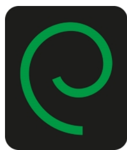

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Government roles in venture capital development: a review of current literature

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Abstract

Purpose – Interest in venture capital markets continues to be of relevance to politicians and policy makers, recognizing the importance of government participation in venture capital market development. Yet advice regarding developing venture capital markets appears increasingly disparate. The paper aims to discuss these issues.

Design/methodology/approach – The authors engage the assumptions that underpin three dominant policy approaches to the development of venture capital markets with regard to the role of governments in that process. The authors categorize existing empirical studies against three approaches and give examples of the different government policies associated with the various approaches.

Findings – Direct and indirect approaches recognize the importance of active stock markets but largely ignore the dynamic processes of markets, asserting that the provision of capital, institutional changes, and financial incentives *ex ante* will cause a positive market reaction, regardless of the market's context. The recent timed approached is purported as being more comprehensive in its awareness of the need to adapt to countries' contexts and the need for varying policies at the different stages of market emergence.

Research limitations/implications – Limited empirical research tests the voracity and limitations of the timed approach. The challenge in doing so is that evolutionary theories typically explain an event after it has occurred, thus its predictive power is often limited. Future research might investigate the efficacy of policy levers based on the timed approach.

Practical implications – The authors highlight the need for the development of venture capital markets, rather than a venture capital industry.

Originality/value – The authors extend the existing venture capital market development categories and evaluate each approach in terms of the efficacy of government's roles in venture capital market development in light of the existing evidence of economic development and entrepreneurial activity.

Keywords Venture capital, Development policy, Financing, Policy

Paper type Literature review

1. Introduction

Interest in venture capital markets continues to be of relevance to policy makers and scholars in the context in entrepreneurship and regional innovation systems (Lindgaard Christensen, 2011; Ribeiro-Soriano and Galindo-Martín, 2012). Venture capital, the "independently managed dedicated pools of capital that focus on equity or equity-linked investments in privately held high growth companies" (Gompers and Lerner, 1999, p. 349) is important in today's economies. Governments are increasingly aware of the impact that venture capital can make to economic growth (Murray, 2007). In particular, the lack of seed-capital or early-stage finance to foster internal growth in private firms (Metrick and Yasuda, 2010) is a concern to countries with embryonic venture capital markets (Avnimelech and Teubal, 2006).

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This paper reviews some of the current literature to identify and describe the dominant public policy approaches to venture capital market development with the aim of identifying gaps and problems in our current understanding of venture capital market development. In doing so we offer a research agenda that can guide future research in the economic development-entrepreneurship nexus. Venture capital markets do not develop in isolation. It is commonly accepted that the transition of venture capital from an intermediary solving finance-specific problems to providing financial and non-financial resources (Gulinello, 2005) is inefficiently facilitated by free-market philosophy (Rosiello *et al.*, 2011). The significant increase in government-initiated and financed venture activity underscores governments' commitment to nascent venture capital markets (Bottazzi and Da Rin, 2002; Bruton *et al.*, 2002; Cumming, 2007; Da Rin *et al.*, 2006; del-Palacio *et al.*, 2012; Gilbert *et al.*, 2006; Lerner, 2010, 2002). Nonetheless, variable rates of organic growth in domestic venture capital markets have prompted various governmental actions to develop immature local venture capital infrastructure (Murray *et al.*, 2012).

We offer three contributions about the role of governments in venture capital market development derived from us "organising previous contributions in a useful way to advance the conversation" (Huff, 2009, p. 24). First, we contribute a review of current knowledge about venture capital development. Two valuable features of our review are: first, the review is built on a market-based definition of venture capital market development that responds to the dominance of supply-side policy prescriptions that seem out of kilter with empirical evidence on the importance of demand-side factors (Da Rin *et al.*, 2006); second, our organizing framework utilizes three existing approaches to venture capital – the direct, indirect, and timed approaches (Avnimelech *et al.*, 2010; Avnimelech and Teubal, 2008; Lerner and Tåg, 2013; Rosiello *et al.*, 2011) to summarize and review governments' role.

Second, we discuss each approach in terms of the efficacy of governments' roles in venture capital market development, finding that the direct and indirect approaches are the most conspicuous with their focus on government involvement in capital markets as manager or investor-manager. Recent studies argue for direct and indirect government policies at different stages of venture capital market development. While the supply of capital is vital in venture capital markets, empirical evidence about economic freedom and entrepreneurial activity supports the agreement that institutional issues in the form of monetary, fiscal, regulatory, and legislative policies are more likely to impact market development, and are best facilitated through the timed approach. Third, we recommend a number of future research opportunities to develop the evolutionary models of venture capital markets, including the need for exploratory (qualitative) and explanatory (quantitative) studies in a wider range of contexts than is currently available.

2. Venture capital, markets, and development: foundations for a literature review

Venture capital investment is generally recognized as a three-stage process: fundraising, investing, and exiting (Gompers and Lerner, 2006; Silveira and Wright, 2010). During investment, venture capitalists select and allocate equity into new "untried firms pursuing complex, innovative technologies or novel business strategies" (Gompers and Lerner, 2001, p. 87). Unlike traditional financial intermediaries, venture capitalists provide organizational, managerial, and industry advice, assisting entrepreneurs to mitigate complications such as uncertainty, knowledge gaps, inexperience, and volatile market

conditions (Arthurs and Busenitz, 2006; Bottazzi *et al.*, 2008; MacMillan *et al.*, 1989; Metrick and Yasuda, 2010). Venture capitalists are able to better manage inherently risky investments because they usually possess specialized industry knowledge and networks of experts who can evaluate people, markets, and technology (Gompers and Lerner, 2001).

Although the role of venture capitalists is clear, an underlying ambiguity exists as to whether government policies address industry or market development. The notion of a market is widely used, but not well defined, in venture capital market development studies (Brooks, 1995). "Industry" and "market" are commonly interchanged throughout the literature; but separately they imply different phenomena (Brooks, 1995). Many studies have implicitly viewed venture capital markets as freestanding entities and have attempted to develop them accordingly, leading some to suggest this as one reason for some governments' failed policies (Avnimelech and Teubal, 2008; Lerner, 2009).

From a more mainstream economics perspective, a market requires both a buyer and seller, or supplier and consumer, to perform transactions of exchange (Samuelson and Nordhaus, 1985). Other scholars classify market as a form of institution at a higher level than the organization (Porter, 1981). In contrast, industries are mainly concerned with the supply-side focussing on firms producing similar goods or services (Brooks, 1995). These definitions suggest that the development of a venture capital industry would create a strong supply of venture capital, but not necessarily demand from players with whom to transact. It is from this market-based definition that we review the main approaches to venture capital market from a market-based perspective where we define venture capital market development as the development of buyers and sellers in the activities of fundraising, investing in, and exiting from high-risk ventures.

Scholars describe a variety of solutions for venture capital market development. Despite a proliferation of works, a consensus on how to grow venture capital markets is yet to emerge (Lerner, 2002). This review provides a general stock take of existing knowledge about venture capital market development to identify existing gaps and problems, and outline some future research directions that might assist scholars toward better explanations of venture capital market development. Recently Lerner and Tåg (2013) categorized various institutions as direct and indirect policies in the context of comparing venture capital markets across countries. In their study direct policies took the form of governments having direct involvement in venture capital markets, where as indirect policies referred to creating the institutional environment through, say, taxation and IP policies. The purpose of their study was to compare how institutional differences affected the venture capital market performance, so the role of governments was not central to their discussion. About the same time Avnimelech and his colleagues described the notion of time approaches to venture capital in the context of conceptualizing evolutionary explanations of venture capital markets. These authors' categorizations of direct, indirect, and timed approaches provide the basis for us to organize and review existing literature that is pertinent to our aim reviewing existing explanations of governments' role in venture capital market development.

Our review process categorizes and summarizes the existing empirical literature into the three approaches: direct intervention, indirect intervention, and timed intervention, then discusses the limitations for each. Since our contribution is a type of stock take of existing knowledge, we provide no new empirical work. Instead, we use the empirical work done by others to inform and illustrate our arguments. The following sections discuss the comprehensiveness of these approaches in addressing governmental roles in developing venture capital markets. Table I provides a summary

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Table I. Summary of government roles across countries

Country examples	Direct approach	Indirect approach	Timed approach	Summary
USA	Small Business Investment Company (SBIC) (1958) created to aid smaller businesses grow through finding capital not available through traditional sources. Program's design less effective than hoped Small Business Innovation Research (SBIR) (1982) awarded monetary grants to support scientific and technological innovation	Changed the institutional environment through allowing the model of limited and general partnership to exist and pension funds to be considered as investments	SBIC provided background conditions for SBIR improvement based on SBIC experience	The US venture capital market illustrates the length of time required to develop a venture capital market
Israel	Inbal (1991) launched a targeted VC Lack of limited partnership practices led to failure Yozma Group (1993) offered limited partnership practices and created a flow-on funds effect. Yozma was successfully privatized in 1997	Office of the Chief Scientist created (1969) to develop institutional setting, including Bi-national Industrial R&D Program' (BIRD-F) to encourage collaboration with US firms	Existence of significant science, technology, and higher education infrastructure provided background conditions. Inbal Program experience provided lessons for establishment of YOZMA	The Israeli venture capital market illustrates how prior experiences can be important for the development and refinement of subsequent initiatives
New Zealand	Development Finance Corporation (1964-1989) made government-managed investments	The Greenstone Fund (1993) and Venture Investment Fund (2002) made government contributions to private co-investors. New Zealand Venture Investment Fund (NZVIF) (2002) launched a "funds-of-funds" approach acting as the investment manager	Introduction of Limited Partnership Act (2008) facilitated venture capital by removing regulatory barriers in the emergence stage Introduced voluntary private contributory saving scheme to increase domestic capital and stimulate investments in less-liquid assets, including VC. Other legislative changes to encourage innovation and investment at the	As a late starter New Zealand's venture capital market requires more time to develop and appears to require government support in developing other capital markets as a critical background conditions

(*continued*)

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Country examples	Direct approach	Indirect approach	Timed approach	Summary
			emergence stage included reduced company tax rates and R&D tax credits	
Germany	Kapitalbeteiligungsgesellschaft (KBG) (1965) Public- and bank-based equity companies started making investments Wagnisfinanzierungsgesellschaft (WFG) (1975) made government investments in traditional financial institutions, but the scheme failure with average returns of −25% Promotion of Technology Orientated Start-Ups (1983) extended subsidies to start-ups and guaranteed a large portion of the private investors' risk Equity Capital for Newly Founded Technology Companies (1989) supported equity financing with decisions made by investment experts. Equity for Young Technology-Based Firms (1995) made similar investments but with fewer shares in the guarantees and increased investments	In the 1980s the German government moved to a Limited Partnership model leading to a few US VC firms setting up in Germany 1987: Government passed the Unternehmensbeteiligungsgesellschaft (UBG) law providing considerable tax advantages for investments in start-ups Neuer Market was founded (1997) as a segment of the German stock exchange to follow new technologies and young companies. Originally a success, it did not survive a sharp decline in stock prices and reduced IPOs closing in 2003	Business Angels Netzwerk Deutschland (BAND) (1998) launched by government with business sponsors set up develop the informal venture capital market	The German government's commitment toward venture capital market illustrates a long commitment toward direct and indirect approaches policy. In particular, it is characterized by extensive use of guarantees, participation of banks, and an emphasis on supporting young innovative firms, contributing toward an active stock market since the 1990s

(*continued*)

Table I.

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Table I.

Country examples	Direct approach	Indirect approach	Timed approach	Summary
Scotland	Scottish Development Agency (SDA) (1975) made available capital for riskier ventures through large investments	From 1982 SDA focussed on facilitating access to finance from commercial sources A review of SDA in 1989 concluded that due to the poor financial performance by limited partnership funds SDA should not be retained by the government European Investment Fund (EIF) (1994) launched public/private equity fund with SDA as 50:50 under the publically managed Scottish Equity Partnership (SEP) Scottish Technology Fund (STF) (1977) was launched based on SEP principles	Scottish Enterprise (1991) focussed on providing grants at seed level and co-investment schemes. Currently under the Executive and Scottish Enterprise (SCEn), the Scottish Co-Investment Fund and the Seed Fund aim at helping small companies obtain capital from banks and private investors, and capability development in the local innovation system. For example, SCORE and Seekit offered support for research jointly undertaken by public bodies and private companies, and Scottish Development International helped gain access to people, technologies and potential business partners	In contrast with other countries the Scottish venture capital market remains underdeveloped. The government's role has been favorable in supporting pre-emergence conditions. The previous program of SDA would be considered one of the background conditions of the market development

of the studies. We provide illustrations of those approaches from a range of countries reported in the existing literature. Table II provides a summary of various roles governments that are relevant to venture capital market development. We provide suggestions for future research directions based on the gaps and problems discussed in the final section.

3. The direct approach

The direct approach focusses on governments' involvement in the supply of capital (Avnimelech *et al.*, 2010; Gompers and Lerner, 1999). Policy makers addressing "equity gaps" to develop venture capital markets typifies this approach. Such gaps suggest a supply-side market failure and provide an argument for the of use fiscal policies to the increase the supply of capital. Although equity gaps arise from a lack of initial financing or future funds required by ventures (Sohl, 1999), they may actually be an efficient market at work. Thus, policy makers must decide whether financing gaps is due to adverse outcomes of inefficient market, or rational and well-informed judgments of efficient markets about unattractive investments (Murray, 2007). The direct approach takes two forms, which we review next.

3.1 Government venture capital funds (GVCs)

Governments may create venture capital funds (GVCs) that they entirely finance and manage using government officials to compensate for lack of venture capitalists. The three-stage market cycle (fundraise, invest, exit) still applies although fundraising is simplified as an investor – the government – is assured (Cumming, 2006; Lerner, 2009). Most research on GVCs tacitly assumes some form of venture capital market exists; it is rare for studies to tackle the issue of no capital market.

The major concerns with GVC arise from a perceived lack of understanding of venture capital markets by governmental officials and the distortions they may create (Lerner, 2002). GVCs typically employ government officials acting as venture capitalists, the assumption being they can efficiently manage and select ventures (Bottazzi *et al.*, 2004; Cumming, 2007; Gilson, 2003; Lerner, 2010). The constant uncertainty around investments requires venture capitalists' active involvement to manage firms, and change their direction when appropriate (Bruton *et al.*, 2002; Lerner, 2009). GVCs may not regard such changes as fundamental to the venture capital process and instead seek to realign the investment with its initial, and now unsuitable, direction (Lerner, 1995; Murray *et al.*, 2012). For example, the American SBIC program initially failed as managers were ill-qualified to select viable start-ups, manage, and add value to them (Lerner, 2009, 1995). Many SBIC-funded firms would not have passed the selection criteria of a private venture capital fund, with BIC-funded firms producing well below average returns (Gilson, 2003; Lerner, 1995). In fact, there are few examples of the direct approach producing superior returns, and "the practice of government […] employees attempting to 'pick winners' at a firm level has been largely discredited" (Avnimelech and Teubal, 2006, p. 1842).

In the second stage of the cycle, venture capitalists actively participate in the venture, usually contributing to its success. This involvement tends to make venture capital a superior form of financing. However, government officials may not have the knowledge or motivation to guide start-ups (del-Palacio *et al.*, 2012). There is evidence that governments' attempts to manage GVCs can introduce inefficiencies (Gilson, 2003; Lerner, 2009; Murray, 2007). The German Deutsche Wagnisfinanzierungsgesellschaft (WFG) experience illustrates this. In 1975 the German government invested 10 million

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Table II. Summary of empirical literature by direct, indirect and timed approach

Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
DIRECT APPROACH				
Achleitner *et al.* (2011)	Macro, industry, and firm conditions effects on VC investment	32 countries	Investment data and taxes from 2000 to 2010. Statistical association	High capital gains tax rates are associated with fewer, but on average more successful companies
Becker and Hellmann (2003)	Contracting and governance structures to reduce agency costs for wealth maximization	Germany	Single case of first German VC firm (Deutsche Wagnisfinanzierungsgesellschaft), interviews, documents from VC firms including annual reports from the case firm	Governance structures and availability of high-quality entrepreneurs effect venture investment strategies; an active stock market is necessary but not sufficient
Black and Gilson (1999)	Economics of scope explaining differences between stock market-centered and bank-centered capital markets	USA, Germany, Israel, Japan, Great Britain and Ireland, Canada	Comparable cases of countries with market-centered and bank-centered capital markets	The best strategy overcome "path-dependent" barriers to venture capital markets in bank-centered systems is to piggyback on the institutional infrastructure of stock market-centered systems, rather than governments creating new institutions
Bottazzi *et al.* (2004)	Human determinants of VC firm style	The 15 EU countries, and Switzerland and Norway	Slice in time Survey of European Venture Capital (SEVeCa). 1750 firms during the 1998-2001 period; 15% response rate; descriptive statistics and cross-tabulations	Government-backed VCs are comparably less experienced and make a narrower range of types of investments compared to independent VCs. They caution drawing conclusion from this without more advanced statistically analyses
Brander *et al.* (2010)	Information asymmetry	Canada	Canadian Venture Capital and Private Equity Association (CVCA) reports, Global Entrepreneurship Monitor data (GEM), Organization for Economic Cooperation and Development data(OECD); descriptive statistics and regressions	Privately backed VCs consistently outperform government-backed VC effects on value creation, competition, and innovation

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Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
Bruton *et al.* (2002)	Institutional theory; cultural institutions effects on VC operations	Singapore	Replication logic methodology during 16 in-depth interviews with venture capitalists and senior government officials	Normative intuitions shapes country-specific VC practices
Cumming (2006)	Economies of scale and risking taking in VC portfolios and its determinants	Canada	VC financing transactions from Macdonald & Associates, Ltd. For Canadian Venture Capital Association (CVCA) during 1991-2000; Hypothesis testing with regression models	Government-backed funds have larger portfolios but the trade-off is they give less assistance to the firms they invest in
Cumming (2007)	Innovation and growth performance of government-backed VC firms and its alternatives	Canada	Description of investment alternatives	Policy makers have a variety of ways to promote entrepreneurship and growth that perform better than labor-sponsored venture capital corporations
Cumming and MacIntosh (2006)	Agency costs and venture capital	Canada	1997-2001 data period; econometric estimates of aggregate demand and supply equations for Canadian VC	Labor-sponsored venture capital corporation crowd out private venture capital reducing the overall pool of VC capital
Da Rin *et al.* (2006)	Public policy effectiveness	14 European countries	Panel of data between 1988 and 2001	No evidence of increased public VC spending on innovation; stock markets targeted at entrepreneurial companies, reductions in the corporate capital gains tax rate, and reduction in labor regulation positively affect high-tech investment
Del-Palacio *et al.* (2012)	Public policy effectiveness	Spain	755 investments made by 83 Spanish public and private VCs 1997 and 2008. Panel data before and after public investment	Government investment, investor previous experience and fund size contribute toward more high-risk investments
Jääskeläinen *et al.* (2007)	Information asymmetry	None specified	Simulation	Governments' profit structures and compensation systems only partially resolve market failure

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Table II.

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Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
Leleux and Surlemont (2003)	Regional development and investment capacity	15 European countries	European Venture Capital Association (EVCA) data from 1990 to 1996 period; regressions and panel data to test hypotheses	European public venture capital programs have led to an increase in venture capital funding in Europe, causing greater amounts of money to be invested in the industry as a whole, demonstrating the social merit of venture capital, and signaling an ongoing commitment to VC markets
INDIRECT APPROACH				
Armour and Cumming (2006)	Economic and legal determinants of venture capital investment	15 countries	Cross-sectional and time series (14 years) analysis	Liberal bankruptcy laws stimulate entrepreneurial demand for venture capital; government programmes more often hinder than help the development of private equity, the legal environment matters as much as the strength of stock markets
Bjørnskov and Foss (2008)	Economic policy and institutional design effects	29 countries	Data from the Economic Freedom Index and Global Entrepreneurship Monitor; regressions for cross-country analysis	Size of government is negatively correlated and sound monetary policy is positively correlated with entrepreneurial activity, focussing government effort
Bonini and Alkan (2012)	Political and legal determinants of cross-country differences in VC investments	16 countries	1995 to 2002 time period. Data from World Bank World Development Indicators, International Federation of Stock Exchanges, and OECD business expenditures; hypotheses with econometric testing	Controlling for legal system effects, political determinants explain variation in VC across countries with government having a role in activating it
Bottazzi *et al.* (2009)	Effects of legal systems on financial intermediation; moral hazard	17 countries	124 responses to survey sent to 750 VC firms, additional date from commercial database VenturExpert, and European Venture Capital Association (EVCA); fixed-effect regressions	Weak legal protection by government leads investors to give more non-contractible support and demand more downside protection

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Table II.

Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
Dossani and Kenney (2002)	Institutional theory and economic development	India	Single case "thick" description	The Indian government remains bureaucratic and highly regulated. To encourage the growth of venture capital will require further action […] the government will continue and even accelerate its efforts to encourage venture capital […] address tax, regulatory/legal and currency exchange policies, since many of these affect both venture capital firms and the companies that they finance
Gohmann *et al.* (2008)	Institutional theory and entrepreneurial activity	USA	Data from Economic Freedom of North America Index; negative binomial models	Industry responses vary toward government policies aimed at economic freedom, suggesting policy makers consider the spill over effects of policies aimed at certain sectors
Gilson (2003)	Engineering markets	USA, Germany, Israel, Chile	Illustrative cases; "thick" descriptions	Capital, specialized financial intermediaries, and Entrepreneurs are central inputs for engineering venture capital but each requires the other to emerge
Hall *et al.* (2013)	Political institutions, economic freedom and economic activity	USA (State level)	Data from Economic Freedom Index and Kauffman Index of Entrepreneurial Activity; correlations and regressions	Policies related to government spending and taxation influence the allocation of entrepreneurial talent more than policies related to regulation
Harding (2002)	Information asymmetries	USA, Germany, Singapore, France, Ireland, the Netherlands, the UK	Comparable case studies including policy analysis	Policy has been most effective in countries which have approached the development of a venture capital market through demand rather than supply-side measures

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Table II.

Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
Jeng and Wells (2000)	Determinants of initial public offerings	15 countries	Investment data collected from *The European Venture Capital Journal*, *Asian Venture Capital Journal*, The GIZA Group for Israel figures, Macdonald's and Associates for Canada figures and Venture Economics for the 1986-1995 period, regressions using panel data qualitative analysis of government programmes in Germany and Israel	Government policies can have a strong impact in setting the regulatory stage, catalyzing private sector seed funding, and galvanizing investment during downturns
Kreft and Sobel (2005)	Entrepreneurship and economic growth	USA (State level)	Published venture capital profiles and patent data; state-level panel causality tests on VC investments and entrepreneurial activity	An environment of low taxes, low regulations, and secure private property rights is necessary to encourage entrepreneurial activity
McMullen *et al.* (2008)	Institutional theory and entrepreneurial action	37 countries	Data from Heritage Foundation/*Wall Street Journal*, Index of Economic Freedom, and Global Entrepreneurship Monitor; regressions	Government restrictions of economic freedom appear to impact entrepreneurial activity differently depending on the particular freedom restricted by government and the entrepreneur's motive for engaging in entrepreneurial action
Misra *et al.* (2014)	Macro-institutional and macro-non-institutional factors effecting new venture creation	15 countries	Data from World Bank Indicators, 2003 to 2006 period; econometric model with jengpanel data	Venture start-up time is related to lending interest rates, start-up procedures, and taxation as well as GDP per capita, therefore new venture friendly institutional mechanisms that facilitate business formation through diminishing the number of days required to start up a new business encourage new venture start-up
Murray *et al.* (2012)	Compensation and profit distribution structures effecting VC investment	USA, UK, Australia, China, Poland	Descriptive cases	Public investment in VC might be lost if entrepreneurial and innovation ecosystems are not developed at the same time

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Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
Nyström (2008)	Institutional settings, economic freedom and entrepreneurial activity	22 OECD countries	1972-2002 period; OECD self-employment data harmonized by COMPENDIA, panel data with econometric testing	Smaller government sector, better legal structure, and security of property rights correlate with increased entrepreneurship
Hall and Sobel (2008)	Institutions, uncertainty reduction and economic growth	USA	Data from Economic Freedom of North America Index and Kauffman Index of Entrepreneurial Activity; hypothesis testing	Governments should focus on improving economic freedom, rather than increasing the quantity of economic inputs, to drive economic growth
Snieska and Venckuviene (2012)	Regional development	Lithuania	OECD data; descriptive statistics	Public investment in VC needs to be supported with development of entrepreneurial ecosystem at the same time
Lerner *et al.* (2005)	Regional development	New Zealand	Single-country case; interviews; descriptive statistics with publicly available data	Policy makers can create an environment conducive for VC markets by addressing problematic tax policies, regulatory hurdles, and barriers to entrepreneurship and the commercialization of academic technology
Lerner and Schoar (2005)	Legal institutions and the effects on the economics of private equity	9 countries frequently represented in the sample of 210 investments	210 private equity investments, regressions	Legal enforcement effects private equity channel use, higher valuations and returns are associated with high enforcement
Lerner and Tåg (2013)	Institutions and VC	USA, Sweden	Illustrative comparative cases	Legal environment, financial market development, the tax system, labor market regulations, and public spending on research and development correlate with venture capital activities across countries

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Author/s	Theory/ies	Location	Research design Data and analytical techniques	Key contributions toward understanding governments' roles in venture capital
TIMED				
Avnimelech *et al.* (2010)	Dynamic view of VC policy	Israel, UK, Scotland, Germany	Case studies; processual analysis of policy implementation	Evolutionary VC policies rely a strategic objective and a long-term commitment to enhancing VC market and high-tech cluster emergence and development, a phased-policy portfolio including both direct and indirect VC-policy components, and a dynamic policy process, which is adaptive to the specific context
Avnimelech and Teubal (2004)	Systems of innovation and VC	Israel	Single case "thick description" including policy analysis	Specific technology policies targeted at VC market development can be effective only to the extent that favorable background conditions exist or are created
Avnimelech and Teubal (2006)	Industry life cycle and VC	Israel	Grounded theory from "thick" descriptions	Provided that appropriate background conditions prevail, VC can be central vector in the transformation of existing high-tech clusters
Avnimelech and Teubal (2008)	Evolutionary targeting	Israel	Single case "thick description" including policy analysis	Targeted policy design and timing of implementation should be market-led processes
Papaioannou and Rosiello (2012)	Evolutionary targeting	England and Scotland	Comparative case studies of biotechnology clusters in England and Scotland; 64 interviews	Resources gaps vary across clusters even at similar stages of development requiring responsive policy support
Rosiello *et al.* (2011)	Evolutionary theory and VC	Israel, Scotland, and UK	Comparative case studies	VC policy may differ from case to case and may change from phase to phase within a particular country

Table II.

DM and 40 million DM from 29 German banks (Becker and Hellmann, 2003; Gilson, 2003) that was managed by government officials who acted as venture capitalists (Lerner, 2009). The WFG generally approached investments passively, made insignificant investments, and gave no managerial, technological or strategic guidance to its investments (Murray *et al.*, 2012). Over the life of the WFG, there were cumulative losses of over 38.4 million DM (annual loss of −25 percent). This loss accrued to the state due to the downside risk guarantee initially offered to the banks by the government (Brander *et al.*, 2010).

In the case of private venture capital managers, the process of fundraising incentivizes them to produce superior returns from previous ventures. However, GVCs may render private venture capital uncompetitive (Cumming, 2006). Effectively subsidized, GVCs "crowd out" private venture capital (Cumming, 2007; Cumming and MacIntosh, 2006; Murray *et al.*, 2012). This occurs when private venture capital firms and GVCs compete to invest in the same start-ups (Leleux and Surlemont, 2003), resulting in investors funding less-private venture capital, and decreasing overall venture capital activity (Armour and Cumming, 2006). This situation occurred in the young Canadian venture capital market (Brander *et al.*, 2010; Cumming and MacIntosh, 2006).

3.2 Government-sponsored venture capital funds (GSVFs)

GSVFs are hybrid funds. Unlike GVCs, GSVFs allocate the venture capitalist roles to private venture capitalists, thus removing government officials' role in the management and selection of venture, and creating some internal characteristics similar to private venture capital firms (Brander *et al.*, 2010; Cumming, 2006; Gilson, 2003).

GSVFs are typically financed through public-private matched funds. To overcome the capability gap (Lerner, 2010), governments act as "special" limited partners in funds run by private venture capital funds (Murray *et al.*, 2012). These funds follow the established form of venture capital funds with the general partner holding operational autonomy (Lerner, 2009). Contractual controls over start-ups (Gilson, 2003) maintain suitable incentives to ensure non-viable ventures are rejected (Murray, 2007; Snieska and Venckuviene, 2012). The result is that GSVFs often provide superior returns and larger than expected valuations (Brander *et al.*, 2010; Lerner, 2009; Murray *et al.*, 2012).

GSVFs tacitly assume an early development stage of a market. Nevertheless – and unlike GVCs – GSVFs imply private involvement in some capacity as their aim is to develop markets (Avnimelech and Teubal, 2004). At such a stage, a lone venture capital player may not achieve the necessary scale to run an efficient venture capital market, and development of the capital market seems to require this complementary interaction between private and public parties (Lerner, 2009, 2002). Yet, the assumption that private venture capitalists desire to work with governments may be idealistic (del-Palacio *et al.*, 2012; Lerner, 2002; Murray, 2007; Murray *et al.*, 2012).

Recognizing of the importance of highly skilled and properly incentivized investment managers, GSVFs have become the main method of government involvement (Gilson, 2003; Murray, 2007). In the case of Taiwan, government policy was aimed at financially complementing and supporting, rather than replacing, the efforts of the private firms (Lerner, 2009). New Zealand adopted a similar approach, the New Zealand Venture Investment Fund Limited (NZVIF), where the government invested in "funds-of-funds." "Funds-of-funds" models provide quasi-governmental screening and selection of privately managed venture capital firms (Black and Gilson, 1999) as limited partners (Lerner, 2010). This gives fund managers responsibility for selecting and managing investments, with NZVIF having identical voting rights to private investors (Lerner *et al.*, 2005).

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The distancing of government from the capital allocation processes that occurs with GSVFs reduces market distortion (Brander *et al.*, 2010; Cumming, 2006; Gilson, 2003; Murray *et al.*, 2012; Snieska and Venckuviene, 2012). Israel's government-sponsored GSVF stands out as an exemplar. Launched in 1993, Yozma Venture Capital Ltd, a $100 million entirely government-backed fund, invested in private venture capital funds (Lerner, 2009). The "upside" of the investment was supported with an option to buy the fund from the government at the original price plus a standard interest rate, demonstrating the importance of aligning incentives (Achleitner *et al.*, 2011; Avnimelech and Teubal, 2008, 2004; Lerner, 2009; Rosiello *et al.*, 2011).

The varying success of countries' GSVFs can be explained by their differing incentive structures; when incorrect they provide little motivation for the funds' managers (Maula *et al.*, 2003). Empirical evidence shows GSVFs that provide protection or guarantees against losses produce lower performing funds (Jääskeläinen *et al.*, 2007). In addition, lack of alignment between government and private venture capital investors can create problems. For example GSVF funds tend to invest in private markets that are underdeveloped. Areas remain underdeveloped due to their unattractive nature and lack of incentives to private venture capital (Jääskeläinen *et al.*, 2007). However, once governments have committed capital, and funds are established, they are usually discouraged from interfering in the operation of the funds (Armour and Cumming, 2006).

The direct approach appears misguided when used to fill a financing gap; market analysis often shows finance is actually distributed efficiently and no funding gap exists (Da Rin *et al.*, 2006; Keuschnigg and Nielsen, 2003). Frequently, government-funded approaches cause no change in the overall level of venture capital activity and may even cause a decrease in the market (Armour and Cumming, 2006). Furthermore, conflicts of interest can arise as government seek to act as investors and managers, and regulators[1] (see, e.g. Bessler and Kurth, 2007). Overall, the direct approach, in both of its forms, is seen as an inefficient means of venture capital market development (Achleitner *et al.*, 2011; Cumming, 2006; Da Rin *et al.*, 2006).

4. The indirect approach

The indirect approach focusses on government involvement in creating a supportive environment where venture capital can flourish (Murray, 2007). Increased focus on governments using policy to support economic freedom occurs on the back of a number of empirical studies proving the relationship between economic policy and entrepreneurial activity. Studies using the Economic Freedom Index and various forms of entrepreneurial activity data, including OECD self-employment data, Global Entrepreneurship Monitor (GEM), and Venture Capital Profiles, all find a positive relationship between the size of government, quality of fiscal and monetary policy, and levels of entrepreneurial activity (Bjørnskov and Foss, 2008; Hall *et al.*, 2013; Hall and Sobel, 2008; Kreft and Sobel, 2005; Nyström, 2008). Notwithstanding empirical evidence that opportunity and necessity entrepreneurs respond to different economic and monetary policies (McMullen *et al.*, 2008), cross-sector variation in response to institutional change (Gohmann *et al.*, 2008), and variation in developed and emerging economy responses start-up procedure policies and trade opportunities (Misra *et al.*, 2014), focus on efficient operation (Dossani and Kenney, 2002; Guler and Guillén, 2010; Landstrom, 2007; Lerner and Tåg, 2013); i.e., creating and enforcing rules, including how organizations originate and how they function (Bruton *et al.*, 2002; North, 1990; Scott, 1995) led governments to create and maintain monetary policies, such as FDI policy, and

fiscal policies, such as R&D tax policy, in order to incentivize entrepreneurial activity, rather than direct investment.

The focus on creating conducive economic conditions has a number of implications for venture capital market development. The venture capital cycle depends on a strong legal landscape. Due to the dominant logic of holding higher rates of control proportional to the equity investment and demanding contractual downside protection (Armour and Cumming, 2006; Bottazzi *et al.*, 2009), venture capital requires legal institutions that protect the owners' ability to appropriate value. Strong intellectual property rights are positively associated with opportunity entrepreneurs who tend to be more innovative than necessity entrepreneurs (McMullen *et al.*, 2008). Higher investor support and downside protection characterize a strong legal landscape for venture capital (Bottazzi *et al.*, 2009; Lerner and Schoar, 2005; Lerner and Tåg, 2013) and creates the capacity for efficient contracts that accommodate uncertainty, information asymmetry, and reduce opportunism and transaction costs that are inherent in start-ups (Gilson, 2003; Gompers and Lerner, 1999; Guler and Guillén, 2010; McMullen *et al.*, 2008; Metrick and Yasuda, 2010). The incentives outlined in contracts encourage investment and non-contractual support to develop capabilities that start-ups require (Bottazzi *et al.*, 2009).

Policies cannot effectively lower the monitoring costs of start-ups, so instead target an increase in the potential returns (Bonini and Alkan, 2012). Start-ups generally disperse their returns as capital gains on initial equity investments (Keuschnigg and Nielsen, 2005), and tax on these returns directly discourages venture capitalist's extra involvement, lessening their expected return (Achleitner *et al.*, 2011). This impacts venture capital activity as less is invested, decreasing the value of venture capital, and the incentive to search for, invest, support, and monitor start-ups (Achleitner *et al.*, 2011; Bonini and Alkan, 2012; Da Rin *et al.*, 2006; Keuschnigg and Nielsen, 2005, 2004).

Exiting investments relies heavily on financial markets' capacity to facilitate opportunities for the divestment those investments. At the final stage, returns earned from the market decide the future funds investors are willing to devote (Jeng and Wells, 2000). For example, India's success in attracting venture capital investment and its rapid growth of overall venture capital activity stemmed from the lure of their robust public markets (Lerner, 2009). Using Venture Capital Profile data, Kreft and Sobel (2005) show that the existence of entrepreneurial activity attracts venture capital activity. Based on this economic policies creating conductive environments positively support entrepreneurial activity, a number of scholars expect that the policies that support the development of robust public markets for initial public offerings will drive the frequency and volume venture capital activity (Black and Gilson, 1999; Bonini and Alkan, 2012; Da Rin *et al.*, 2006; Jeng and Wells, 2000). Proponents of this approach state that an active stock market is a necessary condition for the development of a venture capital market.

While the importance of active stock markets is recognized, the indirect approach largely ignores the dynamic processes of markets, asserting that the provision of capital, institutional changes, and financial incentives *ex ante* will cause a positive market reaction, regardless of the market's context (Avnimelech *et al.*, 2010). The indirect approach does not consider the importance of timing of such events. By ignoring timing it is easier to "assume away the more difficult problem of how to engineer the foundational structure of capital markets" (Gilson, 2003, p. 1093). Young and inexperienced stock markets catering to only existing firms impair development in comparison to more experienced markets (Dossani and Kenney, 2002). For example,

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small high-tech firms struggled until the introduction of new stock markets in Europe in the mid-1990s; countries such New Zealand face these challenges currently with underdeveloped capital markets (Da Rin *et al.*, 2006; Lerner and Tåg, 2013). The differing stages of venture capital market process suggests a dynamic approach with policies changing to evolving situations (Avnimelech *et al.*, 2010; Avnimelech and Teubal, 2004; Rosiello *et al.*, 2011).

More widely, in empirical studies it is common for idiosyncrasies to be assumed away in attempts to provide a generalizable solution (Keuschnigg and Nielsen, 2005). Studies often assume contexts are homogenous, and this may explain the varying outcomes of countries attempts to develop venture capital markets. Understanding that the combination of "national cultures, history and geography' that intertwine in crucial ways" (Zahra, 2004, p. 21) is needed so that policy recommendations can be adaptive to country context and individual situations. Governments may aim to develop localized versions of the American market, but reverse-engineering will not necessarily produce the same returns (Gilson, 2003; Gompers and Lerner, 1999; Harding, 2002; Lerner, 2002). The practice of transferring venture capital as an institution itself has received limited scholarly attention, leaving the ease of this task questionable.

5. The timed approach

The timed approach is a dynamic policy approach, which targets different areas of market development at different stages of venture capital market emergence (Avnimelech and Teubal, 2008). The timed approach, which is also known as the evolutionary approach (Avnimelech and Teubal, 2006; Rosiello *et al.*, 2011), is predicated on evolutionary-based drivers of change. Changes occurs in three stages: the background conditions for new markets (variation and pre-selection), the identification and selection of a new market (selection), and policy suitably designed and implemented to develop a new market (reproduction) (Avnimelech and Teubal, 2008; Rosiello *et al.*, 2011).

The timed approach involves the coordination of the development of new venture capital institutions and the development of a venture capital market. For a market to emerge, the co-evolution of start-ups (demand) and capital (supply) is required (Rosiello *et al.*, 2011). Co-evolution aims to remove the supply-side bias in previous approaches, to develop a market that "reaches a critical mass of resources and capabilities, which is sufficient to spark a rapid self-sustained cumulative emergence market process involving significant positive feedback" (Avnimelech and Teubal, 2008, p. 156). The timed approach attempts policy-led venture capital market development that builds market capabilities. A capable market may reach a sufficient state of development, permitting the government to "let go" (Avnimelech *et al.*, 2010; Avnimelech and Teubal, 2006; Rosiello *et al.*, 2011). Unlike the direct and indirect approaches, this approach takes into consideration the time needed to develop a market (Rosiello *et al.*, 2011). Furthermore, a generic plan cannot be specified; instead, it provides governments with the foundation to adapt policy for the environment.

The timed approach uses both direct and indirect policy tools (Avnimelech and Teubal, 2008). Background conditions are the first stage of a timed market development. Initially, no venture capital market exists and only a small amount of informal venture capital such as angel investors may be present (Rosiello *et al.*, 2011). Policy tools in background conditions generally stems from a government forming new priorities, in reaction to the economic environment; resources to effectively commercialize innovations are rudimentary (Avnimelech and Teubal, 2006). The goals at this stage are to form both the technological and financial infrastructure for the future venture capital market, to

create innovation capabilities, and confront the financing concern for the typical small and medium-sized enterprises (Rosiello *et al.*, 2011).

When countries do not successfully develop a venture capital market on their first attempt it is usually a failure of the background conditions. For example, one of the background conditions for the successful Yozma program in Israel was the previous failed Inbal program (Avnimelech and Teubal, 2006). Lessons about fund structure, incentives, and encouraging venture capital investors formed the background conditions for Yozma. In addition, governments can learn vicariously from the experience of other government's attempts about required conditions and potentially hastening their development.

The second phase of evolution is characterized as pre-emergence, a stage of experimentation (variation) and learning. During pre-emergence, the identification of an appropriate configuration of future venture capital and start-ups for the local context occurs through trial and error (Avnimelech and Teubal, 2008). At this point, an over-supply of start-ups may create demand for a venture capital market (Avnimelech and Teubal, 2006). This stage is the focus of most policy, with tools aimed at creating favorable pre-emergence conditions (indirect policies), as market emergence is heavily dependent on the pre-emergence conditions (Rosiello *et al.*, 2011). Indirect policies such as de-regulating and developing financial markets, and strengthening the legal system ensure a suitable future organization of both venture capital and start-ups (Avnimelech *et al.*, 2010). Some pre-emergence conditions consist of locally adapted forms of intermediation orientated toward the financing gap, growth of investment ready start-ups, some informal venture capital active in the market and forming ties with international venture capital markets (Rosiello *et al.*, 2011). This stage ideally ends in the market acquiring critical mass to fuel venture capital emergence.

The rapid growth of venture capital and start-up activity signals the emergence stage of the market. Direct approach policies are generally implemented to trigger this stage, as the environment and infrastructure have been adequately organized (Rosiello *et al.*, 2011). At this point, GSVFs are suitable, ideally creating positive feedback from entry of new funds and venture capital organization (Rosiello *et al.*, 2011). In addition the infrastructure is usually adequate, with ongoing experimentation of venture capital strategies and organization (Avnimelech *et al.*, 2010; Rosiello *et al.*, 2011).

This stage of the market tends to see a co-evolution of venture capital and start-ups, as both show rapid growth in their activity (Avnimelech and Teubal, 2006). The importance of co-evolution has been recognized in prior approaches, but most studies assume that venture capital demand would respond to government stimuli (Avnimelech *et al.*, 2010). European countries have disproved this assumption; satisfactory markets have not developed, even with advantageous institutional and environmental conditions (Lerner, 2009; Rosiello *et al.*, 2011). Emergence is reached when a large number of players on the demand side (start-ups) and supply side (venture capital) can sustain a market (Avnimelech *et al.*, 2010).

As a relatively new approach to developing venture capital markets, there are very few empirical studies investigating government attempts at using this approach to study compared to the number of studies that have investigated the older direct and indirect approaches. The few exceptions we identified are Avnimelech and his colleagues (Avnimelech *et al.*, 2010; Avnimelech and Teubal, 2008, 2006, 2004; Rosiello *et al.*, 2011) and Papaioannou and Rosiello (2012) whose contributions are summarized in Tables I and II. While the empirical evidence is limited both in terms of volume and the location of empirical settings, we identified some theoretical problems with the timed approach.

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First, the timed approach is based on a combination of evolutionary and lifecycle models (Rosiello *et al.*, 2011). One well known weakness of lifecycle-based models is that the stages within the life cycle vary in their length from industry to industry (Porter, 1981). This, in turn, makes an evaluation of what is the current stage – and where one is within the stage – difficult. For example, knowing the point when market development moves from the background conditions to pre-emergence stage to the emergence stage (Avnimelech *et al.*, 2010). If a government wrongly assesses the stage they are in, this may result in the wrong conditions being targeted by policy and may cause further distortion in the market.(Avnimelech, 2013). Furthermore, typically, a lifecycle-based model implies a linear movement from stage to stage in a fixed order; in reality market development may skip steps, face steps in parallel, or even proceed through them in the incorrect order (Porter, 1981). This further complicates the difficulty of assessing the states of the current and subsequent stages.

Problems also emerge when considering the evolutionary basis of the timed approach. Evolutionary change theory asserts a continuous cycle of variation, selection, and retention which develops somewhat randomly (Van de Ven and Poole, 1995). Thus, there may be limited control that policy makers can exert over the direction of the emergence. This may limit the predictive power of using a timed approach. Limited control and an inability to assess or predict the development of the market creates a tension for policy makers with a more teleological worldview.

6. Conclusion: future research directions

Governments recognize the importance of their role in the development of venture capital markets but remain uncertain as to the best policy approach (Lerner, 2009). One reason for this is that scholarship on the topic is somewhat fragmented. As a result, scholars have struggled to make uniform policy recommendations for governments. The purpose of this paper was to review current understanding of governments' role in venture capital development taking a market-based perspective. In the final section we summarize our key findings about the gaps/problems we identified within the three dominant approaches and outline a number of research opportunities that could assist scholars in better understanding and advising policy makers about governments' role in venture capital development.

Empirical evidence, from descriptive single-country cases and through to economic modeling with large-scale multi-country (and state) state, generally shows that indirect approaches are more efficacious than direct approaches since they assist governments to put in place economic environments where entrepreneurial activity can occur. (Bjørnskov and Foss, 2008; Hall *et al.*, 2013; Hall and Sobel, 2008; Kreft and Sobel, 2005; Nyström, 2008). What we have not been able to establish within the indirect approach are the dynamics of the market-forming processes. That institutional changes through the provision of economic, financial and intellectual property rights is positively correlated with economic activity might explain the antecedents of venture capital markets but it does not explain how venture capital market development is influenced by context-specific demand-side factors, such as the timing of such events (Gilson, 2003), sectorial variations that are shown to respond differently to government policy (Gohmann *et al.*, 2008) and variations between emerging and developed economies (Misra *et al.*, 2014).

In response to these problems with indirect approach the timed approach suggests that developing venture capital markets requires varying policies at the different stages of market emergence. Clarifying between the development of a venture capital institution

or a venture capital market (Avnimelech and Teubal, 2008), the timed approach recognizes the need for co-evolution of venture capital and start-ups to develop a market (Avnimelech *et al.*, 2010). Through clarifying the end goal of development, this approach acknowledges the time required to develop a market through experimental and vicarious learning to build on existing market features. However, there is limited empirical research to test the voracity of the timed approach. The existing studies are predominantly descriptive single-country studies that are contribute toward theory-building, indicating the need for more comparative and explanatory studies. So, based on our review, we can see a number of research opportunities.

More studies are needed to describe what contextual factors influence, and are influenced by the timing of events, and how these factors create variation, selection, and retention and struggle (Aldrich, 2006) in the evolution of venture capital markets. There are relatively few empirical studies investigated how the timed approached explain market development as can be expected since this is a relatively new approach. Furthermore, these tend to be single-country case studies that offer very limited generalization. Studies that compare and contrast the evolution of events in different sectors, different countries, and different economies, are needed to inform evolutionary-based propositions about governments' role in venture capital development. These comparisons would be very useful since existing studies already report variations in how different sectors and types of entrepreneurial activity, countries, and types of economies respond to government change (Gohmann *et al.*, 2008; McMullen *et al.*, 2008; Misra *et al.*, 2014).

In addition, more analysis of unsuccessful policy changes as well as successful ones is needed so that researchers consider both "successes" and "failures" in order to avoid the success bias problems associated with evolutionary explanations (Aldrich, 2006). In the studies we identified within the timed approach successful and unsuccessful government policies were recognized with single case studies using qualitative methods to explain the selection, retention, and variation processes that contributed toward venture capital development. Given the challenges associated with studying unsuccessful (and failed) policy, such as gathering analyzing comparable data over periods of time and comparing across countries, we recommend that a wider set of research designs be explored. For example, critical incident techniques (Kaulio, 2003) and comparative case analysis (Li and Zahra, 2012) appear to be useful analytical tools to build upon the existing thick descriptions and better theorize the evolutionary-based timed approach.

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Note

1. We thank the Morgan Miles, the Entrepreneurship, and Small Business convenor at ANZAM for suggesting this point.

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