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Governmental venture capital for innovative young firms

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Abstract Governments around the world have set up governmental venture capital (GVC) funds, and are increasingly doing so, with the aims of fostering the development of a private venture capital industry and to alleviate the equity capital gap of young innovative firms. The rationale and the appropriateness of these programs is controversial. In this paper, we borrow from the recent literature on entrepreneurial finance to document the evolution and to compare the effects of the different types of governmental support. In contrast with a lack of success in some countries, there have been successful GVC initiatives, such as the Australian Innovation Investment Fund. Consequently, the proper design of the investment processes of GVC funds is an urgent topic for scholars and policy makers.

Keywords Entrepreneurial finance · Venture capital · GVC · IPOs · M&As

JEL Classification G30

1 Introduction

Most literature on technology transfer has focused on demand-side public interventions, such as technology transfer offices, incubators, accelerators, and other initiatives of network development, as well as matchmaking involving prospective entrepreneurs and investors. This paper aims to refocus the attention of technology transfer scholars to supply-side policies, which seek to increase the supply of financing to entrepreneurial

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ventures (Meoli et al. 2013). In particular, this paper highlights the role of GVC funds. In so doing, we aim to inform the broader public about the impact of public policy towards Venture Capital (VC) and, hopefully, to provide policy makers with an international and comparative perspective on the effects of the governments' efforts, which may guide future interventions. First, we review the prior research on this topic and provide a picture of GVC programs around the world. Then, we identify some open research questions and enlarge the scope to encompass the role of public policies in developing VC markets and fostering access to public equity markets.

Innovative young firms play a key role in modern knowledge-based economies, as they are an important source of new jobs, radical innovations, and productivity growth, as well as a tool for disciplining established firms (Audretsch 1995; for up-to-date evidence related to 18 countries, see Criscuolo et al. 2014). Unfortunately, these firms suffer from financing constraints, which limit their growth and menace their survival. Lack of internal cash flow and collateral, asymmetric information, and agency problems are the main reasons for their difficulties in raising external capital (Carpenter and Petersen 2002). Given the importance of innovative young firms and of external financing for these firms, the crucial role played by VCs in fostering entrepreneurship is evident and has been documented by numerous studies (e.g. Colombo and Grilli 2010; Chemmanur et al. 2011; Puri and Zarutskie 2012; Croce et al. 2013). VCs provide portfolio companies with bundles of value-added activities, including direct coaching and indirect benefits, such as a certification effect to third parties (e.g. customers, skilled workers, alliance partners, and financial intermediaries) (Gompers and Lerner 2001).

However, for reasons that will be discussed in detail in next section, the equity gap faced by young innovative firms cannot be entirely solved by the private VC market. In response, many governments have set up programs to foster VC financing, through the establishment of GVC funds (Cumming et al. 2009). Besides addressing the financial gap problem, GVCs can pursue investments that will ultimately yield social payoffs and positive externalities for society as a whole. The drawback of these instruments, however, is that they may crowd out rather than stimulate private investments. The rationale and appropriateness of these programs are at the center of a controversial academic debate, which we review in this paper.

Currently, VC markets in many countries exhibit a dearth of capital, with negative effects on innovative young firms (Cumming 2014). Assessing the impact of public policy on VC markets seems particularly important in this climate. Indeed, the recent financial crisis has increased the difficulty for these firms to raise seed and early-stage finance, as VCs have become more risk adverse and have focused on later-stage investments (Block and Sandner 2009). As a consequence, policy interventions have increased in recent years in many OECD countries (Wilson and Silva 2013).

2 Rationale for governmental venture capital

The creation of GVC funds is primarily meant to correct for supply-side failures in domestic VC markets.[1] Due to the information asymmetries surrounding young innovative

[1] VC investors are typically classified on the basis of their ownership and governance structures. An independent VC is a limited partnership in which a management company raises capital from limited partners, often institutional investors. VC forms other than independent VCs are collectively known as *captive VCs*, which include *corporate VCs* (affiliated with a nonfinancial corporation), *bank-controlled VCs*

firms, it is likely that adverse selection, moral hazard, and agency problems may lead to a market failure for entrepreneurial finance.[2] This financing gap is alleviated by VCs, who address informational asymmetries by intensively scrutinizing firms before providing capital and monitoring them afterwards (Hall and Lerner 2010). Nonetheless, in an underdeveloped seed and early-stage market, direct governmental intervention can be helpful for filling the firms' equity capital gap. Private investors do not easily acquire the skill set needed to be good VCs. Government programs can facilitate the training of good VCs. Moreover, government awards to private parties certify the quality of the company, help the company become established, and enable the company to secure other sources of funds (as well as suppliers, customers, etc.) (Lerner 1999). The selective provision of GVC funds to underfunded young innovative firms can signal their high potential to private sector investors and, thus, foster the additional funding of these firms. Thanks to signaling effects, GVCs can have a positive, crowding-in effect on the development of VC markets.

As GVC is generally instrumental to broader policy objectives, the activity of GVC programs is *not* guided exclusively by the financial goals that are (allegedly) typical of private sector investors. Accordingly, during the selection process, GVCs will consider investments that might not be as satisfactory in terms of return for risk, if the investment could generate significant social payoffs or localized public benefits (e.g. job creation or economic growth in a specific region or sector). Investment opportunities in underprivileged regions, for instance, could remain unpursued without governmental intervention. GVC programs may be able to alleviate some problems in peripheral and economically lagging regions lacking an indigenous VC industry.

Thus far, we have provided a justification for a public engagement in VC programs. However, intervention is valuable only when its benefits outweigh the costs of its implementation. While action to address the market failures is theoretically justified, it might be counterproductive. With reference to GVC activity, there are three main concerns. First, there is skepticism regarding the ability of GVC investors to pick winners, because investors might lack the skills to perform successful selections or because of possible distortions of the investment strategies due to political interests (Brander et al. 2008). Second, GVC programs might not be effective in monitoring, nurturing, and mentoring investee companies (Cumming et al. 2014). Third, and most importantly, public investment may displace private investment, leading to crowding-out effects (Armour and Cumming 2006; Cumming and MacIntosh 2006). As GVC investors have broader objectives than independent VCs, they are less accountable for generating high returns. Therefore, the provision of cheap equity capital by GVC investors discourages private investors, leading to replacement, rather than engagement, of private VCs.

Footnote 1 continued
(affiliated with a bank), and *governmental VCs* (the focus of this paper). For an extended discussion of the rationale for the creation of GVC programs, see, e.g. Cumming and Johan (2013). Similar to GVC programs, in *guarantee systems*, the government commits to covering, totally or partially, potential losses of private VC funds, so a minimum return to private investors is warranted.

[2] It is widely accepted that entrepreneurial ventures are a major source of innovation, employment, and growth. Market failures are related to the public good nature of innovation, which causes free-riding and insufficient incentives for investments, as well as to information asymmetries, which generate adverse selection and moral hazard problems.

3 Definition and taxonomy of GVC funds

Governments may have various intentions and objectives when setting up GVC programs. To the extent that these objectives differ, there will be heterogeneity in the types of firms that the GVCs invest, in the effort that they devote to their investee firms, and, ultimately, in the efficacy of their investments. The success of a GVC program also depends on the institutional environment in which it operates, which is typically poor in lagging areas (Florida and Kenney 1988). For example, the mission of the UK Regional Venture Capital Fund is "to ensure that each region [in England] has access to at least one viable regionally-based venture capital fund making equity-based investments in smaller amounts".[3] All else being equal, this affects more the performance of GVCs aimed primarily at regional development and localized job creation than those that more broadly point to support the development of a young high-tech industry or to seed private sector investors. Therefore, the effectiveness of GVC programs largely depends on their design and aims.

Different definitions of GVC are available in the literature, ranging from a narrower focus on VC funds managed by governmental bodies, to broader classifications that include taxation policies aimed at favoring the engagement of private investors. With regard to direct public intervention, there is heterogeneity in the type of allocation of governmental funds to GVCs. Allocation types can be classified into three categories: direct public funds, hybrid private–public funds, and funds-of-funds. To be as comprehensive as possible, we comprehend and compare the effects among all types of governmentally supported funds.

Direct public funds include investments through government-supported VC-like schemes, often with the aim of facilitating the development of a VC industry within a region or industry. For example, In-Q-Tel was founded by the US Federal Intelligence Community in 1999 to finance information technologies. OnPoint Technologies was founded by the US Army in 2002 to finance investments for new power and energy solutions. Due to problems related to a lack of skills or crowding-out issues, some of these programs have been modified to include coinvestments from private investors. The German High-Tech Gründerfonds fund, whose investors include the German Federal Ministry of Economics and Technology, the KfW Banking Group, and 12 industrial groups, is an example of a hybrid VC fund. From a critical perspective, these public–private partnerships could be viewed as subsidies to large firms. Lastly, government support can take the form of funds-of-funds, which invest in other investment funds rather than investing directly in companies. On January 21, 2014, the Canadian Finance Minister announced the establishment of the Northleaf Venture Catalyst Fund, the first fund-of-funds established under Canada's Venture Capital Action Plan. Of the CAN$ 217.5 million in this fund, CAN$ 145 million are from institutional and corporate investors, while the governments of Canada and Ontario each provide CAN$ 36.3 million.

4 Empirical evidence from around the world

In this section, we first present evidence on the systemic effects of GVCs, and then focus on the effects on their portfolio firms. Systemic effects basically refer to the effects that GVC programs have on the development of a private VC industry. GVC funds might

[3] "Addressing the SME Equity Gap: Support for Regional Venture Capital Funds", URN 99/876. Small and Medium Enterprise Policy Directorate, DTI, Sheffield.

Table 1 Summary of selected studies on governmental venture capital

Authors	Sample description	Data source	Summary of findings
Alperovych et al. (2013)	Belgium VC data, 1998–2007	Venture Economics and Zephyr	The presence of a public investor in the equity of Belgian entrepreneurial firms translates into statistically significant reductions in the relative growth rates and relative performance with respect to their privately-backed peers
Armour and Cumming (2006)	European VC data, 1990–2003	European Venture Capital Association	European government VC funds have crowded out private venture capital investments. Aggregated data based on VC/GDP
Brander et al. (2008)	Canadian VC Data, 1990–2004	Canadian Venture Capital Association	Canadian subsidized labour sponsored venture capital funds in Canada are less likely to finance companies that develop patents, implying less value-added by investors
Colombo et al. (2007)	550 New-Technology Based Firms in Italy		The presence of inefficiencies in venture capital markets are not alleviated by the existing Italian technology policy measures towards high-tech start-ups
Cumming (2007)	Australian VC data, 1982–2005	Thompson SDC	Australian government subsidized Innivation Investment Funds (IIFs) facilitated the development of the Austalian VC industry, and are more likely than private funds to invest in early stage high technology companies. IIFs also syndicate and stage more often, and have smaller portfolios per manager (implying more advice per manager)
Cumming (2011, 2014)	European VC data, 1990–2012	European Venture Capital Association	Whether or not European government VC funds have not crowded out private venture capital investments depends on benchmarking and measurement. Comparison of aggregated data based on VC/GDP, VC/Population, and early stage VC/late stage VC
Cumming and Johan (2008)	Canadian VC Data, 1990–2004	Canadian Venture Capital Association	Government subsidized labour sponsored sponsored venture capital funds in Canada more often have inefficient exits in terms of more frequent secondary sales and buybacks. To some extent there is evidence that government subsidized labour sponsored sponsored venture capital funds are also more likely to have write-offs
Cumming and Johan (2009)	Australian VC data, 1982–2005	Thompson SDC	Australian government subsidized Pre-Seed Investment Funds (PSFs) facilitated the development of the Austalian VC industry, and are more likely than private funds to invest in early stage companies. PSFs have smaller portfolios per manager (implying more advice per manager). There are large differences in performance across the different fund managers awarded licences PSFs to operate PSFs

Table 1 continued

Authors	Sample description	Data source	Summary of findings
Cumming and Johan (2010)	Canadian and U.S. venture capital data, 1990–2004	Thompson SDC	Canadian government subsidized labour sponsored venture capital funds are quicker to exit investments that go public, and have a smaller proportion of IPOs, than private venture capital investments in Canada, as well as compared to U.S. venture capital investments, implying less value added pre-IPO
Cumming and Johan (2014b)	Australian VC data, 1990–2012	Australian Private Equity and Venture Capital Association	Australian government subsidized funds have facilitated employment, R&D, patents, time to IPO, and market capitalization relative to private VC funds and non-VC backed companies
Cumming and MacIntosh (2006)	Canadian VC data, 1977–2001	Canadian Venture Capital Association	Canadian Labour Sponsored Venture Capital Funds crowd-out private venture capital funds
Cumming and MacIntosh (2007)	Canadian LSVCC data, 2000–2005	Globefunds.com	Canadian Labour Sponsored Venture Capital Funds underperform peers, and charge higher fees than their peers. Fees are unrelated to performance
Cumming et al. (2014)	European private and government VC investments, 1990–2010	VICO Dataset	Government VC deals with private syndicated VCs do better in terms of exit outcomes
Grilli and Murtinu (2014a)	European private and government VC investments, 1990–2010	VICO Dataset	Government VC deals syndicated with private VCs do better in terms of financial performance
Jääskeläinen et al. (2007)	Not applicable	Not applicable	The authors compare the incentive effects of different profit distribution schemes for different private and public investors fund structures
Johan et al. (2014)	Canadian government subsidized labour sponsored venture capital corporations 1995–2011	Globefunds, and annual reports	Removal of a tax subsidy in one province (not others) led to the reduction in private entreprise investment and increase in investment in publicly traded companies by 58 %
Leleux and Surlemont (2003)	European VC Data, 1990–1996	European Venture Capital Association	Large public participation is correlated with smaller VC industries, but analyses do not support the view that public venture capitalists are acting to seed the industry or that are they crowd-out private funds

Table 1 continued

Authors	Sample description	Data source	Summary of findings
Lerner (1999)	US SBIR	Thompson SDC	SBIR awards certify quality of early stage ventures and facilitate growth
Lerner (2012)	Not applicable; survey of articles in a book	Not applicable	Government venture capital funds typically under-perform in most countries around the world
Keuschnigg and Nielsen (2001, 2003)	Not applicable	Not applicable	The authors derive, from theoretical models, conditions under which tax policy towards venture capital and entrepreneurship promotes efficient outcomes and improvements in social welfare

contribute to expand the market and attract private, independent investors, or might actually substitute for private VCs. This stream of literature has direct implications on local development and has been studied from different perspectives, including regional economics. At a firm level, studies focus on the selection and treatment effects that could possibly arise from GVC programs. This research stream has yielded useful insights into entrepreneurial finance and entrepreneurship in general. These two types of studies (i.e. systemic vs. firm level) typically use different aims and methodologies. Therefore, we present them in two separate sections. Table 1 summarizes the sample, data sources, and contributions of most of these studies in alphabetical order.

4.1 Effects of GVC at the systemic level: crowding in versus crowding out

The role of GVC is not limited to the benefits yielded to investee firms, as their outreach encompasses the economy at large. First, these programs typically seek a crowding-in effect on private VCs. For instance, the Australian Innovation Investment Fund (IIF) aims "to develop a self-sustaining Australian early stage, technology-based venture capital industry" (Cumming and Johan 2013). By seeding the private VC market, GVCs aim to correct or alleviate market failures in entrepreneurial finance, thereby promoting competition and a more entrepreneurial economy. "Fostering entrepreneurship" is one of the most frequent cited objectives of GVCs, as new enterprises supported by GVCs are expected to provide additional competition in the marketplace.

Existing studies on GVC have pointed to both successful and unsuccessful experiences of GVC programs in different countries. In terms of the former, in 1958, the US Congress created the Small Business Investment Company (SBIC) scheme, which has subsequently served as a benchmark program worldwide. In this model, government involvement, either direct or indirect, enables additional capital to be raised, thereby creating a leverage advantage for private investors. In Israel, the Yozma Group was launched in 1993 using public funds. Yozma is widely considered to be the catalyst for the successful development of the domestic VC industry in that country. As the domestic VC industry matured, the role of the government declined, and Yozma was privatized and sold.

Similarly, governmental support, particularly the IIF program, has been very helpful in Australia. Prior to 1998, there were few early-stage venture investments in Australia. Establishment of the IIF program in 1997 led to more investments in subsequent years, even after the collapse of the Internet bubble (Cumming 2007). Brander et al. (2014) find that markets with more GVC funding have more VC funding per enterprise and more VC-funded enterprises, suggesting that GVC finance largely augments, rather than displaces, private VC finance. Further evidence of crowding-in effects comes from Hood (2000), who showed that the Scottish public VC program SDF was followed by the formation of new private VC funds.

In contrast, Armour and Cumming (2006) find no support for the crowding-in effect in a sample of 15 Western European and North American countries. Bertoni et al. (2014) show that although European governments have tried to fill the seed investment gap left by private VC investors, by launching GVC funds (e.g. university seed and regional government-controlled funds) and investing in small, young, seed-stage companies, notably biotech firms,[4] they have failed to attract private VCs to these companies. In Quebec,

[4] This study is based on the VICO database of young high-tech entrepreneurial companies operating in seven European countries (Belgium, Finland, France, Germany, Italy, Spain, and the UK). The dataset consists of 8,370 companies, 759 of which are VC-backed, and 1,125 VC investors.

Canada, Labour-Sponsored Venture Capital Corporations (LSVCCs) were established in 1983 and extended to other Canadian provinces from 1988 to 1993. However, LSVCCs suffer from crowding-out problems (Cumming and MacIntosh 2006, 2007) and were phased out of Ontario. Since 2011, the government in this province has adopted a model akin to the Australian model.

4.2 Effects of GVC at firm level: selection and treatment

Besides the crowding-in effects on the private VC industry and systemic effects on the economy, the desired achievements of GVC funds include direct returns from the companies in which they invest. A growing literature has examined the treatment effect (Bertoni et al. 2011, 2013) of GVC investments in portfolio firms. We review this literature by considering different performance measures: namely, successful exit, innovation, and growth. We also consider evidence related to coaching and the value added by GVC investors to portfolio firms.

4.2.1 Exit

One clear-cut measure of the performance of VCs is their ability to exit successfully from their investments. In a European study, Cumming et al. (2014) find a positive contribution of independent VCs on the likelihood to reach an exit though IPO or M&A, whereas GVCs have a negligible impact. However, mixed independent-governmental syndicated VC investments lead to a higher likelihood of a positive exit than independent VC-backed investments. Cumming and Johan (2014) show that Australian IIF backing results in a higher percentage of investments that are publicly listed, as well as a greater market capitalization of such investments relative to both VC- and Private Equity-backed firms. Croce and Ughetto (2014) find no significant impact of the switching dynamic from an independent to governmental VC (or vice versa) on the probability of successful exit.

Other studies find less positive effects of GVC. In Canada, GVC-backed companies are less likely to be sold as IPOs and acquisitions, whereas they are more likely to be sold as secondary sales and buybacks (Cumming and Johan 2008). GVCs (e.g. LSVCCs) are more likely to exit sooner than would otherwise be optimal for the investee (Cumming and Johan 2009, 2010). Moreover, Johan et al. (2014) find that as a result of the elimination of tax credits and the removal of certain investment restrictions, Ontario's LSVCCs have drifted from their original mandate towards investing in less risky listed companies. In a Europe-based study, Buzzacchi et al. (2013) find that while independent VCs divest low-return investments as soon as possible, GVCs tend to postpone the exit from those ventures that might generate social returns or exert positive impacts on the economic system, even if their financial returns might not be satisfactory.

4.2.2 Innovation

Young innovative firms play a central role in spurring innovation and are a vehicle for transferring and capitalizing knowledge (Audretsch et al. 2008). For these reasons, they are often the target of policy support. Audretsch et al. (2002) find that the US Small Business Investment Research program has been effective in stimulating R&D, and that its net social benefits have been substantial. Similarly, because private investors are unlikely to ensure the full appropriation of returns of R&D investments, GVCs can be helpful in facilitating

innovation. A specifically stated goal of GVC programs is to promote innovation. For example, the Australian IIF aims to encourage private sector investment in R&D activities. The German Mittelständische Beteiligungsgesellschaften aims to assist in the commercialization of R&D activities, building linkages between research agencies, the finance community, and business. Other GVC programs seek to foster the development of specific technologies and sectors identified as being strategic to the nation or region. In Israel, Yozma invested in companies in the fields of Communications, IT, and Medical Technologies.

Finally, GVC fund managers have more positive attitudes toward academic entrepreneurship. Knockaert et al. (2010) find that the likelihood of a VC fund being open to investing in academic spin-offs is positively affected by the percentage of public funding in a VC fund. Nevertheless, Murray (1998) suggests that commercial funds are more likely than regional public funds to lead to innovation. Using a sample of European biotech and pharmaceutical entrepreneurial ventures, Bertoni and Tykvova (2012) find that firms backed by independent VCs outperform those backed by GVCs in terms of patenting activity. However, the best results are obtained when independent VCs join forces with GVCs

4.2.3 Growth

A few studies have focused their attention on the effects of GVC on growth. For example, firms backed by independent VCs generally outperform those backed by GVCs, in terms of growth rates of sales or total assets. Using data from the VICO database relating to a multi-European country context, Grilli and Murtinu (2014a) find that GVC investment has no significant effect on the sales growth of portfolio firms. There is some evidence of a sales impact when funding is syndicated, although the governmental investor is subordinate to the private interest. Grilli and Murtinu (2014b) also show that the negligible impact of the sole GVC investments is independent of the age of the investees. They corroborate the view that cofinancing between public and private operators is effective only when they target the youngest prospects. Alperovych et al. (2013) find that, for VC-backed firms, public backing translates into statistically and economically significant reductions of efficiency. Vanacker et al. (2014) find that firms backed by a corporate, government, or university VC investor are less likely to raise additional equity financing compared to firms backed by independent VC investors.

The goal of GVCs often explicitly includes job creation and job empowerment. As the most common measure of local economic performance (Audretsch 2002), employment growth is connected to regional development. Young innovative firms grow so rapidly in their early years that the jobs they create offset job losses from early-stage business failures. By facilitating their creation and growth, GVCs aim to contribute indirectly to employment. However, this treatment effect of GVCs on employment growth is negligible. Empirical evidence comes from studies in European countries (Grilli and Murtinu 2014a), Australia (Cumming and Johan 2014), and Spain (Balboa et al. 2007). Whereas Balboa et al. (2007) show that private VCs have a positive impact, Grilli and Murtinu (2014a) find no significant effect, even for independent VCs and syndicated investments.

4.2.4 Value added and coaching

The studies reviewed above generally suggest that GVC backing has a dismal treatment effect on the performance of firms, with the possible exception of privately led mixed

governmental-private syndicates. The underperformance of GVC-backed firms may be due to their lower engagement in coaching and value-adding activities for their portfolio firms. Knockaert et al. (2006) and Knockaert and Vanacker (2013) show that the managers of captive funds are less involved in value-adding activities than independent VCs. Coherently, Schäfer and Schilder (2006) report that GVC funds have more portfolio firms per manager. Further reasons for underperformance include excessive capital under management relative to the number of managers (Cumming and MacIntosh 2007), lack of control and ability to effect changes in investees due to minority stakes (Cumming and MacIntosh 2006, 2007), and minimal time spent screening investments due to time limits to reinvest capital (Cumming and MacIntosh 2007). Using a composite indicator of the value-adding activities of VCs in the seven European countries covered by the VICO project, Luukkonen et al. (2013) report that the profiles of value added differ across VC types. Independent VCs provide more support in the development of the business idea, professionalization, and exit orientation compared to GVCs. However, they argue that, on average, the importance of the value-adding contributions of GVCs does not differ from that of independent VCs.

5 Conclusions

This paper brings supply-side policies to the attention of scholars in technology transfer, who are traditionally focused on policies aimed at fostering entrepreneurship and, therefore, demand for financing (Bonardo et al. 2011). With a comparative perspective from around the world, we borrow from the recent literature on entrepreneurial finance to document the evolution and effects of GVC programs. Rationales for supporting GVC programs derive from the needs to alleviate the equity gap of young innovative firms and to stimulate the development of a private VC industry, as well as from expectations of positive externalities and spillover effects on the (local) economy. On the other hand, there are concerns regarding possible distortions and a lack of skills in the selection and nurturing of portfolio firms, as well as the risk of crowding out of private VCs. Global empirical evidence is mixed; good examples, such as the Australian IIF, are in contrast with a lack of success of GVC programs in other countries. Consequently, the design of proper investment processes of GVCs is an urgent item in the agenda of scholars and policy makers.

Although we hope that the recent progress of empirical literature on GVCs offers guidelines for future policy interventions, there remain some open research questions. First, the treatment effects of GVC investors on portfolio firms require further analysis regarding the role of moderating factors, including firm-level factors, such as the age, size, human capital endowment, and business model of the firm; investor-level factors, such as the experience and centrality of the GVC investor; and institutional-level factors, such as the complementarity between GVC and other policy measures supporting young innovative firms (e.g. R&D subsidies; see e.g. Colombo et al. 2007). Grilli and Murtinu (2014b) is a first contribution in this direction. The heterogeneous nature of GVC funds is another promising area of investigation. The treatment effects of GVC funds seem to be relatively more positive when the GVC syndicates with private investors. GVC programs may adopt a fund-of-funds investment logic. However, so far, there is no systematic comparison of the effects of direct GVC investments and fund-of-funds investments.

Finally, although numerous papers address the impact of GVC on the performance of investee firms, there is no study of how the broader set of objectives of GVC programs

actually affects investment selection. This selection process considers investments that might not be as satisfactory in terms of return for risk, if they are supposed to generate significant social payoffs or localized public benefits. However, we lack a deep understanding of how GVC managers can consistently screen investment proposals with fund objectives.

Policy makers consider GVC programs to be an important part of a broader economic development strategy and to address the problems of financing gaps by intervening in multiple areas. Coherently, policy interventions in the VC market cannot be considered in isolation. In this context, legislative initiatives on taxation and the regulation of public equity markets, which affect their efficacy, must be considered. Regarding taxation, Keuschnigg and Nielsen (2001, 2003) derive, from theoretical models, conditions under which tax policies towards VC and entrepreneurship promote efficient outcomes and improvements in social welfare. In terms of public equity, vibrant stock markets and the possibility of a successful IPO are traditionally considered crucial for the development of the VC industry, as first argued by Black and Gilson (1998). Jeng and Wells (2000) find that IPOs are the strongest driver of VC investing. However, different types of VC are affected differently. In particular, IPOs have larger effects on late- than on early-stage VC investing. The role of policy in the access to public equity markets, although perhaps more limited than in private equity, has an impact on the structure and evolution of the VC industry.

Currently, there is an intense debate among regulators and practitioners on the extent of regulation of financial markets, particularly with regard to accessing public equity. Restricting laws aimed at restoring investor protection, such as the 2002 Sarbanes–Oxley (SOX) Act in the USA, have had unintended, overreaching consequences. Such laws have inadvertently caused a reduction in the attractiveness of listing avenues. To allow small and high-tech companies to go public without the burden of excessive regulation, stock exchanges have launched secondary, unregulated markets, particularly in Europe (Vismara et al. 2012). However, there is no agreement on what are the undesired effects of more restrictive regulation, as the decline in the number of firms going public over the last decade might be due to different causes. For instance, a private firm may be more likely to be acquired than to go public in the current economic climate, due to the higher importance of a fast time-to-market and the higher economies of scope that can be achieved through a merger with a strategic, established acquirer (Gao et al. 2013; Ritter et al. 2013). How and whether these aspects will affect the exit strategies of independent and government VCs are questions that are worth investigating.

Finally, new ways to finance entrepreneurial ventures may emerge at the crossroads between private and public equity. In 2012, a legislative initiative, the US Jumpstart Our Business Startups (JOBS) Act, was passed to stimulate economic growth by improving access to public capital markets and eliminating listing requirements for emerging growth companies. With the JOBS Act, equity crowdfunding has started making its way into entrepreneurial finance. Equity crowdfunding will allow unsophisticated investors to invest directly in young innovative firms. We believe that this aspect is a promising future research avenue that will gather together scientists from entrepreneurship and finance to contribute to the literature on technology transfer.

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