization in the distribution of venture capital could enhance the overall level of innovation activity by spreading investments to less developed regions with high potential.

Overall, the analysis of the statistical data in the study emphasizes the need to reconsider the current strategies for managing venture capital in Canada. Decentralizing investments in favor of less developed regions could become an important step toward building a sustainable innovation ecosystem, not only unlocking the potential of peripheral provinces but also improving the overall efficiency of the Canadian economy.

To overcome the described regional investment disparities and create a balanced innovation ecosystem, a comprehensive approach must be implemented, encompassing the following steps. Firstly, regional venture funds should be established in the provinces of Manitoba, Saskatchewan, Newfoundland, and Labrador, which could be partially funded by the government and should aim to attract private capital. Additionally, tax incentives should be introduced for venture funds and private investors who invest in startups based in less developed regions. This measure will ensure capital redistribution and increase the availability of funding for local entrepreneurs.

The second step involves the development of innovation infrastructure in regions with low levels of venture investment, including the creation of innovation clusters that integrate incubators, accelerators, coworking spaces, and prototyping laboratories. Furthermore, collaboration between universities and businesses should be facilitated through the provision of grants for research and development, thereby stimulating the commercialization of university innovations.

Thirdly, it is necessary to develop a system of public–private partnerships by creating programs in which the government and private investors jointly finance early-stage startups, offer government guarantees for investments in startups in less developed regions, and reduce risk levels for private investors. As J. St. Mill emphasized, the role of government institutions in creating conditions for economic progress and innovation is crucial (Meramveliotakis & Manioudis, 2021, 2024). Venture funds can collaborate with government bodies to develop policies that encourage investment in sustainable projects, such as subsidies, tax incentives, or innovation support programs. Additionally, a number of studies substantiate the fact that venture funds should focus on investments in projects that contribute to achieving sustainable development goals, which implies supporting startups engaged in renewable energy, sustainable agriculture, and social innovations such as improving health and education (Bocken, 2015). Fourthly, it is necessary to implement training programs aimed at developing management, marketing, and financial literacy skills among local entrepreneurs. Simultaneously, mentor networks should be created, involving successful entrepreneurs and experts who can provide consultancy services to entrepreneurs in the implementation of startup projects.

Fifthly, it is essential to raise investors' and entrepreneurs' awareness of investment opportunities and attract the attention of venture funds and private investors. To address this task, online platforms can be developed to connect startups from less developed regions with potential investors, including venture funds and corporate investors.

Finally, it is crucial to establish a monitoring and evaluation system for the effectiveness of the venture capital distribution process across regions in order to identify and eliminate imbalances, as well as to conduct regular assessments of the effectiveness of the implemented programs and measures to adjust strategies based on the data obtained. A key component in the implementation of strategies aimed at decentralizing capital, optimizing its distribution, and supporting regional innovations could be organizations responsible for regulating and coordinating processes related to the development and implementation of innovations. The approach for achieving these goals within the activities of the CVCA is presented in Table 2.

Thus, CVCA, as a key organization in the Canadian venture ecosystem, can play a decisive role in addressing regional disparities and implementing the objectives outlined in the study. Its ability to bring together the efforts of investors, startups, and governmental structures will enable it to make a significant contribution to projects aimed at enhancing the efficiency of venture capital allocation and unlocking the innovative potential of all regions in Canada.

In order to address the inequality in the distribution of venture capital across regions, it is essential to develop and implement a series of effective mechanisms aimed at reallocating funds and creating targeted tax incentives. The federal government can play a key role in this process by stimulating the flow of venture capital into underdeveloped regions. Let us examine several potential mechanisms for government involvement in venture capital management in more detail.

The first option is the Matching Fund Model. Similar to the federal Venture Capital Action Plan (VCAP), the government could participate in investing in regional venture funds. Such activity would attract private investors to projects aimed at developing startups in provinces such as Manitoba, Newfoundland and Labrador, or Prince Edward Island. The second option involves the creation of venture funds dedicated to specific regions, which, with federal and regional support, would invest in early-stage local startups. The third mechanism involves expanding the infrastructure of accelerators and incubators. Public funding for projects that create innovation hubs in provinces with low startup activity could serve as a stimulus for the development of regional entrepreneurial ecosystems. Additionally, it is important to more actively disseminate the experience of the Innovation Superclusters Initiative, which supports regional innovation clusters across the country, clearly demonstrating the potential of such geographically targeted strategies (Government of Canada, 2024a).

A powerful mechanism for attracting capital to regions with limited opportunities is tax incentives for investors and startups. For instance, Regional Investment Tax Credits (RITC) allow investors funding startups outside major provinces to receive enhanced tax deductions. Tax holidays for startups, which grant young companies in peripheral regions temporary exemption from federal or provincial taxes, have also proven effective, as they increase survival rates and growth rates. The existing Scientific Research and Experimental Development (SR&ED) program could also be

Table 2 Opportunities in CVCA for implementing tasks aimed at decentralizing venture capital

Project	CVCA resources	Results
Creation of a platform for decentralizing investments	The CVCA brings together leading venture capital funds, investors, and government organizations. This allows it to serve as a bridge between large funds and regional startups	Organizing informational campaigns and educational events to draw attention to less developed regions Supporting initiatives to create Venture Capital Funds focused on financing startups in high-potential regions (e.g., Manitoba and Saskatchewan)
Promotion of best practices in venture capital investment	The association collects and analyzes data on the state of Canada's venture capital and innovation ecosystem	Publishing analytical reports highlighting the advantages of investing in less developed regions, which may attract the attention of large funds Developing recommendations for the effective allocation of capital, based on successful examples of regional startup support
Facilitation of coordination between public and private efforts	CVCA actively collaborates with government bodies to help implement initiatives supporting startups, such as the Venture Capital Action Plan (VCAP)	Stimulating investors through public-private partnerships aimed at financing startups in regions with low venture activity Participating in the development of new government programs focused on decentralizing investments and supporting the innovation ecosystem
Expansion of accelerator and incubator networks	The association works closely with accelerators, incubators, and Venture Capital Funds, such as MaRS Discovery District and Creative Destruction Lab	Supporting the creation of new accelerators in less developed regions to enhance their investment attractiveness Organizing mentorship programs that connect experienced investors with young startups in regional areas
Ensuring transparency and monitoring of venture capital flows	CVCA tracks and reports on venture capital investments in Canada, providing access to up-to-date data	Monitoring capital distribution across regions will help identify imbalances and assess the effectiveness of measures taken Publishing data on best examples of regional investments, which will facilitate their replication
Strengthening the international reputation of provinces	CVCA promotes Canadian startups and the venture ecosystem in international markets	Attracting the attention of foreign investors to undervalued regions Promoting regional innovation clusters and startups as promising investment opportunities

amended. In Canada, the SR&ED program is designed to stimulate scientific research and development in the private sector. The program could offer higher credits for R&D conducted outside Ontario, Quebec, Alberta, and British Columbia. Similar approaches have been successfully implemented in Quebec, where tax credit programs have supported the growth of regional innovation potential.

In summary, it should be emphasized that the data, conclusions, and recommendations presented in this study must be interpreted within the context of systemic barriers that may constrain the implementation of measures supporting venture financing. It is essential to account for regional political heterogeneity, which significantly limits the universality of national initiatives. Under Canada's federal structure, economic policy priorities vary from province to province. In resource-dependent regions, such

as Alberta, the support of innovation may be subordinated to the needs of sustaining extractive industries, thereby reducing the likelihood of adopting joint programs with federal institutions.

Another barrier stems from institutional inequality: developed innovation clusters and acceleration infrastructure are concentrated in select provinces (Ontario, Quebec, and British Columbia), while other regions lack the necessary conditions for the full-scale implementation of venture initiatives. A third barrier lies in the limitations related to the volume and quality of human capital, particularly in remote provinces. The shortage of professionals specializing in startup evaluation, technology transfer, and legal support for transactions creates an institutional vacuum that restrains the activity of venture funds.

Additionally, inefficiencies in administrative procedures—including prolonged application review periods, the absence of transparent selection criteria, and a lack of coordination across different levels of government—reduce decision-making efficiency and limit startups' access to financial support, particularly in the early stages of development. Finally, it is important to note the fragmented nature of strategic approaches to managing investment activities. Regional innovation support programs are often misaligned with the national agenda, are not integrated into a unified system for evaluating effectiveness, and do not foster the exchange of best practices among provinces.

Thus, any measures aimed at strengthening the role of venture capital in regional innovation development must involve not only financial investments, but also careful consideration of the actual institutional landscape, political differences, and local human capital capacities.

Discussion

The conducted study confirms the significant role of venture capital in the development of innovations in Canada, which aligns with the findings of previous research (Lee et al., 2023) and demonstrates the fact that the concentration of venture capital in certain regions leads to regional imbalance. These findings are consistent with the results of international experience regarding the concentration of venture capital in Silicon Valley in the USA and Shenzhen in China (Sun et al., 2024).

Our study identified unique features specific to the Canadian context. For instance, in provinces with limited venture capital, such as Manitoba and Saskatchewan, we observed high startup survival rates and stable patent activity. The obtained results contradict the widespread belief that a high level of venture financing is directly linked to the success of innovation projects. Our findings support theories suggesting that, in some cases, local conditions and support from local authorities can compensate for the lack of venture capital (Ge et al., 2025).

Furthermore, our research emphasizes the importance of developing public–private partnerships in the growth of the innovation ecosystem. Programs such as the Venture Capital Action Plan (VCAP) and Scientific Research and Experimental Development (SR&ED) play a key role in attracting capital to investment projects of small and medium-sized enterprises. This thesis aligns with findings based on research on the Chinese business environment, which showed that government subsidies for research and development contribute to the increase of venture capital investments in China

(Bai & Zheng, 2024). However, unlike China, where government funds often invest in companies with low innovation potential at early stages, Canadian programs are more focused on supporting projects with high commercialization potential. In the context of the findings regarding the economic consequences of such venture capital distribution, it is important to highlight the issue of startup relocation due to insufficient funding at the early stages of managing an innovation project. Research demonstrates that venture capital plays a significant role in the international migration of startups. Approximately 6% of startups relocate across borders, which accounts for 17% of the total value of the startups created (Weik et al., 2024). Most of these relocations are directed toward the United States, indicating the significant influence of foreign venture capital, particularly from the U.S., on the relocation of startups. The results of this study also demonstrate that startup relocation often involves the movement of a significant portion of their workforce and support the hypothesis that startup relocation is not only a formal legal process but also a real relocation of business operations.

An interesting aspect of our study is the identification of a weak correlation between the level of patent activity and the volume of venture capital investments. The result obtained contradicts the traditional view that patents are a key indicator of a company's innovation potential. For instance, in Alberta, where the number of approved patents is high, the volume of venture investments is relatively low. This situation may be related to the increasing trend in Canada for venture funds to focus on projects with rapid growth potential and high scalability, rather than those that focus on long-term research and development processes (Xie & Wang, 2025). This finding aligns with studies that show a new orientation in the activities of venture funds, which are increasingly targeting investments in projects aimed at social and environmental transformations, rather than solely technological innovations (Yu et al., 2024). In the context of sustainable development, defined as a strategy aimed at preserving environmental integrity, social justice, and economic growth (Akter et al., 2024; Meramveliotakis & Manioudis, 2024), venture funds can contribute to achieving these goals by investing in projects that combine innovation with environmental and social responsibility. For example, funding startups focused on renewable energy or sustainable technologies can promote not only economic growth, but also address global environmental challenges.

For instance, one of the priority areas for venture funds in Canada is supporting startups focused on environmentally sustainable technologies, thus confirming that venture capital can be an effective tool in achieving sustainable development goals, including the transition to a low-carbon economy. In recent years, there has been growing investor interest in startups developing solutions in the fields of clean energy, sustainable production, and the substitution of fossil resources. A notable example illustrating this trend is the Carbon Cure Technologies project (Nova Scotia). The company has developed a technology for capturing and incorporating carbon dioxide into concrete, which reduces CO₂ emissions in the construction industry. The startup has received support from venture funds, including Breakthrough Energy Ventures and BDC Capital. In 2023, the company raised \$80 million in a funding round led by Blue Earth Capital (CarbonCure, 2023). Currently, CarbonCure is recognized as one of the most promising cleantech companies in North America and is actively implementing its solutions in construction projects worldwide. Another successful case is the Svante project (British Columbia).

The company specializes in developing filtration systems for large-scale CO₂ capture. In 2023, Svante raised over \$300 million in venture investments from funds such as Chevron Technology Ventures, OGC Climate Investments, and Temasek. The company's technology continues to prove its effectiveness, being in demand in the energy and cement industries and contributing to the decarbonization of production (Svante, 2022). These cases successfully illustrate how venture funds can actively influence the process of integrating sustainable approaches into the strategy for venture capital distribution and the formation of foundations for expanding government support for the cleantech sector in less developed regions of the country.

The trend of redistributing investment flows into startups and businesses is based on the principle of "triple bottom line", which includes supporting clean technologies, sustainable entrepreneurship, technological innovations, green solutions, and initiatives aimed at achieving sustainable development (Dhayal et al., 2023). Such investments not only contribute to economic growth, but also help address global environmental and social challenges, laying the foundation for a more equitable and sustainable future. Our study also emphasizes the need for the decentralization of venture capital to ensure the balanced development of Canada's innovation ecosystem. This conclusion aligns with research that substantiates the key role of regional innovation systems (RIS) in stimulating local-level innovation (Zhang et al., 2024). However, unlike European countries, where RIS often focuses on multifactorial approaches involving scientific research, policy, and the business environment, the Canadian venture capital model remains predominantly concentrated in major provinces and requires adaptation of innovation stimulation strategies and innovation ecosystem development, taking into account the successful experiences of other countries. In conclusion, it should be noted that our research not only confirms the importance of venture capital for innovation development, but also identifies the unique characteristics of the Canadian context.

In summary, it should be noted that the weak correlation established between the level of patent activity and the volume of venture capital investment in Canada may be attributed to several factors. First, the attractiveness of a project to investors is influenced by the startup's life cycle. In early stages, startups often rely on patents as key assets; however, at more mature stages, venture funds may prioritize projects with demonstrated commercial viability rather than those based solely on patent protection. This observation helps explain why regions with high patent activity, such as Alberta, do not necessarily attract a proportionally high volume of venture capital investment.

Second, the sectoral structure of Canada's economy plays a significant role. Provinces specializing in industries with long commercialization cycles, such as biotechnology and agritech, may exhibit high levels of patent activity but attract fewer venture investments, which are often directed toward sectors offering quicker returns, such as fintech and SaaS. This dynamic is supported by data from the BDC report, which notes that in 2023, venture capital investments in Canada were concentrated in fast-growing sectors such as artificial intelligence and clean technologies (BDC, 2024). Similarly, the CVCA report for 2024 also indicates that information and communication technologies and clean technologies attracted the

largest volumes of venture capital investment, while biotechnology and agritech received comparatively less investor attention (CVCA, 2024).

Third, the attraction of venture capital to certain regions may be constrained by institutional barriers. For example, rural and remote areas of Canada regularly face limited access to innovation infrastructure and support programs, complicating the commercialization of patents and the attraction of investments (OECD, 2024).

Thus, to more effectively stimulate innovation and attract venture capital, it is necessary to account for the characteristics of startup life cycles, the sectoral specialization of regions, and the prevailing institutional conditions, thereby developing tailored strategies to support innovation activities.

Conclusions

The study's results enabled an assessment of the role of venture capital in Canada's innovation ecosystem, revealing significant regional disparities in its distribution. The concentration of venture capital (95%) in Ontario, Quebec, British Columbia, and Alberta leads to economic inequality and limited access to funding and infrastructure in less developed provinces.

A key finding of the study was the understanding that provinces with limited venture capital, such as Manitoba, Prince Edward Island, and Saskatchewan, exhibit high startup survival rates, implement innovative projects, and demonstrate stable patent approval rates, indicating their untapped potential that remains underutilized within the current capital distribution system. At the same time, large provinces, despite their dominant position in the investment ecosystem, do not always use their resources to the fullest. For example, the high patent activity in Alberta is not accompanied by a corresponding volume of investments, which limits the commercialization opportunities for innovations.

The data analysis also revealed that venture capital, in its current form, was insufficiently focused on the long-term development of startups and innovations. Investors preferred late-stage projects, leaving early-stage startups without the necessary support. Furthermore, the emphasis on quick profits has undermined business resilience, creating conditions in which many companies fail to reach maturity. This strategy hinders the full potential of new technologies and restricts opportunities for sustainable economic growth, diminishing Canada's competitiveness in the global market.

The study's findings highlighted the need for the decentralization of venture capital as a key mechanism to address the identified disparities. The redistribution of financial flows and a focus on supporting less developed provinces will help create new growth points, attract investments to regions with high innovation potential, and reduce economic inequality.

A crucial role in achieving these goals could be played by public–private partnerships, the integration of startup support programs, and projects involving CVCA. Such initiatives will provide platforms to promote startups from underdeveloped regions, foster interactions between investors and local companies, and offer analytics for corrective actions regarding existing financing strategies.

Thus, the development of Canada's venture ecosystem, aimed at capital decentralization, the support of innovation infrastructure, and enhanced collaboration between public and private initiatives, will enable the country to successfully develop its innovation potential, ensuring its sustainable development and competitiveness in the global economy.

The academic significance of this study lies in its pioneering analysis of venture capital at such a detailed regional level within Canada. This contributes a new layer to the existing literature on venture investments and their impact on innovation, as it examines the country as a whole and uncovers regional disparities.

For example, high patent activity in Alberta, not supported by an appropriate volume of investment, clearly limits the possibilities of commercializing innovations. Additionally, the analysis of the data collected during the study reveals that the venture capital management system lacks a focus on the long-term development of startups and innovations. Investors prefer projects in the late stages of development, leaving new startups without the necessary support. Focusing on a short payback period and quick profit deprives startups of the prospects for sustainable and consistent development and creates conditions in which many companies never reach the stage of maturity. Such decisions prevent the full disclosure of the potential of new technologies and limit the ability of innovative projects to ensure sustainable economic growth of the economic system, reducing the level of competitiveness of Canada in the global market.

The findings highlight the importance of decentralizing venture capital as a means of addressing regional disparities. The redistribution of financial flows and support for less developed provinces will create new growth opportunities, attract investments, and reduce economic inequality. Public–private partnerships, the integration of startup support programs, and projects involving the CVCA could play a crucial role in achieving these objectives. Initiatives aimed at creating platforms to promote startups from underdeveloped regions will enhance the effectiveness of interactions between investors and local companies and provide analytics for adjusting existing funding strategies. Thus, measures aimed at decentralizing capital, supporting innovation infrastructure, and strengthening the interaction between public and private initiatives will enable the successful development of innovation potential, ensure sustainable development, and increase Canada's competitiveness in the global economy.

The practical value of the research is demonstrated by its findings, which may be useful to both entrepreneurs planning to establish businesses in Canada and investors seeking promising regions for investment. For government bodies, the study is also of value, as it highlights the need to support innovation in smaller provinces. The study's limitations include its time frame (the analysis was based on data from a 2-year period) and its focus on venture capital, which necessitates further research to confirm the conclusions over a longer time frame. Future research should consider the impact of other factors, such as global economic trends and government policies, on the regional dynamics of venture investments in Canada.

Abbreviations

BDC	Business Development Bank of Canada
CIPPO	Canadian Intellectual Property Office
CAPEX	CAPital EXpenditure

CDL	Creative Destruction Lab
CVCA	Canadian Venture Capital Association
ESG	Environmental, social, and governance
ISC	Innovation Solutions Program
RIS	Regional innovation systems
R&D	Research and development
SR&ED	Scientific Research and Experimental Development
VCAP	Venture Capital Action Plan

Acknowledgements

Not applicable.

Author contributions

MR solely contributed to the experimentation, designed and conducted the experiment, studied scientific literature about the topic, wrote and edited the article, read and approved the final manuscript.

Funding

Funding source Canadian Foundation for Innovation and Research.

Data availability

All data generated or analyzed during this study are included in this published article.

Declarations

Competing interests

The research has no competing interests.

Received: 9 January 2025 Accepted: 27 May 2025

Published online: 07 August 2025

References

- Akter, M. M. K., Haq, U. N., & Uddin, M. A. (2024). Sustainable development and circular economy. In S. A. Bandh & F. A. Malla (Eds.), *Waste management in the circular economy* (pp. 133–152). Springer International Publishing. https://doi.org/10.1007/978-3-031-42426-7_7
- Aldatmaz, S., & Celikyurt, U. (2023). The effect of venture capital backing on innovation in newly public firms. *Journal of Empirical Finance*, 74, 101436. <https://doi.org/10.1016/j.jempfin.2023.101436>
- Alsuwaidi, H. (2016). Venture Capital Research Paper. American University in Dubai. Retrieved December 12, 2024, from https://www.researchgate.net/publication/318673054_Venture_Capital_Research_Paper
- Amore, M. D., Conti, A., & Pelucco, V. (2023). Micro venture capital. *Strategic Entrepreneurship Journal*, 17(4), 886–924. <https://doi.org/10.1002/sej.1478>
- Bai, C., & Zheng, J. (2024). Moderating effect of business environment on the relationship between fiscal science and technology expenditure and venture capital. *International Review of Financial Analysis*, 96, 103655. <https://doi.org/10.1016/j.irfa.2024.103655>
- BDC (2024). Canada's Venture Capital Landscape 2024. Retrieved December 12, 2024, from https://www.bdc.ca/en/about/analysis-research/canada-venture-capital-landscape?utm_source=chatgpt.com
- Beraja, M., Peng, W., Yang, D. Y., & Yuchtman, N. (2024). Government as venture capitalists in AI (No. w32701). National Bureau of Economic Research. <https://doi.org/10.3386/w32701>
- Bocken, N. M. (2015). Sustainable venture capital—catalyst for sustainable start-up success? *Journal of Cleaner Production*, 108, 647–658. <https://doi.org/10.1016/j.jclepro.2015.05.079>
- CarbonCure (2023). CarbonCure Secures \$80M USD in New Equity Round Led by Blue Earth Capital
- European Commission (2025). Interregional Innovation Investments (I3) Instrument. Retrieved December 12, 2024, from https://eisma.ec.europa.eu/programmes/interregional-innovation-investments-i3-instrument_en
- Cui, J., Zhang, S., Yin, X., & Xu, K. (2021). Determinants of investment timing of government venture capital guiding funds in China. *Discrete Dynamics in Nature and Society*, 2021(1), 7140807. <https://doi.org/10.1155/2021/7140807>
- CVCA (2023). Year-End 2023. VC & PE Canadian Market Overview. Retrieved December 12, 2024, from <https://www.cvca.ca/insights/market-reports/year-end-2023/>
- CVCA (2024). 2024 Canadian Venture Capital and Private Equity Market Overviews. Retrieved December 12, 2024, from <https://www.cvca.ca/insights/market-reports/q4-2024/>
- Dealroom (2024). The State of Global VC. Retrieved December 12, 2024, from <https://dealroom.co/guides/global>
- Dessi, R., & Yin, N. (2012). The impact of venture capital on innovation. In D. Cumming (Ed.), *The Oxford Handbook of Venture Capital*, Oxford Handbooks (Chapter 22). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780195391596.013.0023>
- Dhayal, K. S., Giri, A. K., Esposito, L., & Agrawal, S. (2023). Mapping the significance of green venture capital for sustainable development: A systematic review and future research agenda. *Journal of Cleaner Production*, 396, 136489. <https://doi.org/10.1016/j.jclepro.2023.136489>
- Fu, H., Qi, H., & An, Y. (2024). When do venture capital and startups team up? Matching Matters. *Pacific-Basin Finance Journal*, 85, 102361. <https://doi.org/10.1016/j.pacfin.2024.102361>
- Ge, G., Xue, J., & Zhang, Q. (2025). Syndicate partner composition of governmental venture capital firms: Evidence from China. *Pacific-Basin Finance Journal*, 90, 102689. <https://doi.org/10.1016/j.pacfin.2025.102689>

- Government of Canada (2023a). Insolvency Statistics in Canada — 2022 (Table 1). Retrieved December 12, 2024, from <https://ised-isde.canada.ca/site/office-superintendent-bankruptcy/en/statistics-and-research/insolvency-statistics-canada-2022-table-1>
- Government of Canada (2023b). Patent statistics: 2021 to 2022. Retrieved December 12, 2024, from <https://ised-isde.canada.ca/site/canadian-intellectual-property-office/en/canadian-intellectual-property-statistics/patent-statistics-2021-2022>
- Government of Canada (2024a). Current Investments. Retrieved December 12, 2024, from <https://natural-resources.canada.ca/science-and-data/funding-partnerships/opportunities/current-investments/21146>
- Government of Canada (2024b). Insolvency Statistics—December 2023. Retrieved December 12, 2024, from <https://ised-isde.canada.ca/site/office-superintendent-bankruptcy/en/statistics-and-research/insolvency-statistics-december-2023>
- Government of Canada (2024c). Key Small Business Statistics 2023. Retrieved December 12, 2024, from <https://ised-isde.canada.ca/site/sme-research-statistics/en/key-small-business-statistics/key-small-business-statistics-2023>
- Government of Canada (2024d). Patent statistics: 2022 to 2023. Retrieved December 12, 2024, from <https://ised-isde.canada.ca/site/canadian-intellectual-property-office/en/canadian-intellectual-property-statistics/patent-statistics-2022-2023>
- Gucciardi, G. (2024). Do venture capital investments contribute to the achievement of the sustainable development goals? *Business Strategy and the Environment*, 33(8), 8716–8746. <https://doi.org/10.1002/bse.3942>
- Hill, L. A., Cam, A. L. Menon, S., & Tedards, E. (2022). Leading in the digital era. Retrieved December 12, 2024, from https://hbswk.hbs.edu/Shared%20Documents/pdf/HBSWK_EE-Research-Collection_Digital-Leadership.pdf
- Lee, K., Oh, F. D., Shin, D., & Yoon, H. (2023). Does venture capital investment enhance corporate innovation? Evidence from Korea. *Journal of Business Finance & Accounting*, 50(1–2), 236–266. <https://doi.org/10.1111/jbfa.12618>
- Lee, O., Park, J., Chang, M., & Cho, H. (2024). Venture Capital 2024. South Korea. Chambers and Partners. Retrieved December 12, 2024, from <https://practiceguides.chambers.com/practice-guides/venture-capital-2024/south-korea>
- Leonard, D. (2024). Unpacking the last decade of Canadian venture capital fundraising. RBCX. Retrieved December 12, 2024, from <https://www.rbcx.com/ideas/startup-insights/canadian-venture-capital/>
- Lerner, J., & Nanda, R. (2023). Venture capital and innovation. *Handbook of the economics of corporate finance* (Vol. 1, pp. 77–105). Elsevier. <https://doi.org/10.1016/bs.hecf.2023.02.002>
- Li, J. J., Fung, H. G., & An, S. (2024). Government venture capital funds: Balancing the impact of social and financial goals on startups. *China Economic Review*, 85, 102185. <https://doi.org/10.1016/j.chieco.2024.102185>
- Li, Y., Chi, T., Lan, S., & Wang, Q. (2025). Venture capital exit after venture IPO. *Strategic Entrepreneurship Journal*, 19(1), 111–144. <https://doi.org/10.1002/sej.1515>
- McNabb, N. K., Christensen, E. W., Rula, E. Y., Coombs, L., Dreyer, K., Wald, C., & Trembl, C. (2024). Projected growth in FDA-approved artificial intelligence products given venture capital funding. *Journal of the American College of Radiology*, 21(4), 617–623. <https://doi.org/10.1016/j.jacr.2023.08.030>
- Meramveliotakis, G., & Manioudis, M. (2021). History, knowledge, and sustainable economic development: The contribution of John Stuart Mill's grand stage theory. *Sustainability*, 13(3), 1468. <https://doi.org/10.3390/su13031468>
- Meramveliotakis, G., & Manioudis, M. (2024). *Sustainable economic development: Perspectives from political economy and economics pluralism*. Taylor & Francis. <https://doi.org/10.4324/9781003349402>
- National Venture Capital Association (2024). Venture Monitor. Pitchbook. Retrieved December 12, 2024, from <https://pitchbook.com/news/reports/q3-2024-pitchbook-nvca-venture-monitor>
- NBER (2022). Why larger firms produce higher value inventions. Retrieved December 12, 2024, from <https://www.nber.org/digest/2022/1/why-larger-firms-produce-higher-value-inventions>
- OECD (2024). Enhancing rural innovation in Canada. Report. Retrieved December 12, 2024, from https://www.oecd.org/en/publications/2024/03/enhancing-rural-innovation-in-canada_f68182c2.html?utm_source=chatgpt.com
- Poelhekke, S., & Wache, B. (2023). The impact of venture capital on economic growth. Tinbergen Institute Discussion Papers. Tinbergen Institute. Retrieved December 12, 2024, from <https://www.econstor.eu/handle/10419/282863>
- Shuwaikh, F., Tanguy, A., Dubocage, E., & Alolah, O. (2025). Insights for sustainable business practices: Comparative impact of independent and corporate venture capital funding on financial and environmental performance. *Research in International Business and Finance*, 73, 102632. <https://doi.org/10.1016/j.ribaf.2024.102632>
- Silvestrov, S., Starovoitov, V., Firsov, D., & Krupnov, Y. (2022). Control of platform monopolization in the digital economy: The implication of open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(2), 66. <https://doi.org/10.3390/joitmc8020066>
- Statista (2024). Venture Capital – Worldwide. Retrieved December 12, 2024, from <https://www.statista.com/outlook/fmo/capital-raising/traditional-capital-raising/venture-capital/worldwide#capital-raised>
- Sun, S. L., Santos, R. S., & Qin, L. (2024). Divergent trajectories on frontier innovations: A comparison of international venture capital-invested ventures between China and the United States. *Technovation*, 137, 103094. <https://doi.org/10.1016/j.technovation.2024.103094>
- Svante (2022). Svante raises us\$318 million in series e round, led by chevron new energies. Retrieved December 12, 2024, from <https://www.svanteinc.com/press-releases/chevron-invests-in-carbon-capture-and-removal-technology-company-svante/>
- Traversa, A., Loifredo, E., Palazzo, A. J., Bashore, T. L., & Senesi, N. (2014). Enhancement of switchgrass (*Panicum virgatum* L.) early growth as affected by composts. *Journal of Soil Science and Plant Nutrition*, 14(2), 471–482. <https://doi.org/10.4067/S0718-95162014005000037>
- Weik, S., Achleitner, A. K., & Braun, R. (2024). Venture capital and the international relocation of startups. *Research Policy*, 53(7), 105031. <https://doi.org/10.1016/j.respol.2024.105031>
- Xie, C., & Wang, Z. (2025). Impact of venture capital on firm's technological innovation: Empirical study based on the strategy of pre- and post-investment. *Managerial and Decision Economics*, 46(2), 1330–1343. <https://doi.org/10.1002/mde.4436>
- Yon, M. (2024). 53 Startup Statistics for 2024. Growth List. Retrieved December 12, 2024, from <https://growthlist.co/startup-statistics/>
- Yu, P., Dai, H., Zhu, J., Hamori, S., Dong, R. K., & Yue, X. (2024). How does venture capital play a role in corporate green innovation? Evidence from China. *International Review of Economics & Finance*, 96, 103654. <https://doi.org/10.1016/j.iref.2024.103654>

- Zeng, B. (2023). Venture capital research—Investor preferences and success factors for startups. *Open Journal of Business and Management*, 11(6), 2743–2762. <https://doi.org/10.4236/ojbm.2023.116149>
- Zhang, K., Nurbek, A., Ainagul, A., & Zhuldyz, A. (2024). The impact of financial decentralization and investments in green power on the ecology in the European Union: How does the governance of institutions moderate this relationship? *Heliyon*, 10(16), Article e35892. <https://doi.org/10.1016/j.heliyon.2024.e35892>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.