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# Understanding Government Venture Capital: A primer and a taxonomy

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# Understanding Government Venture Capital: A Primer and a Taxonomy

Marius Berger[1], Chiara Criscuolo[2], Antoine Dechezleprêtre[1]

Government Venture Capital (GovVC) Funds are a widely used policy tool across OECD countries to promote innovation. This paper introduces a taxonomy that distinguishes between different fund designs and serves as a practical guide for policymakers and researchers engaged in cross-country comparisons. It explores the rationales behind GovVC initiatives, particularly their role in seeding and complementing private venture capital markets. The taxonomy then highlights the various ways private actors can participate in GovVC programs, such as through external fund managers, private sector limited partners, co-investment partners, or experts on supervisory boards.

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# Executive Summary

The Venture Capital (VC) high-risk, high-reward investment model is widely acknowledged as a catalyst for innovation and entrepreneurial growth. However, persistent challenges limit the scope and scale of private VC investment, compelling governments to intervene to address imbalances in investment across regions, sectors, and technologies, as well as insufficient support for projects with high social value or entrepreneurs from diverse backgrounds.

Government venture capital (GovVC) programmes are designed to mitigate the limitations of the private VC market. These programmes inject capital into underrepresented regions and technologies while levelling the playing field for innovative start-ups. However, the complexity of GovVC programmes, each with distinct objectives and features, presents a challenge for research and policy formulation.

In response, this paper proposes a taxonomy of GovVC, which provides a systematic framework for classifying GovVC design features. It equips policymakers with the tools to navigate the fragmented policy landscape and formulate coherent policy approaches.

Firstly, the taxonomy highlights the diverse objectives behind the establishment of GovVC funds. These objectives primarily fall into two categories: a) scale-enhancing entities that aim to bolster the overall VC supply within an economy, and b) scope-enhancing initiatives that target specific technologies or regions to alleviate market frictions.

Secondly, the role of government ownership is examined. Building on existing literature, the taxonomy considers entities that are fully owned by the government, those that are partially owned by the government, and entities in which the government assumes no ownership but may benefit from tax credits or other types of government subsidies.

Thirdly, the taxonomy examines variations in fund management arrangements, distinguishing between internal fund management by existing government institutions, external fund management by private VC firms, and integrated fund management, which represents hybrid forms of fund management organisations.

Lastly, the taxonomy considers the role of governance and private sector involvement, examining aspects such as commitment, influence, and risk-sharing. This involvement may occur through external fund managers, private sector limited partners, co-investment partners, or experts on supervisory boards.

Based on the taxonomy, the paper offers three key insights. Firstly, performance assessments of GovVC funds should consider the diverse objectives of GovVC programmes. Secondly, distinguishing funds solely by government ownership, as commonly seen in the literature, is an inadequate proxy for government involvement; a more comprehensive examination of governance mechanisms is necessary when analysing GovVC funds. Thirdly, the different roles that private actors may assume in GovVC initiatives call for increased emphasis in future empirical research on the prevalence and relative impact of specific programme design features involving private actors. This last point is particularly relevant because public-private collaboration appears to play a significant role in achieving programme objectives and enhancing performance.

# 1 Introduction

Venture capital (VC) is a catalyst for innovation ecosystems that play a key role for business dynamism, technological breakthroughs, job creation, and sustained economic development. However, the VC industry is geographically concentrated, and in the past few regions have attracted the bulk of invested capital. VC investments are also increasingly concentrated in a few sectors and technologies leaving promising innovations in other fields with potentially high social value overlooked. These challenges limit the scope and the scale of innovation activity and underscore the need for interventions to address these imbalances and foster a more equitable and vibrant innovation ecosystem.

Governments throughout the world have taken measures to support venture capital investments in their countries and increase the scope of the VC investment model often within a broader set of industrial policies (Criscuolo et al., 2022[1]; Criscuolo and Lalanne, 2024[2]). Government venture capital (GovVC) funds are one of the key instruments in policymaker's toolbox to bolster the development of the VC industry. GovVC initiatives aim to address the limitations of the private VC market, injecting capital into underrepresented regions and technologies to level the playing field for innovative start-ups across different regions. In contrast to other industrial policy measures which often address a large number of companies, government venture capital funds usually aim to support a smaller number of highly innovative ones. However, with young and highly innovative companies that do not yet have a track record, picking winners is particularly challenging. In addition, government venture capital programmes often pursue other socially relevant objectives giving rise to potentially conflicting goals. The wide range of objectives and characteristics of GovVC programmes poses a challenge for research and evidence-based policymaking.

Existing research on GovVC funds presents an ambiguous picture. On the one hand, GovVC programmes bridge gaps in investment and hold immense potential to build and transform innovation ecosystems (Cumming, 2007[3]; Avnimelech and Teubal, 2006[4]). On the other hand, they may crowd out private investment (Cumming and MacIntosh, 2006[5]), fund marginal innovations (Kovner and Lerner, 2015[6]; Bertoni and Tykvová, 2015[7]) and may have little impact on company performance (Grilli and Murtinu, 2014[8]; Cumming, Grilli and Murtinu, 2017[9])and regional development.

In part, the ambiguity of these findings can be explained by a lack of a common and standardised definition of GovVC funds, which ranges from a narrow focus on government owned funds that are administered by government bodies to a broad view that entails private entities that benefit from tax policies and other types of government support (Colombo, Cumming and Vismara, 2014[10]). This ambiguity in definitions hampers comparative studies and impedes the development of coherent policy recommendations. In the absence of a consistent terminology and a systematic framework for analysis, researchers and policymakers find themselves navigating a fragmented landscape of GovVC initiatives, making it difficult to draw meaningful comparisons and extract transferable insights.

It is for this reason, that this report develops a new taxonomy to serve as a practical response to the challenges faced by researchers and policymakers in navigating the complex landscape of GovVC initiatives. By systematically organising and defining the features of GovVC programs, it offers a foundation for cross-country comparisons, which should allow for a better understanding of their impact and effectiveness. The taxonomy should help to facilitate the exchange of best practices, the formulation of coherent policies, and support and accelerate the emergence of innovation ecosystems.

The taxonomy shows that GovVC initiatives pursue several, in some cases quite different objectives, are subject to different ownership and governance structures and adopt a variety of fund management strategies with varying degrees of private sector involvement. Using examples of selected GovVC programmes from OECD member countries, the distinct features of GovVC are illustrated and put in context to highlight their respective advantages and limitations.

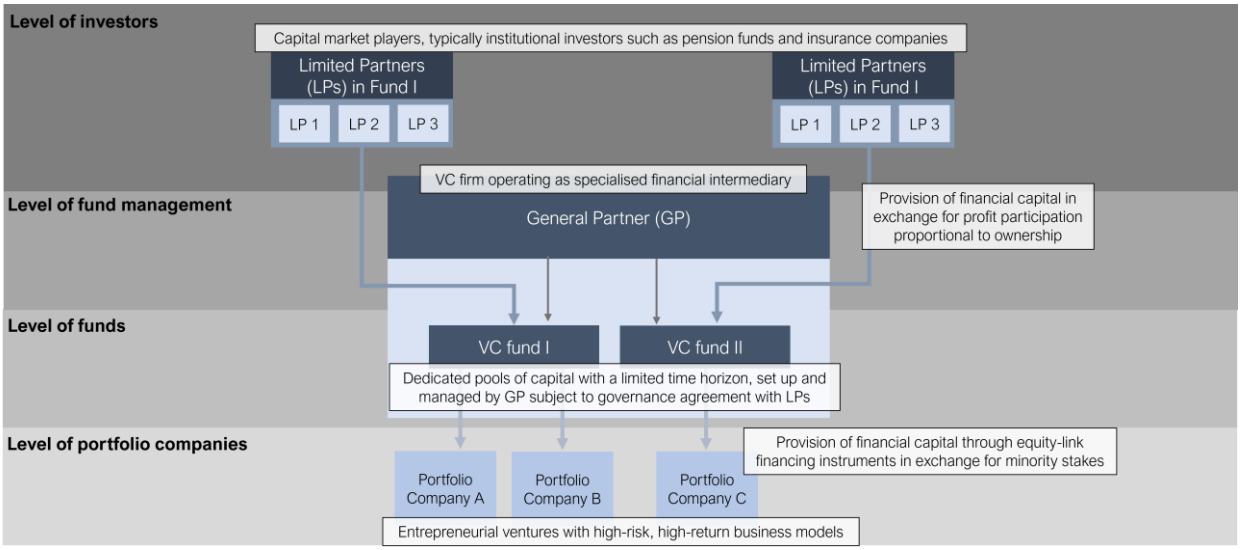
The report is structured as follows. Section 2 provides an overview of the VC investment model and provides a rational for the presence of GovVC funds. Section 3 organizes GovVC initiatives along taxonomical features and illustrates these features by different examples of GovVC funds in OECD member countries. Section 4 concludes.

# 2 The Economics of (Government) Venture Capital

## The VC investment model

VC firms have emerged as specialised intermediaries in innovation ecosystems. In these ecosystems, they are central actors in funding high-risk high-return ventures, which play a key role for technological breakthroughs, job creation and economic efficiency (Goldschlag and Miranda, 2019[11]). These ventures are typically cut off from the institutional capital market (Hall and Lerner, 2010[12]; Kerr and Nanda, 2009[13]) because debt-based financing instruments - that are prevalent to finance entrepreneurship (Robb and Robinson, 2012[14]) - are not tailored to high-risk high-return ventures (Winton and Yerramilli, 2008[15]). Debt-based financing through loans requires that ventures have predictable business models, which generate constant revenue streams and positive cash-flow to make periodical interest payments to banks or other lenders. For highly innovative business models, this is rarely immediately possible because products or services must first be developed and there is often no clearly defined market that would guarantee future revenue streams. VC investors unlike banks use *equity-linked financing instruments* to invest in ventures, i.e., they provide funding in exchange for ownership stakes – typically minority stakes - in ventures. These financing instruments require special types of organizational arrangements to raise and invest capital and come with fundamentally different incentives for the players that are involved.

### Figure 2.1. The venture capital investment model



The organizational form that characterizes the VC industry is the limited partnership (Gompers and Lerner, 2004[16]). Limited partnerships in the venture capital industry have a finite time horizon with the goal of selling the stakes in ventures for a profit. They are governed by the contractual agreements between the relevant players which are divided into the general partners (GPs) and the limited partners (LPs).

GPs are responsible for the day-to-day management and operation of the partnership, including setting up the VC funds, formulating their strategy and taking investment decisions. GPs have significant control over the partnership's activities, although this can vary based on the partnership agreement. GPs receive management fees from the LPs and a share of the profits (carried interest) as compensation for their services. GPs often manage several VC funds simultaneously. When referring to VC investors, we typically mean the GPs, i.e., the investors taking investment decisions vis-à-vis entrepreneurial ventures.

LPs are typically capital market players such as pension funds and insurance companies. Their role is limited to providing capital to the VC fund. They do not participate in the management of the partnership and have limited voting rights, often restricted to major decisions such as amendments to the partnership agreement or dissolution of the partnership. In return, they are entitled to a share of the partnership's profits based on their capital contribution. LPs may invest into various VC Funds simultaneously, either managed by the same GP or by different GPs.

There are various features that make VC investors distinct from traditional financiers (such as banks) and allow them to make high-risk high-return investments. First, as mentioned at the outset, VC investors use equity-linked financing instruments to finance ventures. The equity position gives VC investors a proportional share of companies' profits. In this way the VC fund fully participates in a ventures' growth potential. This is a fundamental difference in the way in which investments are returned compared to the loan-based financing model of banks which provides stable interest payments that can only be realized if the venture does not fail. Second VC investors have better access to information. Again, this is a result of the equity position that investors hold in ventures which provides them with extended information and monitoring rights (Ueda, 2004[17]; Winton and Yerramilli, 2008[15]). Ownership of domain-specific knowledge allows them to process this information effectively when selecting ventures and monitoring their performance. Third, VC investors pay out investments in funding stages. As a result, they can minimise their downside risk and use new information about the development of uncertain projects to make efficient continuation decisions (Neher, 1999[18]; Wang and Zhou, 2004[19]). Fourth, investors use incentive-compatible contracts that, among other things, allocate control rights depending on a company's performance (Kaplan and Stromberg, 2003[20]). This creates additional incentives for entrepreneurs and protects investors (Hellmann, 1998[21]; Cestone, 2014[22]). And finally, investors often act as a nexus between different actors (Gorman and Sahlman, 1989[23]). These actors frequently dispose of critical resources, which means that VC investors themselves can influence the performance of the venture and directly add value to it (Amornsiripanitch, Gompers and Xuan, 2019[24]). In this way, venture capitalists can actively manage risk through their involvement.

The success of innovative ecosystems such as *Silicon Valley* and the *Route 128* tech corridor, backed by their local VC industries, has prompted governments to enact policies to support the emergence similar ecosystems. The design of government venture capital programmes is a cornerstone of these initiatives. Some countries have managed to establish flourishing innovation ecosystems around a local VC industry (Owen and Mason, 2019[25]). However, there are also many examples, where the results of these initiatives have fallen short of the high expectations placed on them (Lerner, 2010[26]). In addition, there are increasing concerns about the general limitations of the VC funding model for innovation and growth (Lerner and Nanda, 2020[27]). While government initiatives can bridge potential funding gaps, it may also discourage private investment activity, undermine financial innovations, and the long-run development of the VC sector. As both government and private VC investors want to leverage the high growth potential of innovative young and small firms, typically in emergent high-tech sectors, it is crucial for policymakers to understand the conditions under which governments can effectively support and develop the VC sector. In the following sections, we highlight some of the roadblocks to venture capital markets that governments

are aiming to remove, such as (1) the geographical concentration and agglomeration of VC markets, (2) underdeveloped financial markets that are key to provide liquidity to the VC industry, (3) the limited investment horizon of private venture capital actors, that have implications for the technologies they invest in, as well as the role of societal objectives that private VCs do not take into account in their investment decisions.

## The role of Government in Venture Capital

### *Seeding venture capital industries outside of established innovation hubs*

The VC market exhibits significant geographical concentration (Chen et al., 2010[28]). Several factors contribute to this phenomenon. Regions witnessing high levels of VC activity often co-evolve with other crucial players in innovation. VC investors and other actors, such as universities, incubators, and industry partners, are mostly situated together (Samila and Sorenson, 2010[29]). Regions where this is the case also offer access to skilled employees, as well as the necessary infrastructure and networks that foster innovation. While these factors appear necessary in fostering a vibrant VC scene, they alone may not explain the geographical disparities between different regions with respect to the VC supply.

VC investors are more likely to locate in regions that already have a history of successful entrepreneurial activity (Chen et al., 2010[28]). Since VC investors prefer to locate near their portfolio companies (Cumming and Dai, 2010[30]), the location patterns of promising entrepreneurs and VC investors may reenforce each other. As a result, certain geographical areas may encounter a deficiency in the availability of VC investors and a dearth of entrepreneurial talent, despite possessing higher education institutions and collaborative industrial networks.[1] Thin VC markets pose a challenge for aspiring entrepreneurs and hinder the emergence of new and innovative industries.

Governments can play a role in jump-starting the market by initiating a process known as *market seeding*. This involves creating the necessary conditions to establish a sufficiently large and dynamic market segment (Lerner, 2009[31]).

### *Deep financial markets: the backbone of the venture capital industry*

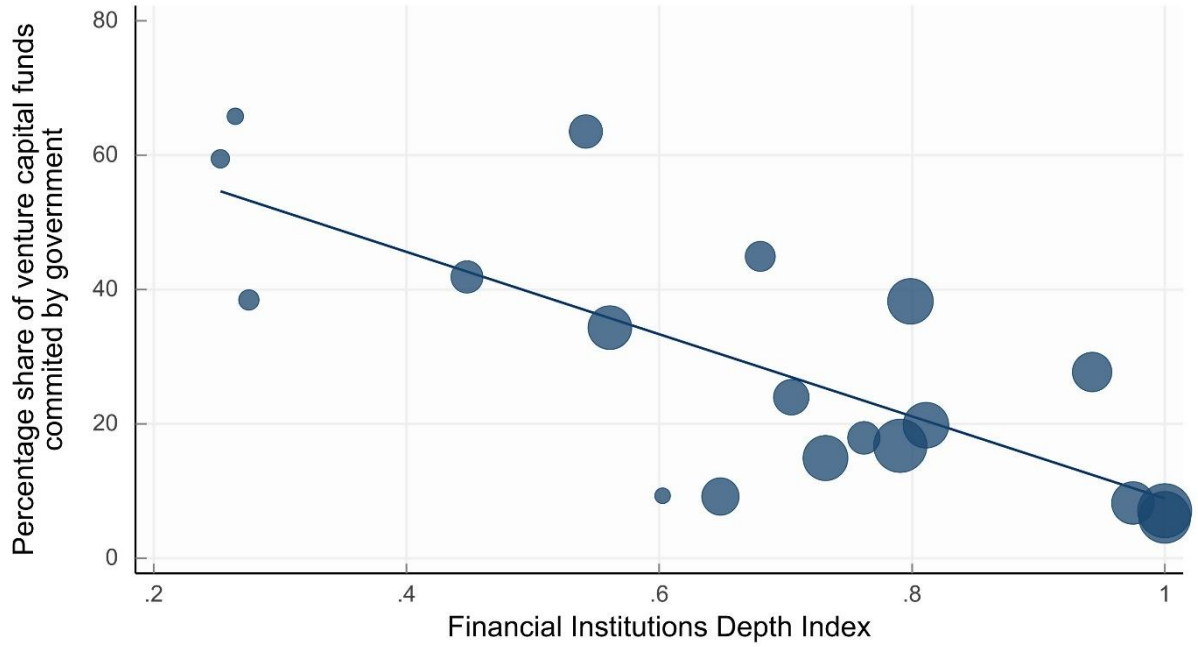
As financial intermediaries, VC funds – unlike angel investors or corporate venture capitalists - are dependent on the availability of external funding sources to fill their funds. The funding sources of VC funds are diverse and range from institutional investors such as insurance companies, endowments, pension funds, and banks to private individuals and family offices. Financial markets with high levels of liquidity and availability of funds in the economy are referred to as having a high *financial market depth*. Financial markets with a higher depth are associated with a larger size of the financial sector in the economy.

Financial market depth plays a key role for a thriving VC industry. In countries with lower financial market depth, the capital supply for VC funds may be limited. Figure 2.2 shows that in countries with low financial market depth the government sector plays a much more significant role as a funding source for VC funds. At the same time, the size of the VC market relative to GDP tends to be much smaller in those countries.

Institutions play a key role in fostering financial market depth. Institutions help protecting investors and build trust in capital markets (Beck and Levine, 2005[32]). This increases the number of participants, including private and institutional investors increasing, in turn, depth and liquidity of the market. Consequently, the institutional context matters for the development of active VC markets (Lerner and Tag, 2013[33]).

Regulation gives governments an important lever to change the liquidity of VC markets. For example, Chen and Ewens (2021[34]) show that restrictions in U.S. banking regulations[2] to invest in VC substantially reduced fund sizes and the likelihood to raise follow-on funds, and adversely affected start-ups. Likewise changes in regulation allowing pension funds to invest in VC funds are often cited to have led to a sharp increase in VC activity in the U.S. (Gompers and Lerner, 1999[35]).

### Figure 2.2. Financial institutions depth and government as a funding source for VC




Note: The graph plots the average share of newly raised VC funds committed by government against the average financial institutions depth index (FID) in the period 2019-2022. The FID is a weighted average indicator combining data on bank credit to the private sector, pension fund assets, mutual funds' assets, and insurance premiums (life and non-life) all relative to GDP. For details see Svirydzenka (2016[36]). Markers represent countries and are weighted by the size of VC investments relative to GDP. The blue line represents the result of a weighted linear regression.
Source: Invest Europe, IMF, authors' calculation

While regulatory changes to the funding environment provide a powerful lever for governments to change the supply to the VC industry, their effectiveness may be conditional on the institutional environment. For example, the size of private pension funds may differ across countries depending on which type of pension system is in place (i.e., private vs. public). Freeing private pension funds to invest in VC would have little effect on the overall supply of VC in a public pension system. Instead, government may itself invest into the VC industry by means of GovVC funds in economies where the institutional environment makes it difficult to free up private funding at scale.

However, even in deep financial markets, governments at times may need to take a more active role. The investment patterns of VC investors exhibit pronounced boom and bust cycles and seem to be closely tied to overall economic conditions, investor sentiment, and the availability of capital. In times of crises aggregate deal volumes, capital invested, and deal sizes decline, in particular for early-stage firms (Howell et al., 2020[37]). E.g., during the COVID-19 pandemic, limited partners in VC funds seem to have pressured fund managers to conserve capital (Gompers et al., 2021[38]), which would explain the reluctance of fund managers to invest.

Government may counteract liquidity squeezes of VC fund managers by providing additional funding to the market. During the COVID-19 pandemic, governments have set up matching funds and other types of facilities to stabilise the VC market.

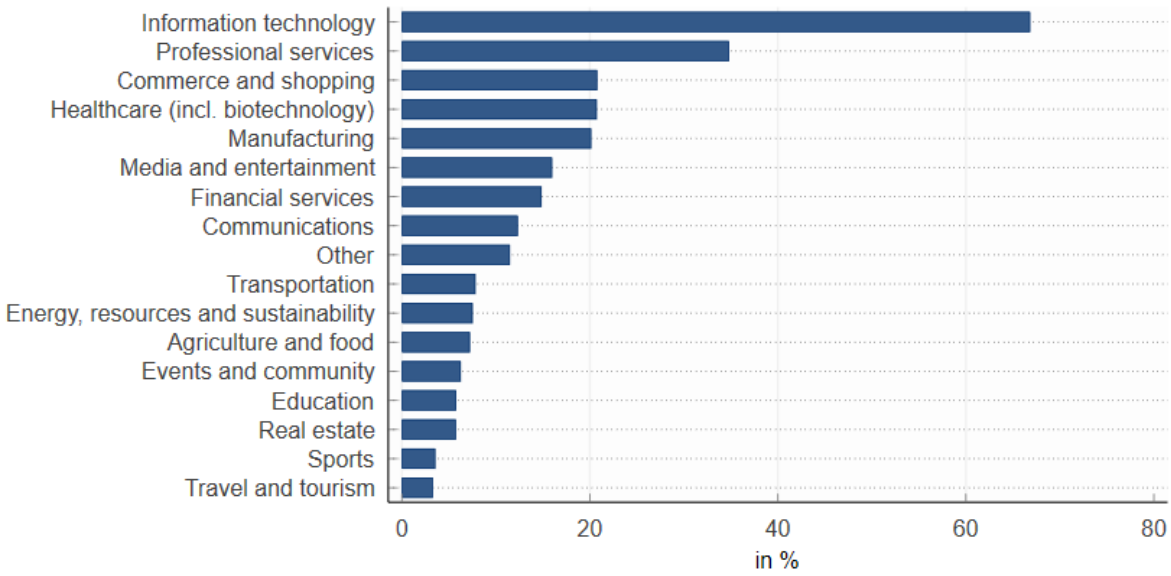
### *Cost of experimentation, limited funding horizons and implications for VC's technological and sectoral concentration*

Innovation is inherently uncertain. Whether an idea eventually turns into a valuable product and a thriving business is initially unknown. To resolve this uncertainty, entrepreneurs need to generate new information. Initially by engaging in experimentation such as simulation, mass-screening, prototyping, or A/B testing (Thomke, 1998[39]). Such experiments can significantly reduce the development costs of an innovation and make it economically attractive to invest in it. At the same time running experiments may come at a significant cost itself. The resolution of initial uncertainty through experimentation may therefore be one of the biggest obstacles for innovating entrepreneurs.

Uncertainty in the process of entrepreneurial innovation constitutes a primary reason for the emergence of the VC industry. The VC investment approach, as outlined above, allows to reduce uncertainty associated with the process of entrepreneurial innovation. However, recent literature points out that the VC investment model critically depends on the cost of running experiments (Kerr, Nanda and Rhodes-Kropf, 2014[40]). VC investors prefer to invest in innovations where experiments quickly generate informative signals about their prospects of success. Informative signals allow investors to abandon unprofitable ideas at an early stage and thus reduce expected losses.

The cost of running experiments differs between technologies. As sectors differ in their adoption of new technologies (Calvino et al., 2018[41]), some sectors will be more attractive to VC investors than others. Figure 2.3 shows that VC investments in OECD countries over the last two decades have been highly focused on information technology. Ewens, Nanda and Rhodes-Kropf (2018[42]) explain this by the advent of new technologies – such as cloud computing and higher level programming languages – that substantially reduced the cost of running experiments. The rise in digital innovations can be regarded as being driven by a sharp decline in the cost of running digital experiments. Making this the primary sector of venture capitalists to invest in. Hence, fundamental shifts in technology have altered the investment patterns of venture capitalists, leading to a decrease in the proportion of investments allocated to complex technologies that involve substantially higher costs for initial experiments and provide less informative signals about their prospects. Conversely, VC investments in cleantech – such as new materials for carbon sequestration or e-fuel technologies have lagged behind those in information and communication technology or biotechnology due to the comparatively higher costs associated with developing prototypes and the limited ability to sell intermediate results in the market (Nanda, Younge and Fleming, 2014[43]; Arora, Fosfuri and Roende, 2022[44]; Kerr and Nanda, 2015[45]).

## Figure 2.3. Sector shares in all VC deals in OECD countries, 2000 - 2022




Note: The sectors shown here are based on a harmonised classification of industry tags used by Crunchbase and Dealroom, which are based on technology fields that companies operate in. E.g., the information technology category contains tags such as *Artificial Intelligence*, *Enterprise Software*, or *Internet Services*. Companies may pertain to more than one sector, which is why percentages sum up to more than 100 percent across all sectors.
Source: STI Microdata lab based on data from Crunchbase and Dealroom

The need for VC investors to quickly resolve uncertainty can in part be explained by the organizational arrangements in the venture capital industry. As discussed in the previous section, limited partnerships are temporary arrangements. The VC funds that are managed by the GP are typically set up as closed-end funds with a lifetime of 7 to 12 years. In this period, the GPs must gradually deploy the fund in suitable investment opportunities and then divest the portfolio and distribute the exit proceedings to the LPs. Hence within 7 to 12 years, the ventures must be able to progress to the point that investors can sell them at a profit. While this may be feasible for certain ventures, the limited investment horizon may fail to align with specific types of emerging technologies with longer gestation periods (Ivashina and Lerner, 2019[46]).

Therefore, the closed-end fund model that VC investors typically use, requires them to quickly receive informative signals from initial experiments, to be able to monetise those results within the lifetime of the fund. One of the potential consequences of this short to medium-term perspective of the closed-end fund model is that VC investors may increasingly finance less-radical technologies. For example Nanda, Younge and Fleming (2014[43]) report that VC funding within net zero patents is increasingly concentrated in non-deep-tech patents, and that the share of VC financed start-ups in all deep-tech patenting has decreased from 70% in 2012 to 55% in 2020.

GovVC funds may therefore play a key role in innovation ecosystems. By focusing their activity on technologies and sectors where the cost experimentation is high, they can reduce the uncertainty of innovations that otherwise fail to attract the attention of private investors (Howell, 2017[47]). Governments are also in a position to follow longer-term investment strategies. GovVC funds can therefore fill funding gaps for technologies that may not be attractive to private sector investors because of their longer gestation periods and high cost of experimentation.

### *Venture capital prioritises private returns over societal benefits*

One of the primary reasons why private VC investors may not fully exploit the innovation potential of firms is due to the presence of externalities resulting from knowledge spillovers and limited appropriability. Externalities indicate that the benefits of an economic activity cannot be fully internalised, placing the investing party at a significant disadvantage. Within the realm of VC, positive externalities often arise from knowledge spillovers, where the innovative activities of one firm benefit others in the industry or economy. Such knowledge spillovers undermine the conventional profit motives of private investors, as they may not be able to fully capture the value of their investment, leading to reduced willingness to invest.

The legal protection of intellectual property (IP) through patents plays a crucial role in venture financing (Hoenig and Henkel, 2015[48]; Gaulé, 2018[49]). However, for certain technologies, it can be challenging to establish clear property rights. Furthermore, while IP protection may be desirable from the perspective of private investors, it is not evident whether it is socially optimal. Technologies with high social value may diffuse more rapidly with less stringent IP protection (Hall and Helmers, 2013[50]).

By considering the societal benefits of investing in certain technologies, GovVC initiatives may help to create a more favourable environment for technologies or firms that exhibit significant knowledge spillovers or additional social value.

### *Venture capital lacks diversity*

The underrepresentation of minorities and women in high-growth entrepreneurship and the VC funding landscape is a critical concern with far-reaching implications for innovation and society (Ewens, 2022[51]). The lack of diversity in these sectors means that innovative ideas and entrepreneurial talents may go unnoticed and unsupported. This deficiency in diverse perspectives and voices stifles innovation, leaving untapped potential in the field. Consequently, society misses the potential economic growth, job creation, and ground-breaking innovations that could emerge if VC were more inclusive in their funding decisions.

Governments can implement policies that promote diversity and inclusion in entrepreneurship and VC. This may include initiatives to increase access to capital for underrepresented groups via targeted funds. Such measures can help rectify the imbalances and unlock the full innovative potential of a more diverse entrepreneurial ecosystem.

# 3 A taxonomy of Government Venture Capital

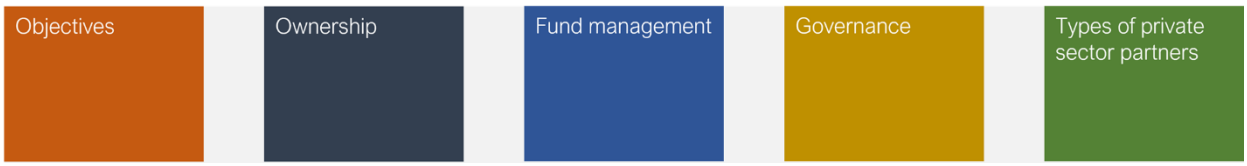
GovVC initiatives aim to close potential funding gaps for equity financing and – unlike private VC – pursue objectives that generate social returns (Giessing and Croce, 2023[52]) equalise differences across regions or improve diversity. The entities that governments leverage to pursue these objectives are called GovVC funds. However, the concept of GovVC fund is not clearly defined in the literature (Colombo, Cumming and Vismara, 2014[10]). Some authors narrowly define the term, while others use a much broader definition.

The lack of a common definition and the considerable heterogeneity of these initiatives complicate comparative studies, especially at the international level. What is more, some concepts are used inconsistently within the literature, and conceptually different types of funding arrangements are sometimes used synonymously. In part, this may be owed to the fact that government participation takes place at different ownership levels and the common terminology does not always explicitly distinguish between the different levels. Some government entities invest directly into start-up companies, while other entities only invest indirectly via private VC funds. Another reason is certainly the separation of ownership and decision-making in VC funds that the limited partnership in the venture capital industry entails, and which can also be found to varying degrees in government VC initiatives. Deriving concrete policy recommendations based on international best practices becomes challenging when concepts are not clearly delineated, and terminology is not consistently used.

In this section we will look at different arrangements of GovVC initiatives and outline their distinguishing elements. As a general principle, we will focus the analysis on entities that directly make equity investments in start-ups. In other words, the unit of analysis discussed here are the funds (and the entities that manage them) that acquire shares in start-up companies as opposed to government (supported) entities that provide finance to other funds. The latter are referred to as public fund-of-funds or simply fund-of-funds (FoFs) and will only play a subordinate role in our discussion. The GovVC initiatives considered in this paper may also provide other types of funding, but it is essential that at least a portion of their funding is made through equity-linked investments. In line with the current literature, we do not consider entities that provide only grants or loans to start-ups.[3]

The following questions will guide our discussion: First, what is the rationale for establishing a government fund? Second, who provides the resources for the fund and how? Third, who makes the investment decisions, and finally, how are those decisions made?

### Figure 3.1. Overview of elements of taxonomy on Government VC



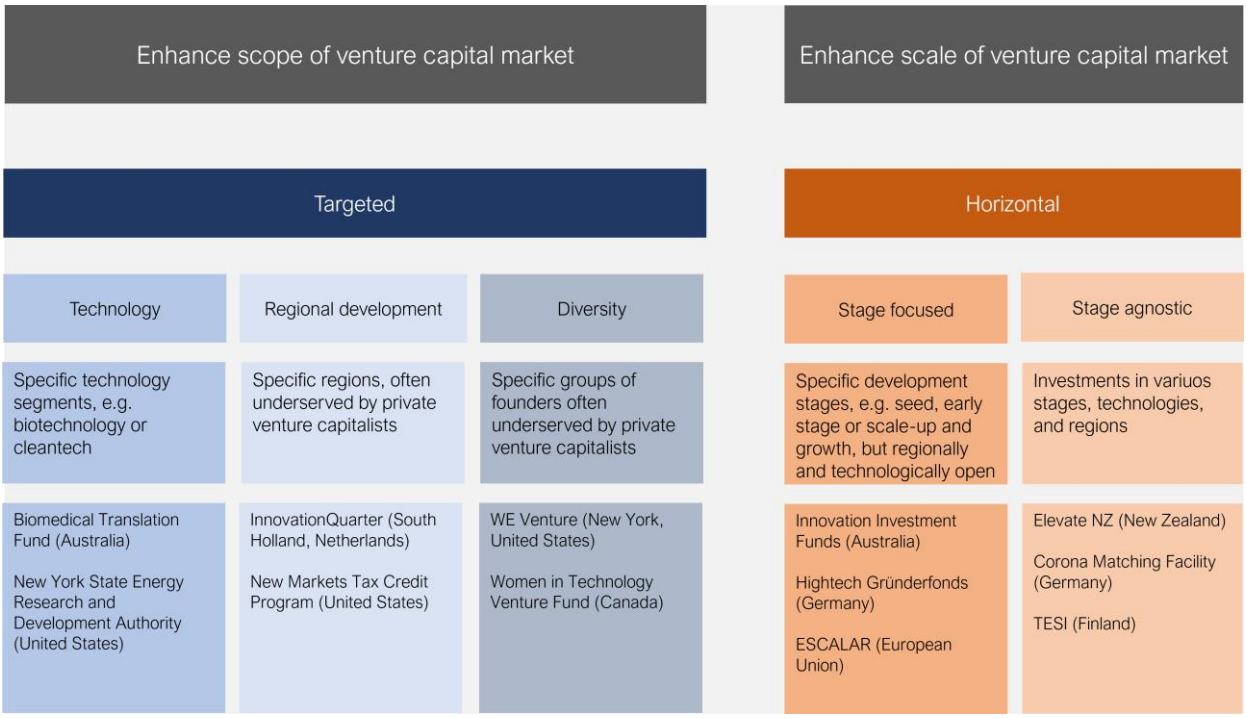
To answer these questions, we provide a conceptual framework that distinguishes GovVC entities along different taxonomical features. We start by considering the objectives of GovVC entities, as government may establish GovVC entities on different rationales. Then we turn to the organizational characteristics of different fund arrangements. Fund ownership is an important proxy for the degree of government and private sector involvement in GovVC initiatives. Delineating GovVC entities based on ownership has attractive features. Ownership has both economic and legal foundations. It is a tangible and measurable concept and constitutes an objective criterion to categorise entities into government and non-government-owned entities. It is also comparable across countries. In the context of organisations, it is also closely tied to the concepts of information gathering and control, thus influencing the ability to determine an entity's general policies or programs.[4] Using a narrow definition of GovVC that focuses on the ownership of the entities that manage the funds may increase comparability across countries and different studies. For all these reasons, much of the empirical work on GovVC relies on ownership to delineate GovVC entities. However, this approach also misses important aspects of the GovVC landscape, such as different fund management approaches, incentive structures and governance structures, and the types of private sector partners that may be involved in GovVC initiatives. Our taxonomy considers these features as different design elements of GovVC initiatives.

Examining these elements individually provides a more comprehensive understanding of the options available to governments when designing GovVC initiatives. More importantly, considering all these factors is essential for identifying and understanding international best practices. For instance, policymakers may want to explore whether specific design features of GovVC entities are linked to specific objectives. Alternatively, they might want to understand whether initiatives that share similar objectives implement distinctive design features. This second scenario could be especially insightful if varying design features lead to different outcomes. Collecting and mapping data on all the different design features across GovVC entities will be valuable to identify international best practices through comparative studies.

## Objectives of Government VC

As Block et al. (2018[53]) note "governments may have various intentions and objectives when setting up [GovVC] funds", and "to the extent that these governmental objectives differ, there is heterogeneity in the types of firms that the GovVCs invest in, the effort that they devote to their investee firms, and, ultimately, in the efficacy of their investments." Broadly viewed, two types of objectives of GovVC programmes can be distinguished: Increasing the scope of the VC market and increasing its size. Thus, in terms of objectives, GovVC funds fall into two classes: scope-enhancing entities and scale-enhancing entities. Figure 3.2 illustrates these two classes, specifies their investment focus, and provides selected examples.

## Figure 3.2. Types and objectives of Government Venture Capital initiatives




Note: Elevate NZ and ESCALAR do not directly invest in start-ups but make investments into other VC funds via fund-of-funds models.

Scope-enhancing entities are typically based on the notion that there are market frictions that limit access to VC for certain technologies, or regions. With these funds, policy makers want to move the market towards a preferred equilibrium. In doing so, the funds usually invest in a targeted manner, i.e., they focus on specific technologies, or regions. For example, entities like the *Biotech Fund Flanders*, the *Biomedical Translation Fund* in Australia, or the *New York State Energy Research and Development Authority* (NYSERDA) are focused on promoting specific technologies. These types of entities are also referred to as *technology-oriented government venture capital* (Bertoni and Tykvová, 2015[7]). Entities that operate in a targeted way may play a significant role in de-risking technologies with long development lead times. Initiatives like the *Women in Technology Venture Fund* in Canada or *WE Venture* by the *New York City Economic Development Corporation* (NYCEDC) are examples of *gender-oriented* and *minority-oriented venture capital initiatives* (Bates, Bradford and Rubin, 2006[54]) and designed to support specific groups of society that are underrepresented in the portfolio of private VC investors. In addition, various programmes at the regional and state level aim to support local VC markets in regions that face little VC supply. For example, the *New Markets Tax Credit Program* in the U.S. provides tax credits to VC funds that invest into non-metropolitan areas in the United States. These initiatives are also referred to as *community development venture capital* (Kovner and Lerner, 2015[55]) or simply *development venture capital* (Rubin, 2009[56]). Some entities may purse multiple of these objectives with different funds, like the Business Development Bank of Canada (BDC). Next to the *Women in Technology Venture Fund*, it also operates the *Seed Fund*, *Clean Tech Funds*, *IT Venture Fund*, *Healthcare Venture Fund*, *Deep Tech Venture Fund* and various more.

Scale-enhancing entities operate in a less targeted fashion and instead aim to increase the overall supply of VC in the economy, including the supply in specific market segments. The rationale behind these initiatives is often based on the notion that the VC market in one country is too small relative to VC markets in other countries. This could be the result of institutional or regulatory differences between countries, but also cultural differences leading to different risk appetites or abilities of private investors to take risk.

Initiatives like the *High-Tech Gründerfonds* (HTGF) in Germany or the - now discontinued - *Innovation Investment Funds* (IIF) in Australia aim to foster seed and early-stage capital markets that were seen as undersupplied by private equity investors in these countries at the time they were established. More recent initiatives like the ESCALAR pilot programme in the European Union want to foster venture capital supply in the scale-up segment. While these initiatives invest in various technologies and regions, they are focused on specific funding stages. In addition, there are entities that operate stage agnostic, i.e., they invest in various technologies, regions, and funding stages. Examples for such types of initiatives include *Elevate NZ Venture Fund* in New Zealand, the *Corona Matching Facility* in Germany and *TESI* in Finland.

Although it is important to recognise the objectives GovVCs, it also important to note that it is often not possible to distinguish GovVCs from other venture capital funds based on their objectives alone. The emergence of so-called impact funds (Barber, Morse and Yasuda, 2021[57]), for instance, has blurred the line between government and private initiatives in terms of their objectives.[5]

## Ownership of Government VC

Government venture capitalist funds are often delineated from other venture capitalists based on their ownership structure. In one of the seminal papers studying government venture capitalists Brander, Du and Hellmann (2015[58]) define an entity "[…] as a G[ov]VC if it is fully owned by a government entity or if it has any limited partners or large investors wholly owned by a government entity." They further refine their definition distinguishing between *government-owned venture capital*, which is defined as "VC funds owned outright by government entities" and *government-sponsored venture capital* defined as "privately owned venture funds in which a limited partner or other significant investor is a government entity", these privately owned entities also comprise entities that "obtain significant financing, tax credits, or other subsidies from government." This definition of GovVC is broad, as it comprises all entities that receive support from government sources, even if the government does not directly take an ownership position in a fund.

The above definition provides a starting point to delineate GovVC entities. However, it may need further clarification. Notably, the terms VC firm and VC fund are sometimes used interchangeably. In the context of GovVC initiatives, this may lead to confusion given the limited partnership structure frequently encountered in the VC industry, in which the owners of the VC funds (the LPs) and the owners of the VC firm that manages the funds (the GPs) are not congruent. The definition in Brander, Du and Hellmann (2015[58]) seems to make no distinction between the two concepts and capture both as GovVC. This can be useful to include GovVC entities that are not organized as limited partnerships, and where there is no clear distinction between VC fund and VC firm. Other authors use a narrower definition and define GovVC as "VC firms that are managed by a company owned by a governmental entity" (Guerini and Quas, 2016[59]).

Another point requiring clarification is the term *government entity*. Narrowly viewed a government entity may refer to a core governmental body, such as a ministry, a department or an executive agency that is directly involved in government functions. However, as we will further discuss in Section 0, government entities may also comprise institutions that are established by a legislative act and operate more independently from the executive branch. In fact, in the context of GovVC initiatives, it seems to be that case that the institutions that take ownership positions in VC funds are typically not part of the executive branch.

In addition to the two above mentioned ambiguities, the conceptual distinction between *government-owned venture capital* and *government-sponsored venture capital* that is frequently used in the literature is not clear cut, as the two categories may overlap. This is a result of different authors using their own definitions of these two classes. While some authors consider only fully owned entities as *government-owned venture capital*, others also include majority owned entities into this definition.[6]

## Figure 3.3: Ownership-based classification of government involvement in venture capital funds

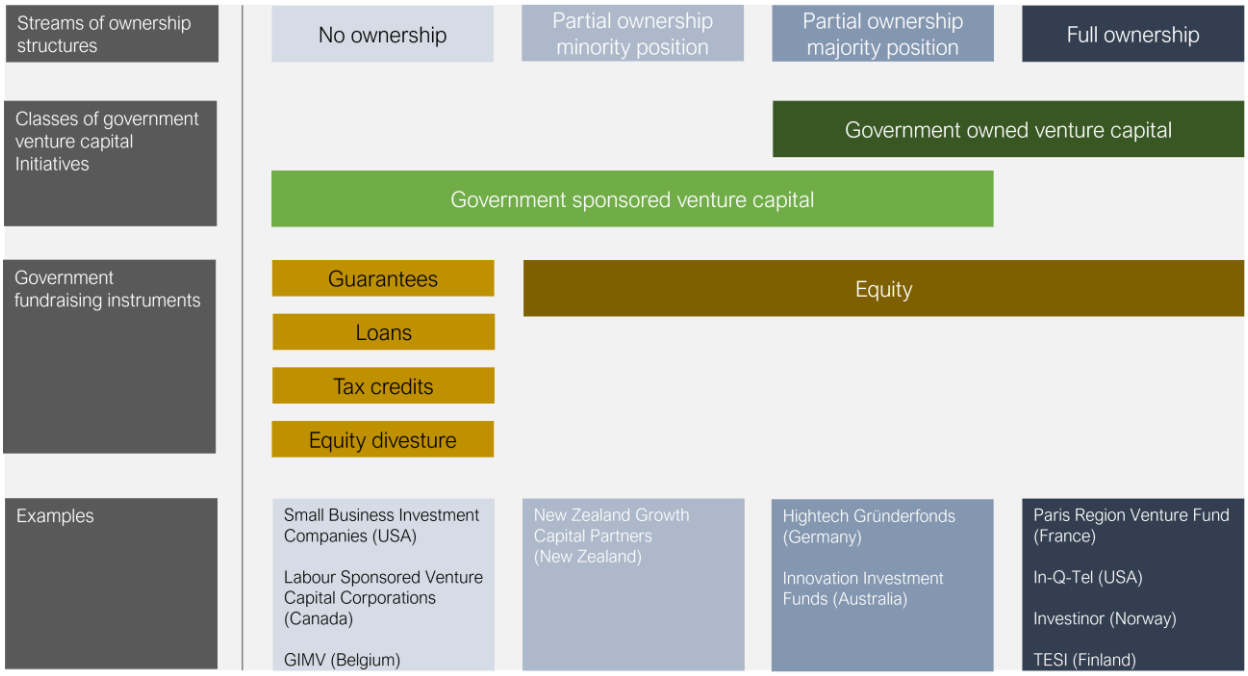



Figure 3.3 illustrates the ownership-based classification of GovVC funds. Based on the broad definition of GovVC, there are four distinct types of ownership positions to conceptually distinguish in GovVC initiatives: *Full ownership*, in which the government provides all funding to an entity. Examples of such initiatives would be *TESI* in Finland, *Investinor* in Norway or *In-Q-Tel* in the United States. *Majority ownership*, where an entity receives funding from both government and the private sector, but where more than half of the funds come from government. Examples include the *High-Tech Gründerfonds* in Germany and *Innovation Investment Funds* in Australia. *Minority ownership*, where the government provides less than half of the resources, and *no ownership*. Entities in which the government takes no ownership benefit from tax benefits or government subsidies either through government loans or guarantees to investors. In return, these entities may be subject to certain conditionalities imposed by the government. These can be, for example, restrictions on the financing instruments used, the stage of development or the location of the target companies. Examples of funds that give tax credits to investors include *Venture Capital Trusts* in the UK, and *Labour Sponsored Venture Capital Corporations* – LSVCC in Canada. *Small Business Investment Companies* (SBIC) in the U.S. are funds that may receive government guaranteed loans.[7]

So far, government ownership has been portrayed as a static element in the design of GovVC programs. However, there are several examples of (successful) initiatives where governments have gradually sold their stakes in funds and privatised government entities. One of the first examples for this is the *Gewestelijke Investeringsmaatschappij voor Vlaanderen* (GIMV) established in 1980 as a government-owned entity in Belgium. In the mid-1990s the company gradually sold off shares to private investors and in later years also to the public market. In the mid-2000s the government sold off its majority ownership but keeping a minority position. In 2023, the government fully divested its position. Another example are the funds that were part of the *Yozma* programme in Israel. Yozma was established as a government-owned fund (Yozma venture fund) that made both direct investments as well as investment into other funds that were set up as hybrid funds (Yozma funds) with a maximum ownership of the government of 40%. The programme gave hybrid fund managers an option to buy back the government shares at the cost of capital plus interest within the first five years of a fund's inception. In 1997, the Yozma venture fund was eventually privatised. One of the main differences between GIMV and Yozma is that in the case of GIMV,

the government still has a strong position appointing five of the twelve board members despite holding only 26% of the shares. Contrary to that, Yozma was completely privatised.

Gradually reducing (and eventually selling off) its position in government venture capital funds is a way of accounting for the dynamic environment in which VC funds operate. In a market environment, VC firms have an incentive to adapt to changing market conditions to be able to compete. This is not the case for government institutions. Government-owned funds may therefore not adapt to the operating standards in the market. Reducing government ownership over time should help government-owned organisations to operate closer to market needs and set incentives to adapt to changing market environment. There is of course a trade-off involved in this. If the main reason for governments to set up VC funds is to foster technologies with longer time horizons, such an approach may be infeasible and unsuitable.

As previously highlighted, ownership – while being an essential element of GovVC initiatives – is only one of several elements of GovVC designs. The following sections will look at design elements of GovVC initiatives – other than ownership - that policymakers use when designing these initiatives.

### *Fundraising instruments and incentives*

The fundraising instruments of GovVC funds come with different incentives, both for the government and the private sector partners who may provide (part of) the funding. This is especially true when focusing on government sponsored funds, where the government takes no ownership.

In the case of venture capital funds receiving government funding through loans, the private sector limited partners may benefit from the *leverage effect*. This implies that in case that a fund makes positive returns that exceed the interest on the loan, LP returns are amplified as the loan effectively increases the invested capital without diluting their equity. On the flip side, LPs may incur additional losses in case that the fund performs poorly. The latter effect may have strong implications on the types of firms that are financed through leveraged funds. For example, in the case of the SBIC debenture programme in the U.S., levered funds typically invest in less risky firms (Brewer, 1996[60]) with more predictable revenues. This are likely to be more mature firm that intent to grow the business.

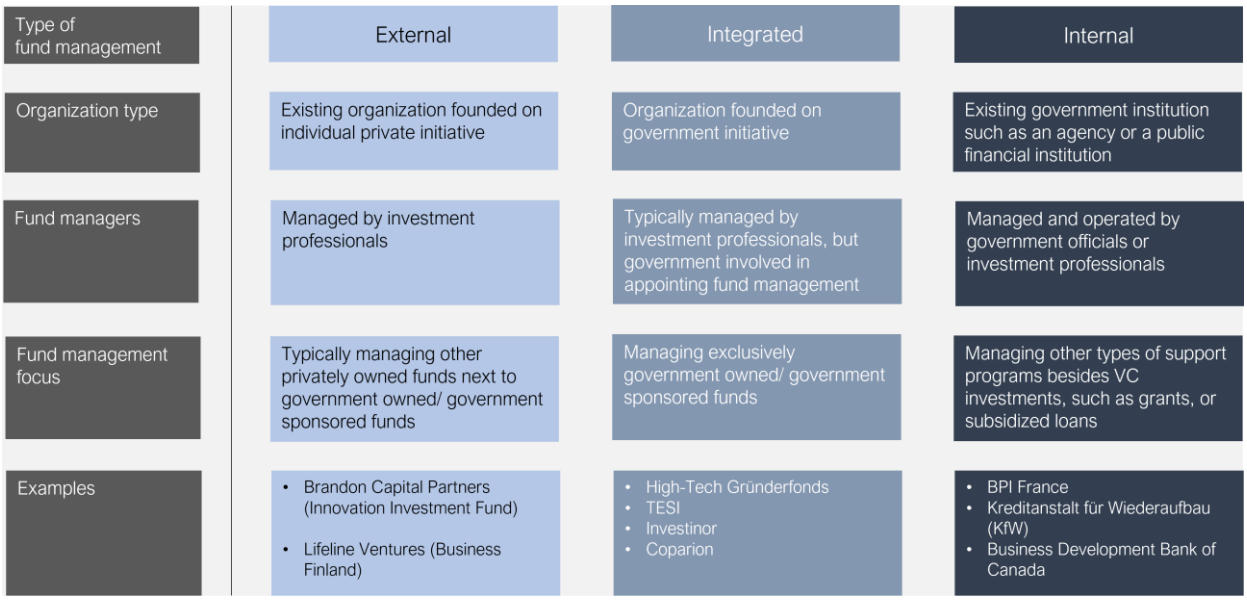
Another funding instruments that governments may use to support venture capital funds are guarantees. Guarantees provide a downside protection against losses for the private investors in GovVC initiative. An early example of an initiative involving guarantees is the discontinued *Deutsche Wagnisfinanzierungsgesellschaft*, the first German venture capital fund, which was set up as a public-private partnership and insured private sectors LPs with up to 75% of their losses (Becker and Hellmann, 2004[61]). Another example is the so called *Mittelständische Beteiligungsgesellschaften*, financial intermediaries at the state level taking equity positions in small and medium sized enterprises that are backed by guarantees from the state-level development banks. Guarantees offering protection against losses to other LPs and fund managers may be particularly attractive to less experienced fund managers (Jääskeläinen, Maula and Murray, 2007[62]).

## Fund management of government venture capital funds

In the VC industry, investment decisions are typically not taken by the owners of the funds. Instead, investment decisions are taken by specialised intermediaries, the so called GPs of the limited partnership (see Section 0 for an overview of the VC investment model).[8] The managers of these funds have extensive expertise in industries and technologies, which allows them to make informed decisions. Fund managers screen investment opportunities, conduct due diligence and monitor the performance of ventures (Sahlman, 1990[63]; Gompers et al., 2020[64]). Professional fund managers also add value to ventures through their technological, industry, and market specific expertise (Bottazzi, Da Rin and Hellmann, 2008[65]), and their network (Hochberg, Ljungqvist and Lu, 2007[66]). Funds that are managed by more

experienced fund managers exit a larger fraction of their portfolio companies (Zarutskie, 2010[67]). Consequently, the management of a fund plays a critical role for its performance and success.

### Figure 3.4. Fund management in government venture capital funds




A common assumption in the literature is that government-owned VC funds are managed within the government sector by government officials working in ministries or affiliated agencies (Bertoni and Quas, 2023[68]) who – unlike professional intermediaries managing privately owned funds – are not specialised in this domain (Lerner, 2002[69]). As government officials are viewed as lacking the experience and/or the appropriate instruments to take the right investment decisions in a dynamic market environment, this has led to scepticism about government managing VC funds (Lerner, 2010[26]). However, policy makers have several options on whom to delegate fund management, making it a central element in the design of public VC programmes. Figure 3.4 illustrates the different types of fund management arrangements that are found in GovVC funds.

First – as frequently assumed in the literature - the fund may be managed internally by an existing government entity. Typically, these entities are public financial corporations such as *BPI France*, *British Business Bank* (BBB), *BDC*, *Cassa Depositi e Prestiti*, *Korea Development Bank*, *Kreditanstalt für Wiederaufbau (KfW)* etc.[9] (see Marchese and Jimenez (forthcoming[70]) for case studies in nine OECD countries). The individuals working for those entities and consequently manage the fund could be government officials but may also be investment professionals who are employees of the public financial corporations. Often, these entities do not exclusively manage equity investments, but may also manage other types of government support instruments such as grants or subsidised loans. Second, governments may decide to have the fund managed externally and delegate fund management to an existing private entity. These fund management organisations are founded on private initiative and managed by investment professionals. Typically, these organisations manage other (fully) privately owned funds next to the funds that receive government funding. Examples of such organisations are Brandon Capital Partners who participated in the Australian *Innovation Investment Fund* program, or Lifeline Ventures who manage funds on behalf of *Business Finland* next to other funds. Finally, governments can set up new organisations that are either fully owned by the government or a public-private partnership. The organisations operate much like an external entity, but they are not founded upon private initiative, but as part of a government program.

These organisations are thus integrated into the governments' agenda. They are managed by investment professionals – i.e., individuals with experience in the VC industry – who are appointed by the government.

Few studies empirically investigate differences in fund management between government and private VC funds (see Box 3.1). The few that do are not explicit in how they define GovVC funds. While these studies open the window into potential differences between VC fund managers, it is unclear what drives those differences. Different types of value-adding activities could reflect both differences in human and social capital as well as differences in the mandate of GovVC funds. In targeted initiatives, the managers of GovVC funds may be required to invest in certain types of technologies or regions in which the supply of managerial talent, corporate buyers or other types of partners might be scarce. In that case the lower reported levels of certain types of value-adding activities of GovVCs may reflect differences in their mandate rather than differences in human or social capital. Conversely, the organisational arrangement of internal organisations such as public financial institutions may not be attractive for professional fund managers. The scope of these institutions is broad, and the lion share of their activity often rooted in the traditional bank lending business, which does not necessarily correspond to the requirements of innovation and growth-oriented start-up companies. For example, Moretti (2024[70]) provides evidence from expert interviews for the German state development bank KfW, that historically, "even KfW's programmes theoretically targeted to start-ups [were] used more by traditional SMEs in their start-up phase, rather than by true innovative start-ups." Also, the work environment in a large bank-like organisation like KfW might not match the identity of VC professionals who may prefer working in an agile and dynamic environment. However, Moretti (2024[70]) also provides examples of large public institutions that have established structures that are more in line with the investment practices of the VC industry and therefore better cater to the needs of innovation and growth-oriented start-ups. For example, BPI France has established close ties with private VC investors. Top managers are usually recruited from private VC funds and BPI France, they establish and consolidate investment practices from the private sector. Young professionals, on the other hand, often consider BPI France as a steppingstone where they can gain experience, build contacts and a reputation to transition into the private sector. BPI France does not replicate the compensation structure of private funds, but its "revolving doors" with the private VC industry provide the basis to strongly orientate itself towards private sector investment practices.

BPI France is certainly a special case, which is made possible by the strong ties between the upper echelons and the state in the French system. A more common approach to bringing private sector practices in government entities is through *integrated fund management initiatives*. Typically, these initiatives are set up as legally independent entities and specifically geared towards VC funding. Examples of such entities would be *TESI* (Finnish Industry Investment Ltd), a limited liability company set up by the Finish government in 1995, *Investinor AS* established in Norway in 2008 and *Coparion* established in Germany in 2016. These organisations, like public development banks, are more independent of the government than ministries. However, unlike public development banks, their task is specifically geared towards VC investments. Like BPI France, their staff is typically composed of investment professionals with extensive industry experience. In some cases, the compensation structure of these integrated funds may be similar to private VC funds, introducing performance-based compensation to retain top fund managers. For example, the *High-Tech Gründerfonds* established in 2005 in Germany has profit sharing components at the fund and the individual portfolio manager level, that are paid out if the fund generates extra profit beyond the minimum return agreed with investors (Moretti, 2024[70]). Such compensation arrangements are similar to the carried interest model that is used in the private VC industry. To strike a balance between private sector practices and government objectives, the investment process may involve government representatives or experts.

This section has highlighted the role of fund management, or put differently, the role of the individuals taking investment decisions in GovVC initiatives. While research indicates differences in the activities of fund managers in GovVC funds compared to private funds, it is not clear what drives these differences. This section has shown that governments have multiple implementation routes available, each with varying

degrees of integration between the management teams of funds and the government. The next section will focus yet on another dimension that may explain observed differences, which is governance.

### Box 3.1. A window into fund management differences between government and private VC

VCs' investment decisions are typically viewed as a three-stage process, consisting of a screening phase in which potential investment opportunities are evaluated and selected, a contracting phase where deals are structured and investment terms are negotiated, and a post-investment monitoring and advising phase in which VCs leverage their expertise and network to add value to companies (Gompers et al., 2020[64]). The limited literature that exists focuses on differences in value-adding activities, while there are few accounts on differences in the selection and contracting phases.

A recently published Swedish case study provides an initial glance into the selection process of GovVC funds. The study, conducted by Johansson et al. (2019[71]), observed managers of a GovVC fund in Sweden as they made decisions on 125 investment proposals. GovVC managers seem to use key assessment indicators similar to those of private venture capital funds and mostly rely on cognitive logic, akin to private VC funds, rather than normative or regulatory logic. This indicates similarities with the selection process of private venture capital funds. Yet, more systematic research would be required comparing the selection process of private VC fund managers and GovVC directly.

Bottazzi, Da Rin, and Hellmann (2008[65]) survey 503 venture partners in 119 venture capital funds in 17 European countries. Their results indicate that partners of GovVC funds are less likely to interact with their portfolio companies compared to partners of private independent VC funds but show no significant difference when it comes to recruiting senior management, hiring external directors, or helping the company to raise additional funds. However, the robustness of these results is not guaranteed as only 5% of the funds in their sample are affiliated with government.

Luukkonen, Deschryvere, and Bertoni (2013[72]) analyse the responses of 88 start-up companies (22 of which funded by GovVC) to a survey on the activity of their lead investors. Their results suggest significant differences between fund managers of private and GovVC funds. GovVC are less engaged in the professionalisation of start-ups (i.e., restructuring the management team and hiring board members, including international board members), exit orientation (i.e., finding acquirers for trade sales and prepare for other exit routes), as well as building partnerships for technological development. Yet, in terms of strategy, technology and market positioning, fundraising, and credibility towards other stakeholders, founders report no significant differences. The authors conclude that the overall value-adding activities between the two types of investors is not different, but that the profiles of value-adding activities differ. Again, given the small number of observations, the results should be interpreted cautiously.

## Governance and incentives, and investment processes in Government VC funds

Entrusting the fund management to professional fund managers opens up the potential to leverage their expertise and boost the performance and impact of GovVC initiatives. However, delegating decisions to fund managers also entails additional risk, which is captured by the notion of “agency costs.” In fact, agency problems are not unique to GovVC (Gompers and Lerner, 1999[73]), but they may be exacerbated in GovVC initiatives. The core predicament lies in the potential misalignment of interests between the government and the fund manager. Fund managers may prioritise personal gain or short-term profitability over the long-term objectives and public interest. This misalignment can lead to moral hazard, where fund managers may deviate from the government’s objectives, e.g., by investing in lower risk or low impact ventures. This

may not only jeopardise the government's objectives but also increase the risk of crowding out private VC investments. What may exacerbate the agency problem in GovVC initiatives, is that that these initiatives often prioritise societal goals over maximizing returns. First, societal objectives such as promoting underdeveloped regions or risky technologies, and the criteria for achieving these goals may be difficult to codify. Second, making such types of investments involves making riskier bets. Since the government observes outcomes and does not take investments decisions itself, it is difficult for it to know whether failures are a result of increased idiosyncratic risk in investment opportunities (as intended by the government) or lower effort by the fund manager.

Another issue in GovVC initiatives is related to the government itself. Elected officials may seek short-term gains to secure re-election, which can clash with the long-term nature of VC investments. During electoral cycles, there may be a propensity to prioritise projects that yield immediate results or political capital, potentially diverting funds from promising but longer-term ventures (Bertoni and Quas, 2016[74]). Government officials may also engage in clientelism, and misuse GovVC funds to gain political support from influential individuals or groups. More generally, government officials may have strong incentives to provide tangible outcomes that they can be easily publicised and may prioritise quantity over quality. All this leads to biased investment decisions and suboptimal use of funds (Lerner, 2002[69]; Fang et al., 2018[75]). This can hinder the development of a robust innovation ecosystem, as GovVC programmes may be subject to changing priorities and funding fluctuations that undermine stability and consistency.

Striking a balance between political pressures and fostering innovation through sustained, patient investment is a critical challenge in the design of government-led VC initiatives. Addressing both agency costs and the threat of political pressure requires designing organisations and programmes with robust governance mechanisms. These organisations must be able to take on high risks, but at the same time invest diligently and generate stable returns to operate profitably (Moretti, 2024[70]).

### *Types of Government VC organisations and governance*

Few government bodies (e.g., ministries) directly make equity investments. Instead, most GovVC programmes are managed by other types of organisations. These organisations may be controlled by the general government but operate as legally independent entities. Legal independence should make these organisations more resilient to political pressure and short-term changes in political direction that could undermine the long-term orientation of public VC programs. Still, additional governance principles may be in place to cater to the specific needs of different GovVC initiatives.

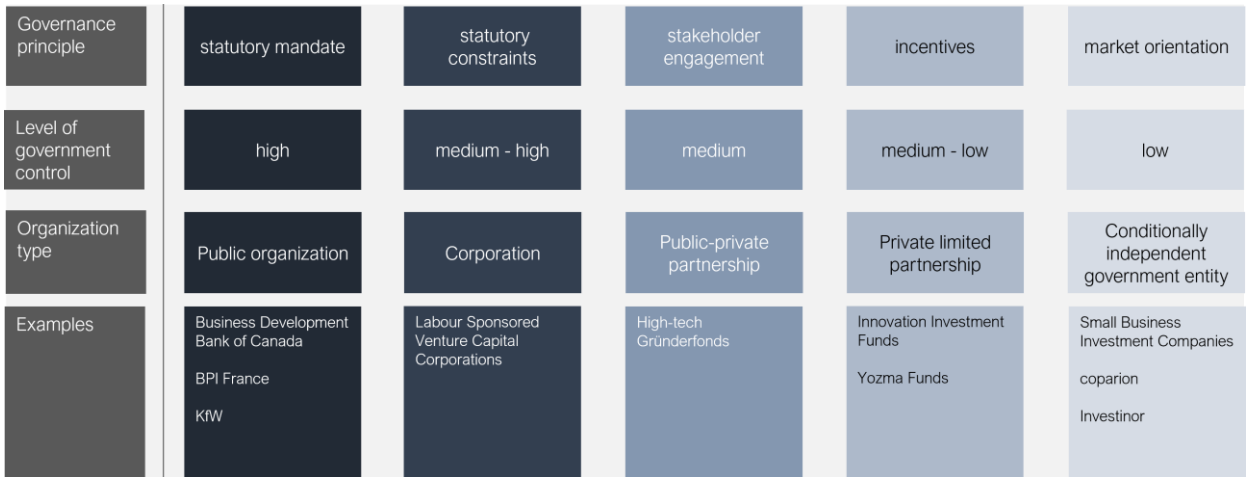
We distinguish between five different types of governance principles of GovVC programmes with varying levels of government control (see Figure 3.5). The governance principles are typically related to specific types of organizational arrangements. Some organisations may be based on multiple of these governance principles. The link between organisational types and governance principles is partly based on reports from the literature. The depiction in Figure 3.5 is simplified and serves illustrative purposes.

Organizations operating under a statutory mandate operate within a narrowly defined regulatory and legal framework. Typically, a board or governing body – consisting of representatives from government - oversees the organisation, ensuring that its activities align with the established mandate. Ownership of these organisations is concentrated in the hands of government and government control in such organisations is high. Public organisations – such as public financial corporations – typically operate on a statutory mandate.

Other organizations are only subject to statutory constraints. For example, organizations may benefit from certain types of subsidies or tax incentives if they comply with certain governance principles or legal arrangements (Cumming and MacIntosh, 2006[5]). Depending on the nature and number of constraints, the level of government control may be high. However, governments take a less active role compared to organizations operating under a statutory mandate and only direct investment decisions to the extent that

they comply with the statutory constraints. Governments may not even take a direct ownership position in such organizations. Prominent examples of such organizations are the Canadian *Labour Sponsored Venture Capital Corporations*. In those corporations, ownership is dispersed among many shareholders that benefit from tax breaks. These types of organisations are not widespread.

### Figure 3.5. Organizational arrangements of government VC initiatives and their governance




The governance principle of stakeholder engagement involves various stakeholders including government, industry partners, scientific experts, and other communities. These stakeholders may be broadly engaged and may take either an advising role or an active role in investment decisions. Organisations that operate on the principle of stakeholder engagement are often organized as public-private partnerships (PPPs). The level of government control in PPPs is more limited as both public and private sector interests need to be respected to achieve common goals.

Incentives play a crucial role in the VC industry. Governments may provide incentives to private sector partners to direct investment decisions of otherwise privately held VC funds. For example, governments may act as limited partners alongside private sector counterparts but give private sector partners and fund managers preferential profit-sharing rates or priority in payout timing (see also Table 3.1).

Finally, GovVC initiatives entail organisations that operate independent from the government, but whose investment decisions are conditional on the private sector. In other words, where funds are invested is directed by the private sector. Unlike the limited partnerships discussed before, there are typically no additional incentives for fund managers or other LPs to steer investment decisions into a certain direction. Although statutory restrictions may also come into play here, the funds are only activated if suitable investment opportunities are deemed profitable by the market.

### *Supervisory boards in Government VC funds*

A crucial element in the governance of government VC initiatives is the supervisory board. Supervisory boards oversee and guide the strategic decisions and management of a company. They act as a check and balance on the executive board, ensuring that a company's interests, shareholders, and stakeholders are protected and aligned with the long-term vision of the organisation. In GovVC initiatives, the importance of the supervisory board lies in ensuring responsible and strategic deployment of taxpayers' money, safeguarding against misuse, and promoting the growth of promising start-ups while contributing to the overall economic development and job creation in the country. Supervisory boards in GovVC initiatives

may bring in external experts from industry and science, and therefore provide critical input for the strategic orientation of a programme to align the government objectives and profitability requirements.

### *Accountability and transparency of Government VC programs*

Accountability and transparency of initiatives are paramount for effective governance. In GovVC initiatives, they play a pivotal role in fostering public trust and ensuring the efficient and equitable allocation of public funds. To uphold their credibility and integrity of programs, governments must establish mechanisms that promote accountability and transparency. This entails clear disclosure of programme objectives, funding allocation criteria, and decision-making processes, enabling stakeholders to understand and scrutinise the program's operations. Regular evaluation studies and performance assessments are essential tools in this regard, providing an objective and data-driven means to measure the impact, efficiency, and effectiveness of GovVC programs. Data from the OECD STIP compass indicates that only 11% of all equity instruments geared towards entrepreneurship have been evaluated.

## Private sector partners in Government VC funds

Some GovVC fund designs assign a key role to private sector partners. Private sector partners may provide additional funds to GovVC initiatives, but they may also benefit programmes through their industry and market specific expertise. Reputable partners may further add credibility to a program. Conversely, private partners may also benefit from GovVC initiatives. The advantages for private sector partners, however, may depend on the specific design of a fund a program. Different types of private sector partners should therefore find distinct types of programmes attractive.

When GovVC initiatives involve private sector partners, an additional layer of complexity is added to government initiatives. Besides balancing potential agency conflicts and regulatory capture of fund managers, they also need to respond to potential conflicts from diverging interest between the government and private sector, for example when they both participate in a fund as limited partners (Murtinu, 2020[76]). As a result of the potential conflicts between government and private sector limited partners governance mechanisms may be more complex than in conventional VC fund arrangements. Besides the implementation of monitoring systems, incentive systems play an important role, some of which are characterised by asymmetric profit and loss distributions (Jääskeläinen, Maula and Murray, 2007[62]). **Error! Reference source not found.** provides an overview of different types of design features and incentive mechanisms used in GovVC programs.

GovVC funds that involve private sector partners can broadly be classified into two types: hybrid funds and government co-investment funds. The following subsections will highlight their differences and highlight some empirical findings on them from the literature.

### *Hybrid funds*

Hybrid funds are GovVC funds that receive part of their funding from the government and part from the private sector. In those funds, the government may take a majority or a minority position. In hybrid fund initiatives that are discussed in the literature, the government invests into the hybrid fund via equity. However, as discussed in the previous section, there are also other types of initiatives where governments provide guarantees or loans to the fund. Hybrid funds are managed by legally independent VC firms that channel and allocate public financial support to start-up companies. The fund management may be either external or integrated into a government initiative. Hybrid fund arrangements tend to be complex, as they involve different types of LPs whose interests potentially differ from the government. Aligning those interests through the right incentive mechanisms is a key challenge in the design of hybrid VC funds (Jääskeläinen, Maula and Murray, 2007[62]). Even hybrid funds that share similar objectives and ownership

structure may have different governance structures and investment processes. This is illustrated here with two examples of hybrid fund initiatives.

### Table 3.1. Design features of government venture capital funds

| Feature | Description | Examples (present and past) | Effects on profit distribution |
|---|---|---|---|
| Public investor co-investing with private investors | Government matching the investments made by private investors | Public participation: <50% of the fund: Europe/EIF Finland/FII Australia/IIF and Pre-seed Fund USA/SBIC and SSBIC UK/regional venture capital funds | |
| Timing of cash flows | Ordering of the cash flows so that the public investor puts the money in first and gets the money out last | UK/regional venture capital funds | Differential timing of the investment of public and private investors |
| Public participation as a loan | Government provides its share of capital as an interest-bearing loan | USA/SBIC UK/ECF | Leveraging the returns to private investors with a loan |
| Capped return for public investors | After all the investors (including the public investor) have received a pre-agreed IRR, the rest of the cash flows are distributed to private investors only | UK/regional venture capital funds Australia/pre-seed fund Chile/CORFU | Limiting the profits entitlement of the public investor |
| Buy-out option for private investors | Private investors are given the option to buy the share of the government at (or until) a specific point of time at a predetermined price (typically nominal price + interest) | Israel/Yozma New Zealand/New Zealand venture investment fund | |
| Downside protection | Government underwrites losses from the portfolio | Germany/WFG Germany/tbg & KfW Denmark/the equity guarantee program | Guarantee of compensation to the private investor for loss of invested capital |
| Fund operating costs | Government subsidises the management company to cover some of the costs in running the fund | Europe/European seed capital scheme | Not examined |

Source: Based on Jääskeläinen et al. (2007[62])

The first example of a hybrid fund initiative is the *Innovation Investment Funds* (IIF) in Australia. These funds were designed to stimulate investment in early-stage, high growth potential companies across various industries, particularly in high-tech sectors. The programme was first established in 1997 and aimed to bridge the funding gap for innovative start-ups and foster a culture of entrepreneurship. Next to providing more funding to companies, the programme also aimed to build experienced fund managers and establish a self-sustaining Australian early-stage, VC industry. The fund operated by providing capital to VC firms, which, in turn, had to invest equity in promising start-ups and innovative enterprises. The programme ran for several rounds with a typical length of a funding cycle being around five to ten years. The operation of the fund involved private VC firms competing for government funding and matching investments. The Australian government, along with private sector investors, provided capital to the private VC firms, with the public sector providing the majority of funds. The fund manager then selected and invested in early-stage start-ups with high growth potential. The license agreements through which the independent fund managers obtained government resources included various clauses aimed at effectively restricting the liability of the Australian government. Except for limitations on certain types of transactions, the license agreements gave the fund managers extensive autonomy over investment decisions. To give private investors an incentive to participate in a fund, the programme included an asymmetric profit distribution which – after paying both government and private investors their initial capital commitments plus interest – gave private investors 90% of the excess profits, which had to be shared with the managers of the fund. Other than this, the government did not provide any additional incentives to private investors.

Evaluations of the IIF found that the funds performed well in supporting early-stage companies (see Box 3.2).

The other hybrid fund example is the *High-Tech Gründerfonds* (HTGF), a government-backed seed-stage VC fund that was introduced in Germany in 2005. It was established as a public-private partnership, with the German Federal Ministry for Economic Affairs and Energy, KfW Banking Group, and various industry partners contributing to the first hybrid fund. HTGF has raised a fourth hybrid fund in 2023 which also includes contributions from private investors. As is the case for the IIF, the primary objective of the HTGF is to support innovative, technology-driven start-ups in Germany and help them turn their ideas into successful businesses. The fund focuses on early-stage investments, providing funding to start-ups with high growth potential and innovative business models. Also, like in the case of the IIF, the HTGF is managed by professional fund managers and obtains the majority of funds from the public sector. With the HTGF, however, the government retains more control over the investment decision process and the fund's mission statement also sets out that the fund is committed to cooperation and partnerships. The HTGF uses a multi-stage decision-making process that begins with the pre-selection and due diligence review of potential investment projects by the fund management. Final investment decisions are taken by an investment committee based on the pre-selected investment proposals. In total, there are three thematic investment committees, each consisting of five members. Three of the members are appointed by the Ministry, and one each by KfW and industry representatives. The investment committees consist of scientific experts, the VC sector and business representatives with founding and funding experience. Also, the investment terms of LPs are on a pari-passu basis, consequently, profits distributed pro-rata. Evaluations of the HTGF found that the fund met its objectives.[10]

The two examples of the IIF and HTGF illustrate that while both receive the majority of funds from the public sector, their investment decision-making process and governance structure differ significantly.

### Box 3.2. Evidence on hybrid funds examples

**Hybrid funds vs. other types of VC funds**

Various studies look at how hybrid funds differ from other types of venture capital funds (both private- and government-owned). These studies fall into two categories: those that look at specific programs, and those considering various hybrid funds across countries and regions. Some of the first evaluation studies on hybrid funds in the literature investigated the IIF in Australia (Cumming, 2007[77]; Murray et al., 2012[78]). These studies found that funds performed well in supporting early-stage companies, giving companies access to follow-on financing as well as successful exit opportunities. However, IIF supported companies were also more likely to fail and the funds only delivered modest returns to investors. Against the background of historically higher returns in later stage private equity deals, the study by Murray et al. (2012[78]) sees this as a major impediment to create a self-sustaining early-stage market segment. It should be noted here that the evaluation did not consider all IIF funds that the government licensed, as the more recent funds were not yet able to provide meaningful information at the time of the evaluation. In the considered funds, most investments went into biotechnology and engineering. Fewer investments into information technology. A conclusion about the attractiveness to private investors can be drawn in 2025, when the investment period of the last IIF funds ends and they are paid out to investors. In another study, Cumming and Johan (2008[79]) look at Pre-seed Fund Program in Australia to compare hybrid funds to non- GovVC funds. They find that the programme partially cannibalised other types of hybrid funds in Australia. Within the programme they also find suggestive evidence for substantial heterogeneity related to the fund management. Looking across different countries, Brander, Du, and Hellmann (2015[58]) find that firms that are financed by hybrid funds – which in their case also include funds that are sponsored through tax credits, or other subsidies from the government – raise significantly less funding and have a lower likelihood of having a successful exit when compared to purely private VC funds. However, they raise more funding and have a higher exit probability when the hybrid fund syndicates with other private VC funds. They also find that hybrid funds tend to fare better compared to fully government-owned funds.

**Heterogeneity within hybrid funds**

Other studies look at the heterogeneity within hybrid funds. Buzzacchi, Scellato, and Ughetto (2013[80]) look at the investment strategy of 179 hybrid funds that were partially funded by the European Investment Fund (EIF) and partially from other funding sources in the period between 1998 and 2007. They show that higher levels of public ownership in hybrid funds is associated with longer investment durations and a lower likelihood to observe write-offs. Likewise, Standaert and Manigart (2017[81]) investigate hybrid funds that were funded by the ARKimedes fund-of-fund in Flanders. Their results point towards a negative association between higher levels of public ownership and employment growth. However, it is worthwhile noting that the effects should not be interpreted as causal, as the ownership share might be related to unobserved qualities of the independent fund managers. That is, less experienced fund managers or those following riskier investment strategies might be more inclined to take on government resources.

### *Types of private sector partners in hybrid fund designs*

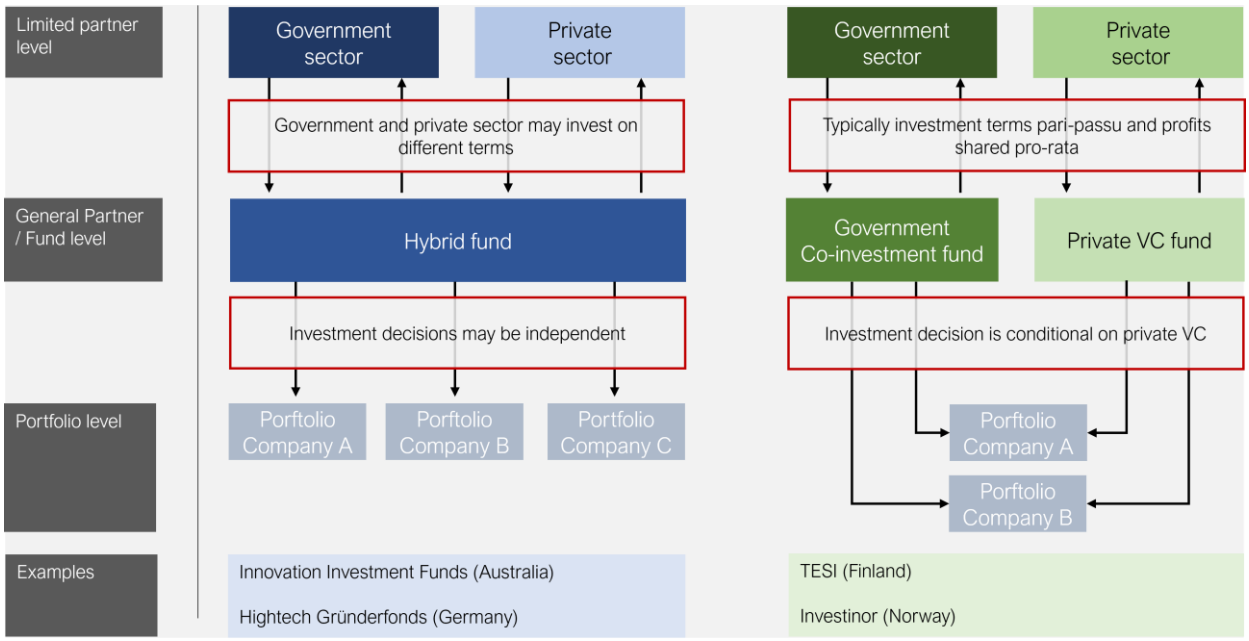
In line with the literature, we may distinguish between four types of non-government LP (Block et al., 2018[53]): institutional investors, private individuals, banks, and corporates. Each of those types has slightly different objectives. While institutional investors are purely profit-oriented, private individuals or family offices, banks and companies may derive additional strategic benefits from their limited partner role. For example, inexperienced private individuals or family offices may gain access to the hybrid fund's network

and deal-flow allowing them to step foot into the VC market. Similarly, banks may be interested in establishing new lending relationships with a hybrid fund's portfolio companies (Hellmann, Lindsey and Puri, 2008[82]). Corporates through their role as LPs may learn from a hybrid fund programme and establish relationships with start-up companies and based on this experience, build their own VC initiatives. These objectives need to be considered already in the design phase of a programme. For example, if institutional investors are to be involved, the programme will probably have to focus more on the design of the profit distribution, while if strategic partners such as banks, private individuals or corporations are to be involved, it will be more important to provide LPs with access to information through appropriate governance structures. Considering the role of the other LPs and their objectives already in the design phase of the programme is crucial to prevent potential principal-principal conflicts between the government and other LPs, which may undermine the success of a hybrid fund programme (Becker and Hellmann, 2004[61]).

### *Government co-investment funds*

Hybrid fund structures may turn out to be quite complex. Depending on the type of LPs, it may be difficult to structure a fund in a way that appropriately aligns the objectives of the government and the other LPs. The societal objectives of a programme pursued by the government may stand in contrast to the strict return orientation of profit-seeking LPs. Alternatives to hybrid funds are *government co-investment funds* (see Figure 3.6).

**Figure 3.6. Characteristics of hybrid vs. co-investment funds.**




Note: Besides operating co-investment funds, TESI and Investinor also invest in hybrid funds via fund-of-funds models.

Government co-investment funds are fully owned by the government and just like hybrid funds invest directly into start-up companies. The difference to hybrid funds is that the private sector investors do not jointly invest into one fund with the government, but coordinate with the government more loosely and flexibly, e.g., through an investment syndicate agreement. As government co-investment funds are financed exclusively from the public sector, and therefore fully owned by the government, they are a subtype of government-owned VC funds. They may be either managed by external fund managers, like in the case of hybrid funds, or internal fund managers. However, the fund managers cannot make independent investment decisions, but need to find private co-investment partners alongside which they

make their investment. While this limits the scope of investment opportunities that the government co-investment fund managers can pursue, it serves to prevent investments in dimly positioned business models as private investors should have a stronger incentive to safeguard their investments. Examples of such types of funds include the *Finnish Industry Investment* (TESI), *Coparion* in Germany, and *Investinor* in Norway, to name but a few.

As in the case of hybrid funds, government co-investment funds may focus on investments alongside specific types of private sector partners. An example is the European Angel Fund initiative which is advised by the EIF. EAF engages in long-term contractual relationships with Business Angels, i.e., private individuals directly their own resources directly into start-up companies. Investment decisions are taken by the Business Angels and their investments are then matched on a pari-passu basis by EAF.

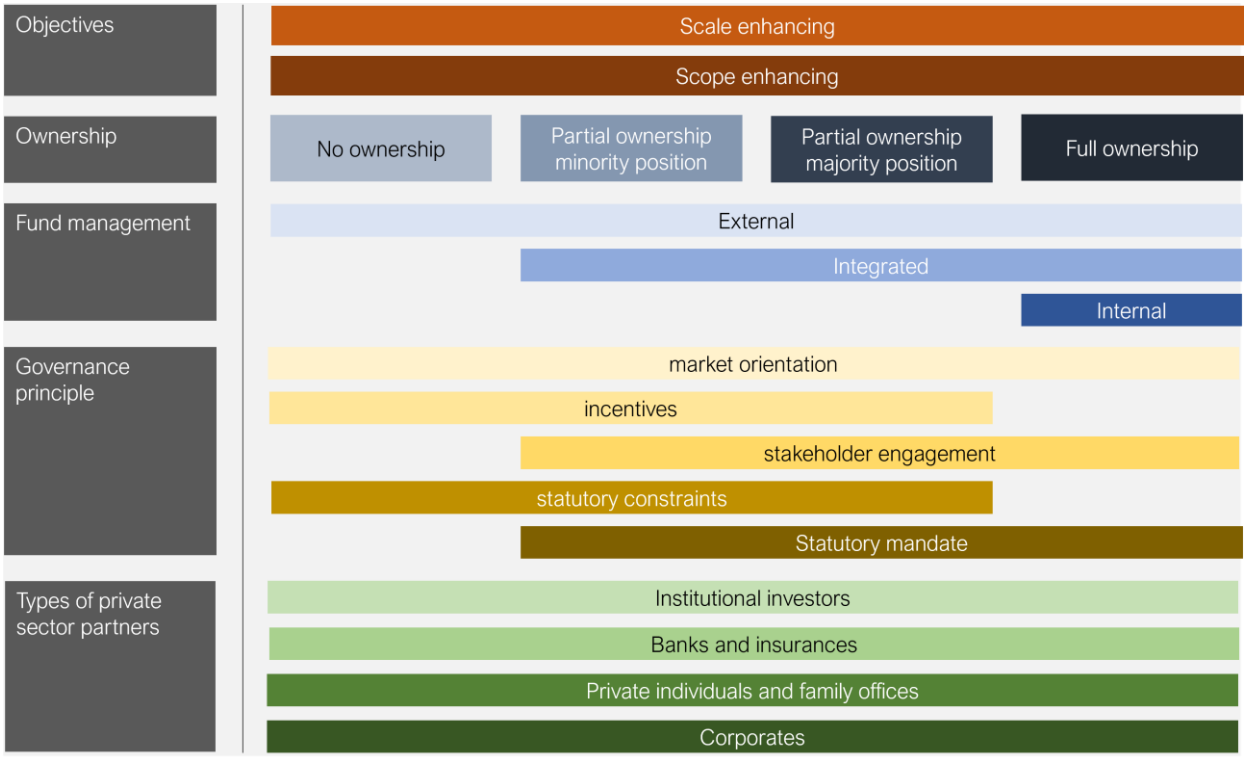
Empirical results point towards a positive effect of syndication with private co-investment partners (Alperovych, Groh and Quas, 2020[83]), in the case of innovation even exceeding the performance of investments that involve only private investors (Bertoni and Tykvová, 2015[84]; Clò, Frigerio and Vandone, 2022[85]).

# 4 Conclusion

GovVC initiatives are widely adopted by governments to provide capital to entrepreneurs, technologies and regions falling short of private VC investments and foster innovation ecosystems. GovVC may broaden both the scale and the scope of the VC market and boost innovation and long-run competitiveness in the economy at large. Prior research provides an ambiguous picture on the effectiveness of GovVC funds, which can in part be attributed to different definitions of GovVC comprising different types of funds and design features of government initiatives.

To equip policymakers with tools to navigate the fragmented landscape of GovVC initiatives and produce coherent policy approaches, a more systematic framework to organise the design features of government VC initiatives is needed. The aim of this paper was to propose a taxonomy of GovVC initiatives to provide a more comprehensive picture of relevant design elements these initiatives (see Figure 4.1).

**Figure 4.1. Elements of taxonomy on government venture capital.**




At the outset, the taxonomy underscores the diverse objectives that underpin the establishment of GovVC funds. These objectives encompass scale-enhancing entities, which aim to boost the overall supply of VC in an economy. They also encompass scope-enhancing initiatives, which target specific technologies or regions to alleviate market frictions. Secondly, the role of ownership is considered, which has been used by most cross-country studies to delineate distinct types of GovVC initiatives, but – as the taxonomy shows - has limitations in capturing government involvement. Thirdly, building on prior work that highlights the

role of human and social capital of fund managers for the performance of VC funds, the taxonomy presents different types of fund management arrangements in GovVC initiatives. Finally, the taxonomy looks at the role of governance and private sector partners in GovVC funds. Private sector involvement can vary in terms of commitment, influence, and risk-sharing, impacting the dynamics of GovVC initiatives and their ability to leverage private sector expertise and resources. These factors may be intricately related to the type of private sector LPs.

In line with prior literature, the taxonomy recognises that public-private collaboration is integral to performance and achieving programme objectives (Colombo, Cumming and Vismara, 2014[10]; Lerner, 2010[26]). The taxonomy highlights different ways in which private actors can be involved in government VC initiatives, such as through external fund managers, private sector LPs or co-investments partners or experts on supervisory boards. Yet, based on the existing literature, neither the prevalence of these design features nor their relative importance for programme performance is clear.

Future research may find the taxonomy useful to direct efforts on filling important gaps in the literature. For instance, considering the existing literature, it is not clear how much of the performance disparities between public and private VC initiatives can be ascribed to variations in the skills and relationships of fund managers versus whether it is primarily linked to the distinct goals of public VC funds. Similarly, there is no systematic investigation into how the design of programs is related to specific objectives. Understanding this is essential for evidence-based policy making. A key requirement for this that should be addressed in future work is the creation of an empirical data base that covers a broad spectrum of public VC initiatives capturing their distinct design features.

In summary, this taxonomy provides a comprehensive framework for classifying and better understanding the complex landscape of GovVC funds and can serve as an impetus for policymakers in the design of new initiatives.

# Endnotes

[1] See for example the model by Chan (1983[92]) to explain how costly acquisition of information about investment opportunities may be an impediment to the formation of a venture capital market.

[2] The regulation that the authors investigate stems was part of the Volcker Rule, which was effective between 2014 and mid-2019 and prohibited banks and their affiliates from investing in or sponsoring venture capital funds. In some U.S. states banks account for up to 30% of funding for venture capital funds.

[3] The SBIR program, for example, only provides grants and would not be considered in this paper. Although in an early work, Lerner (1999[88]) used the term Government Venture Capital in reference to the SBIR program, the literature today uses the term almost exclusively to refer to equity-linked financing instruments.

[4] This corresponds to the definition of public control in the system of national accounts (SNA).

[5] For example, the *Finish Climate Fund* – a government initiative with a focus on investments in net-zero technologies – says in its mission statement that it "focus[es] on combating climate change, boosting low-carbon industry and promoting digitalisation." Similarly, *Kvanted*, a non-governmental Finish industrial tech investor says that its "investment philosophy is rooted in accelerating industrial decarbonization and digital transformation." *Green Code Ventures* – another non-governmental Finish VC firm – describes itself as a "venture capital firm supporting startups that have a positive environmental and social impact while building scalable profitable businesses."

[6] For example, in the definition by Bertoni and Quas (2023[68]) a government owned venture capital fund is "a government owned captive fund that mainly (if not exclusively) uses public resources", which implies that funds that are partially but majority owned by the government are part of their definition. In their analysis on government sponsored funds, Buzzacchi, Scellato and Ughetto (2013[80]) define them as funds through which "independent VC firms are used to channel and allocate public financial support". They use the term hybrid fund synonymously for funds that are partially owned by the government. About one in five of these funds in their analysis are majority owned by the public sector.

[7] Note that LSVCC in Canada are not organised as limited partnerships but as corporations.

[8] Note that these intermediaries typically hold minority stakes in the funds they manage while the lion share of funding is brought in from external sources.

[9] The mandate of these institutions is oftentimes broad and includes besides the provision of venture capital to promote innovation domestically may also include providing development finance abroad. Given the

wide scope of their activities, they are referred to as development finance institutions, public development banks, public investment, or reconstruction banks.

[10] The evaluators of the first two HTGF funds found that the funds successfully achieved its stated mission, in particular the stimulation of the seed segment and establishing a network with co-financing partners and other relevant stakeholders in industry and the startup community. Start-ups that received funding were more likely to receive follow-on funding from private venture capital investors compared to firms that only made it through the pre-selection process. HTGF supported companies were also more likely to receive additional grants and reported significantly higher improvements in business development. While the duration of the investment process was initially seen as unreasonable, it improved with the second fund. The need for government funding in specific segments remained, despite improved financing conditions in the seed phase. An evaluation of the third fund is pending.

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