Industrial Policy via Venture Capital*

Martin Aragoneses† — *INSEAD Finance*

Sagar Saxena‡ — *University of Pennsylvania*

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Abstract

In this paper, we document that around 30% of new funds invested into venture capital (VC) in Europe come from the government. We link European firm micro data to reports on the portfolio of VC investments of the largest government agency engaged in this form of industrial policy via VC funds. We study the allocation of government-backed venture capital, showing that these funds reach 15% of VC-backed firms in Europe, over 30% of all employees that work at such firms, and nearly 40% for relatively large young firms. We also trace out the impacts on this form of government investment on firm dynamics, finding government-backed VC financing has significant and persistent effects on young firms. In contrast, despite significant efforts spent towards later-stage financing, government funds targeting mature firms seem to be much less effective. We develop a model of firm life cycle dynamics in which the government funds financially constrained entrepreneurs via VCs. We show that government spending shocks intermediated via VCs as advocated by the Draghi (2024) Report can increase dynamism especially among young firms at the micro level. However, whether such policies increase output and productivity at the macro level greatly depends on the details of their implementation and the economic environment. Our findings shed light on the puzzling divergence between high dynamism in young firms and stagnating productivity in older firms in Europe.

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†Email: martin.aragoneses@insead.edu

‡Email: sagarsxn@wharton.upenn.edu

1 Introduction

Europe's aggregate productivity growth and business dynamism are underwhelming. A recent report by Mario Draghi[1] highlights that a crucial piece of this EU dynamism puzzle is that private investment remains low in the EU relative to the United States despite higher volumes of public investment relative to GDP.

One form of investment that has received particular interest in the debate around the Draghi Report is Venture Capital (VC), a market in which the EU significantly lags behind that of the US both in terms of total investment and deal volume – a concerning trend that coincides with broader slowdowns in European firm dynamism[2]. Indeed, the literature points to the key role of VC in fostering high-growth firms which outperform similar peers that were not VC-backed[3]. Recognizing the EU's challenges and opportunities regarding VC investments, the "Draghi Report" calls for a coordinated policy response to strengthen venture finance for EU firms through new and existing government agencies. Industrial policy via VC is not unique to Europe; the Small Business Innovation Research (SBIR) program in the US and sovereign wealth funds in China and the Gulf states also make large-scale equity investments of this kind.

This paper documents the striking fact that, on aggregate, around 30% of new funds invested into venture capital (VC) in Europe actually come from government agencies (see Figure 1). Our paper studies the largest of such agencies, the European Investment Fund (EIF)[4], which has been implementing precisely the type of policy intervention advocated in the Draghi Report for nearly three decades. Instead of picking companies directly, the EIF provides equity investments to startups and growing firms across Europe intermediated via VC funds. Our paper evaluates the effectiveness of such industrial policies intermediated via VCs in driving firm dynamism and aggregate productivity.

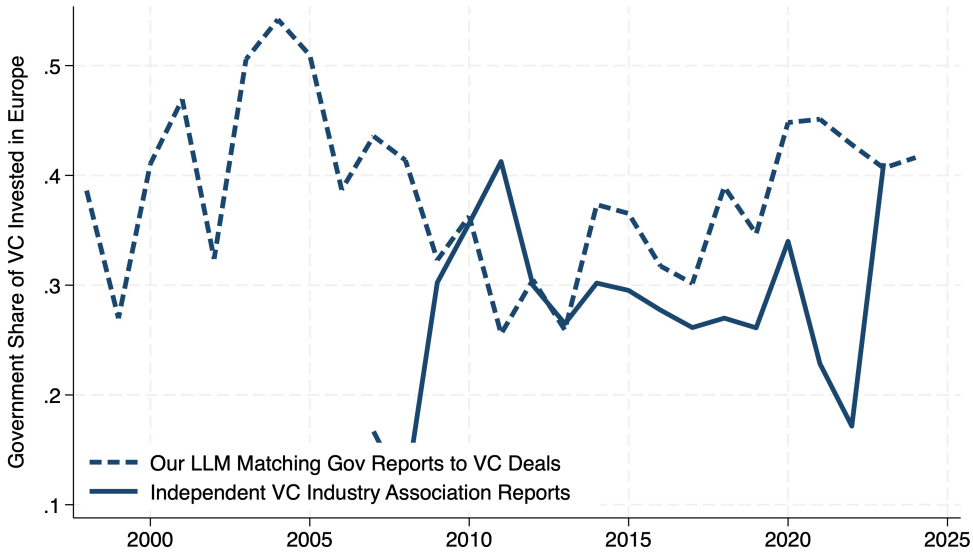
[1] Draghi (2024)

[2] Arnold, Claveres, and Frie (2024) and Biondi et al. (2023)

[3] Hellmann and Puri (2002) and Samila and Sorenson (2011)

[4] The EIF is the venture finance arm of the European Investment Bank Group, which is one of the largest industrial policy player in the world.

Figure 1: *Share of VC Investments Linked to the Government in Europe*



Notes: For the first measure, we match annual reports on the VC funds where the EU government invests through its leading investment fund to micro data on VC investors and deals, and shows how much out of every euro raised in Europe for VC is backed by the government. The second measure shows our own calculations from independent industry report macro data showing the weight of investments from government agencies into all new, classifiable VC funds in Europe. These data sources and methodology used will be described in the next section.

Using detailed data on investments made by EIF-backed VC funds, we study the allocation and impacts of funds by VCs linked to the EIF and the firm dynamics following EIF investments among firms relative to firms financed by sources unrelated to the EIF. We show the EIF has become an important source of venture finance in Europe (as shown in Figure 1), especially for relatively large young firms. Building on our empirical evidence, we develop and calibrate a model of firm dynamics with financing frictions that accounts for the Fund's historical allocation of equity investments across firms of different sizes and ages.

We use various data sources to study the nature and impact of EIF's equity investments. First, we digitize EIF's annual reports and obtain names of funds that the EIF contributed to. We match these to the names of funds in databases of private equity and venture capital investments. We then track all subsequent investments made by the

matched EIF-backed funds. This allows us to identify which deals involve funds that received EIF support versus those that did not, allowing us to compare government-supported VC activity against purely private market investments. We also link these EIF-backed funds to data on financials of private and public companies across Europe, allowing us to track firm outcomes both before and after receiving investments from EIF-backed funds. With our data, we confirm that Europe's venture capital market continues to trail that of the United States; compared to the US, the EU features only two-thirds the number of early-stage VC-funded firms and half as many later-stage firms between 2010 and 2019. Moreover, European companies typically receive just 40% of the capital that U.S. firms secure at both early and later stages.

Using our matched dataset, we document that EIF's intervention in the EU VC market is significant: relative to the private market, EIF-linked funds back larger firms and provide more funding per firm, especially among relatively large young firms underserved by privately funded VCs in Europe. We find evidence that government money is behind 15% of all VC backed firms in the EU. Importantly, EIF-backed companies account for nearly 30% of all employment among young firms and almost 40% of employment at relatively large, young firms with 20 to 249 employees. We find that EIF-backed deals are significantly larger than the typical EU private venture investment, with average funding levels per firm closer to the US level. All in all, this indicates public VC funds have become an important source of equity financing for young, relatively large EU firms that employ a relatively large share of workers and require large amounts of capital on average both for early and late stages of financing.[5]

Moreover, we study the dynamic effects of EIF financing on firm-level outcomes among treated firms relative to their peer firms in EU VC data using a stacked difference-in-differences regression coupled with propensity score matching as our main specification. We show significant, positive, and persistent effects of EIF VC funding mainly

[5]We show empirically that the EU government has been trying to solve the two problems with financial market simultaneously. Relative to the market the EIF has been providing funding at much larger volumes for startups that are much larger than what private VCs alone fund. In additional, the EIF has been supporting mature firms later in their life cycle with growth funds relative to what private VCs in Europe are willing or able to provide.

when funds are allocated towards young firms via early-stage VC. In contrast, we observe little persistent effects when funds are allocated towards older firms via late-stage VC. This suggests EIF financing significantly boosts different measures of firm performance relative to EIF-backed firms themselves before the first financing and relative to market-financed firms not VC funded by the EIF, suggesting the impact of public VC is more effective when targeting young firms and not the old.

We develop a general equilibrium, heterogeneous firm dynamics model where entrepreneurs can be equity financed in the early or later stages by VCs funded by the government helping them overcome the borrowing frictions that inefficiently tie their scale to their private wealth. We propose a simple funding rule that approximates why a public VC funds heavily relatively large mid-sized young firms fueling their growth as in the data: governments provide funds unequally across entrepreneurs in proportion to their firms' unconstrained ex-ante valuation without regards of their level of wealth. In the model, the most productive entrepreneurs when public VC funded can reach a level of assets that at least gets them in equal footing to compete with their wealthy counterparts that have a business idea of much lower quality. Further, we allow government-financed firms to obtain higher volumes of VC financing on average irrespective of their size, a pattern that holds in VC deal level data.

A preliminary contribution of our analysis is to study the nuanced aggregate and distributional consequences of a "Big Push" via publicly funded VC inspired by the Draghi Report where the government injects funds to entrepreneurs today (like lump-sum transfers) in exchange for future equity shares (like corporate taxes) and the hope of stimulating business dynamism. We ask, given the lack of VC funding existing in the EU, what would happen if we injected VC capital into the economy through government investment intermediated by VCs in the long run? We show in a simulation that the public VC shock leads to an increase output by crowding-in capital investment among high productivity young firms that previously were unable to borrow from banks due to low initial wealth. We show there are distributional effects as the wealth distribution shifts for VC backed entrepreneurs. We see substantial reallocation of economic activity

among previously constrained young firms while leaving older firms that are already wealthy, unconstrained, and around their optimal size unresponsive. Despite this, we highlight such VC shock can depress TFP by shifting activity to firms that are not yet at their productive peak due to being in earlier stages of the life cycle.

Finally, we note that such an increase in government-sponsored VC could be behind the EU dynamism puzzle highlighted by Biondi et al. (2023). Indeed, despite the decline of aggregate TFP, we show the model can reproduce significant labor reallocation among young firms, which increased despite aggregate dynamism falling. Indeed, in the model we see a significant expansion at the top of the productivity distribution among young firms as VC funding undoes their financing constraints while makes previously subsidize unproductive firms struggle. Importantly, we also see very little labor reallocation happening among older firms of all sizes consistent. This is consistent with the distributional patterns documented in Biondi et al. (2023).

We are exploring how these aggregate and distributional effects depend on the degree to which funds target early v.s. late stage VC, to what extent VCs are able to target productive young firms with high growth potential in need of capital, and to what extent being backed by a government-funded VC expands the firms' borrowing capacity or crowd-in co-investment from private financiers. We are working on several results to answer: Does the ability of public investments to crowd-in private investment differ by the stage of the firm life cycle (e.g. young v.s. mature) at which the investment is made? (2) How should estimates of the growth trajectories of firms (e.g. firm size at the time of investment relative to the startup size of firms at entry) be used when allocating funds to better select and stimulate investments among high growth potential firms? (3) What shapes the relative effectiveness of different EIB Group's instruments, from early to late-stage private equity to firm of different ages? (4) What are the effects and best ways to encourage co-financing by VCs and private banks without crowding out private capital? (5) How should the EIF policy rule depend on the private financing limitations faced by young firms in intangible-intensive sectors with high fixed costs?

Related Literature. This paper is related to several important papers in the literature of firm dynamics, private finance, and industrial policy.

Our paper builds on the canonical models of macro-development with entrepreneurs subject to financial frictions following Midrigan and Xu (2014) and Buera, Kaboski, and Shin (2011) among many others. Like we do, many related papers use this framework as building blocs to study various questions: Di Giovanni et al. (2023) study the effects of government procurements, Kochen (2024) studies the trading of firms in private equity markets, and Peter (2019) studies the IPO decision of entrepreneurs subject to equity frictions. Our work more broadly informs the literature on firm heterogeneity with financial frictions: Kochen (2024) discusses financial frictions in Europe, Ottonello and Winberry (2024) discuss financial frictions in general, Krusell, Thurwachter, and Weiss (2023) look at the importance of firm age. Sterk, Sedláček, and Pugsley (2021) also discuss the importance of financial frictions as a barrier to firm growth.

Our work also relates to the PE and VC literature, such as Davis et al. (2014), Sørensen and Yasuda (2023), Sorensen, Wang, and Yang (2014), and Hellmann and Puri (2002) and Samila and Sorenson (2011). Of particular relevance are Colonnelli, Li, and Liu (2024) and Beraja et al. (Forthcoming) which analyze empirically role the government in the Chinese venture market. Howell (2017) focuses on VCs in the US following government grants. Further, Ando (2024) and Akcigit et al. (2022) study VC in the context of endogenous growth but do not discuss industrial policy in Europe.

We also build on a rich literature on industrial policy that includes Atalay et al. (2023) in Turkey mostly related to bank financing and subsidies without discussing private equity. In the European context, Fuest et al. (2024) provide suggestive evidence that one of the VC-like arms of the EU government, the European Investment Council (EIC) provides funds to relatively mature firms instead of financing "disruptive" innovations and propose redirecting funds towards a new ARPA-like government agency in Europe and outsourcing VC activities to specialzied funds.[6]

[6]In our paper, we study precisely this investment of the EU government intermediated via specialized VC funds where the government simply deposits money without picking which companies get financed.

2 Setting & Data

In this section, we describe the sourced used to provide an overview of the EU private equity market and the rising important of the European Investment Fund.

2.1 EU Private Equity and Venture Capital Market

In 2024, Mario Draghi published a report highlighting weaknesses in EU business dynamism, private investment, and productivity partly linked to a weakness of private equity markets.[7] The report brought back to light unsolved issues that had been discussed ten year earlier in the World Economic Forum.[8] These reports highlight that, in essence, EU private equity markets systematically underfund firms at different stages of the life cycle, providing a lower amount of early-stage funding and less later-stage funding for growth. Behind these patterns there is likely both a lack of risk capital supply for firms with good long term projects to invest and that EU firms lack sufficiently good projects that require long-term risk finance perhaps due to the lack of supply. It could well be the case that these two issues are interconnected if the lack of later-stage financing discourages the creation of relatively large and capital-intensive young firms with growth perspectives.

The micro data described below shows the EU and the US have surprisingly stationary and similar ratios of young v.s. old firms getting funded and the average funding deal size per firm. This hints at the technological parameters in the VC production/cost function being not so different between the US and the EU, which could explain the strikingly similar proportions at which the industry allocates less money on average to a larger number of young firms. Thus, all the differences could simply arise from the fact that there is less aggregate amount of money being poured into VC despite the VC industry's inner workings being pretty similar. In this case, having outside entities like

[7] Draghi (2024)
[8] World Economic Forum (2014)

the government or institutional investors simply pour liquidity into the VC eco-system alone (effectively finding a way to reallocate savings from households that are right now sitting at banks or invested in public firms at low returns) could improve things.

2.2 The European Investment Fund (EIF)

The EU government has become an important player in the EU private equity market through the EIF. The EIF is part of the European Investment Bank (EIB) Group, the "biggest multilateral financial institution in the world". The EIF specializes in providing access to risk finance to support small and medium-sized enterprises (SMEs) across Europe. EIF conducts its activities using its own resources or those provided by the EIB, the European Commission, EU Member States, and other third parties. Rather than financing beneficiaries directly, EIF develops and offers targeted financial products to intermediaries mainly through private equity (PE) funds, venture capital (VC) funds, growth funds, and mezzanine funds, but also invests through banks, business incubators, guarantee and leasing companies, micro-credit providers to enhance SMEs' access to finance. By facilitating access to equity across the entire life cycle of corporate innovation, the EIF aims to play a crucial role in developing high-growth and innovative SMEs. Its investment strategy spans the early stages of intellectual property development and technology transfer to more mature phases of growth. One of its aims is to help develop the European financial sector while advancing core European Union objectives of entrepreneurship, growth, and job creation.

2.3 Data Sources

We combine multiple data sources to construct a comprehensive dataset that allows us to analyze venture capital investments made by the European Investment Fund (EIF), compare these to investments made by other non-EIF-linked investors, and track firm outcomes both before and after receiving venture capital funding.

2.3.1 Annual Reports on Government PE and VC Investments

Our first data source comes from the European Investment Fund's annual reports, which we digitized to obtain detailed information about the EIF's equity investments. These reports provide granular data on fund-level capital allocations, including the names of recipient funds and the amount of capital allocated to each fund on an annual basis. It's important to note that these equity investments are distinct from the EIF's other policy interventions (such as loans). The scale of the EIF's equity investment activities has grown substantially over time. As shown in Figure 2, which displays both the annual budget allocations and the cumulative assets under management, the EIF has expanded rapidly since its inception in the last 1990s. By 2023, the EIF's annual allocation for equity investments exceeded 5.6 billion euros.[9] The scale of the EIF alone is comparable to major private sector investors like Softbank deploy globally, which invested approximately 4.8 billion euros (784 billion yen) in the same year across all countries.[10]. The EIF alone deploys an amount equivalent to the combined investments made by the top 5 sovereign wealth funds in the world that invest in Europe, the closes being GIC from Singapore, which invested 1.9 billion euros in the continent in 2024.[11] These numbers hint at the scale of the EU government's involvement in the EU venture market.

2.3.2 Deal-Level Data from Private Equity and Venture Capital Markets

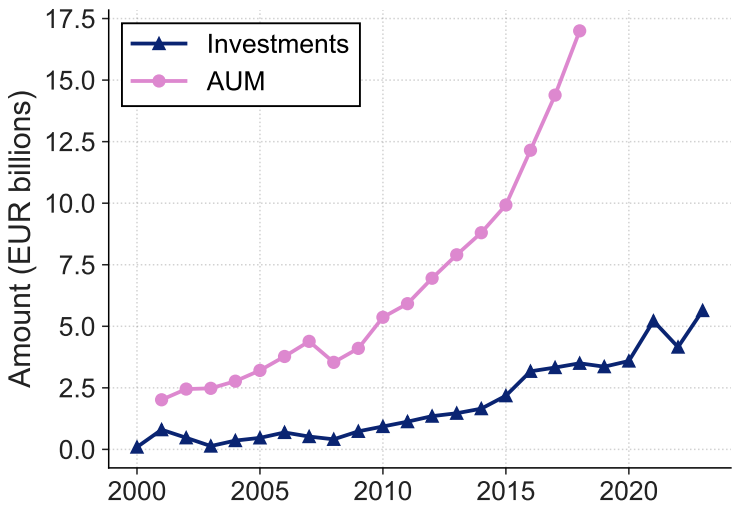
PitchBook, our second data source, captures comprehensive deal-level information on private equity and venture capital investments. Each deal record includes the transaction date, company details (name, location, and founding year), participating investors and their associated funds, and deal size. We link these records to EIF investments through a two-step process: we first match fund names across the EIF annual reports and Pitch-

[9]The EIF represents a large share of the overall commitment of government agencies acting as PE investors in Europe, which is estimated to be 8.3 billion euros in the same year by an association of private capital providers in Europe.

[10]Source: Softbank's Consolidated Statement of Cash Flows found here.

[11]Source: Industry reports on the importance of sovereign wealth funds in Europe here.

Figure 2: *Investments and Assets Under Management (AUM) of the EIF*



Notes: This figure shows the total amount of capital allocated to the European Investment Fund's (EIF) equity investments and the total assets under management of the EIF. The data are from the EIF's annual reports.

Book datasets, then track all subsequent investments made by the matched EIF-backed funds. This matching strategy identifies which deals involve funds that received EIF support versus those that did not, allowing us to compare EIF-supported venture capital activity against purely private market investments. In Section 3, we provide several facts related to investments made by EIF-backed funds. Further, we contrast our aggregated micro data with aggregated information from an independent, anonymous association of private capital providers in the EU that reports macro data on the EU VC and PE industry (see Figure 1 in the introduction). In addition to PitchBook, we have tested our results with other standard micro data sources used in the PE literature including CrunchBase and Preqin.[12].

[12]Results based on CrunchBase and Preqin are in the Appendix; we have found CrunchBase to be of lower quality relative to Pitchbook in terms of matching ratios observed in the European independent industry reports relative to Pitchbook.

2.3.3 European Firm-Level Micro Data

For our third dataset, the Orbis database, provides panel data on private and public companies across Europe, allowing us to track firm-level outcomes over time. For each firm, we observe detailed financial metrics including sales, profits, assets, and debt, alongside firm characteristics such as age, size, number of employees, and industry classification. We link Orbis records to our PitchBook dataset using firm names and locations.[13] This linkage enables us to track firm outcomes both before and after they receive investments from EIF-backed funds.

2.3.4 Aggregated/Macro Data

Our final datasets comes from EuroStat and CompNet, which contains aggregated Census data for European countries. We leverage the regional (NUTS-2) and sectoral (NACE-2) information from each EIF investment, along with firm characteristics like age and size, to connect our EIF-Pitchbook/Orbis sample to CompNet. We use these data to construct moments which we use to calibrate our model.

3 Empirical Facts

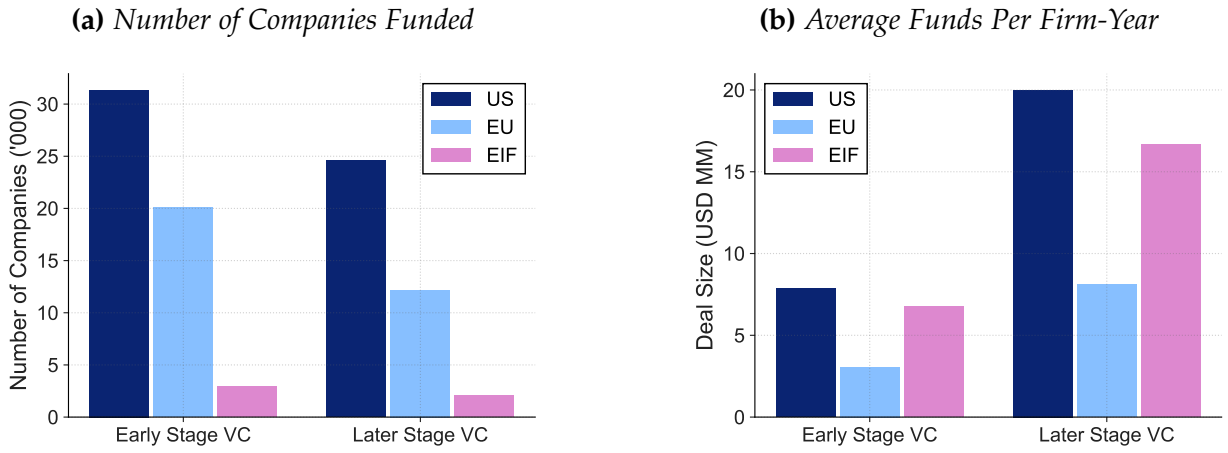
In this section, we present some descriptive and reduced-form facts related to the EIF's investments in the EU.

3.1 Venture Capital in the EU

The difference in the size of the Venture Capital (VC) market in the US and the EU is well known. One estimate, from a 2024 IMF report, shows that annual VC investments

[13] We employ a variety of techniques to ensure matching across potentially inconsistent string names, including text embeddings generated using state-of-the-art LLMs.

Figure 3: *Size of Venture Capital Market in the US and the EU, 2010-2019*



Notes: This figure shows the number of companies funded and the average amount received by a funded firm in a year, broken down by the age of the firm. In each panel, we also show the corresponding statistic for firms in the EU which received investments from EIF-backed funds. The data are from PitchBook for the period 2010-2019. The sample is limited to the US and the EU, where the EU includes the set of countries included in the CompNet sample.

make up 0.7% of GDP in the US compared to only 0.2% of GDP in the EU, only 30% the size of the US market[14].

This macro difference also appears in our micro data, which shows that fewer firms receive VC funding in the EU *and* each firm gets less funding on average. In Figure 3, using PitchBook data between 2010 and 2019, we show that the number of early-stage VC funded firms in the EU is about 2/3 of the number in the US; for later-stage VC funded firms, this number is half of that in the US.[15] These patterns are surprising since the US and the EU have similar startup rates.

Remarkably, there are large differences in the average funding received by a firm in a year as well. In panel B of the same figure, we show that, on average, EU firms receive only 40% of the venture capital that US firms receive at both early and later stages. The relative difference between early and late funding amounts is surprisingly

[14](Arnold, Claveres, & Frie, 2024)

[15]Data from an industry association shows an even starker difference in the number of firms getting financed in later stages in Europe.

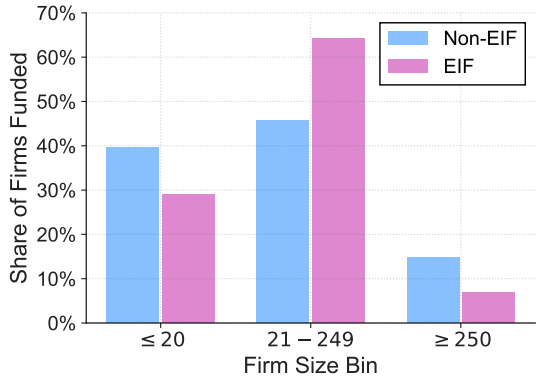
similar between the EU and the US, suggesting the supply of venture capital per funded EU firm is depressed uniformly across all financing stages, an observation we will be building into the model presented later.[16]

These striking differences may have important implications for the long-run trajectory and performance of firms in these markets, and may partially explain recent concerns about the decline in business dynamism in Europe[17]. This lack of private VC funds supplied in the EU may have various origins we do not attempt to shed light on, such the lack of capital market integration (since VCs in one country still face regulatory burdens in raising and investing funds in other EU countries) or the concentration of the excess household savings Europe in the hands of the government or banks (preventing them from reaching firms in need of funds to invest).

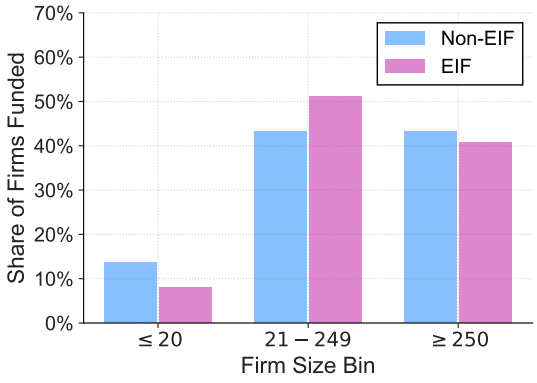
On the same plots, we highlight the number of firms funded by European Investment Fund (EIF)-backed funds and compare their average funding levels to the broader EU and US markets. We find that over 15% of EU VC-funded firms receive support from the EIF in the 2010-2019 period, and interestingly, those firms enjoy investment sizes much closer to US levels than the typical EU deal. By providing larger cash injections, the EIF appears to be bolstering the EU's VC market and positioning its portfolio companies to be more "competitive". But how effective and well-targeted this policy is remains an empirical question. The true impact of these interventions — both on the long-run performance of firms and Europe's overall economic dynamism — is not immediately clear, and the primary goal of this paper is to rigorously evaluate how well this differential funding policy performs.

Figure 4: *Share of EU Firms Funded by Size | EIF vs. Market*

(a) *Early-Stage VC*



(b) *Later-Stage VC*



Notes: This figure shows the share of firms in each size bracket that received fundings from EIF-backed funds and non-EIF-backed funds. The data are from PitchBook for the period 2010-2019.

3.2 Allocation of EIF Funds

In this section, we compare firms receiving EIF funds with those that do not in order to understand how investments differ by funding stage and firm size. Specifically, we split the deals into early-stage versus later-stage, and within each funding stage, we further separate firms according to whether they received EIF backing. We then group firms into three size categories — small (1–20 employees), medium (20–249 employees), and large (250+ employees) —based on the number of employees, and compute the share of firms in each size bracket. These comparisons allow us to highlight how EIF support is distributed across different firm sizes, and the results are summarized in Figure 4.

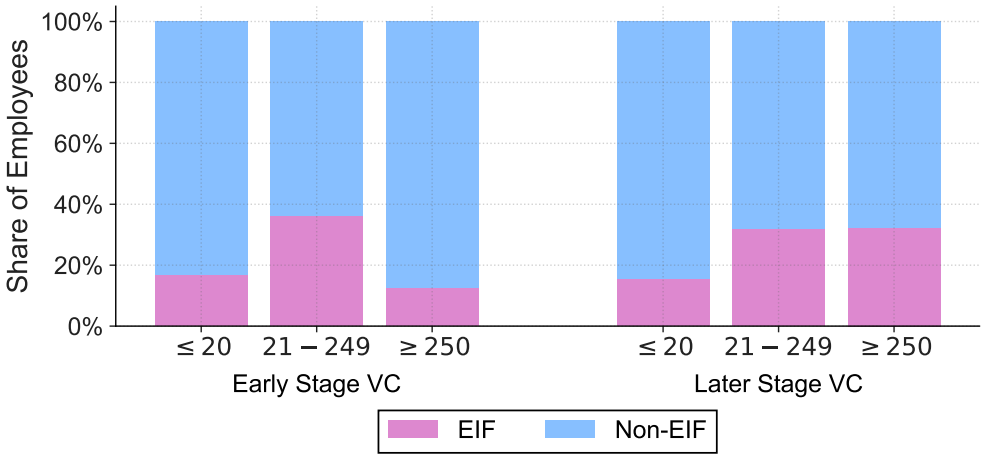
The figure shows that across both early-stage and later-stage venture capital deals, EIF-backed funds are relatively more inclined to invest in medium-sized firms compared to non-EIF-backed funds. Notably, the difference is more pronounced for early-stage deals where EIF-backed investments exhibit a clearer bias toward medium-sized firms.

[16]Indeed, regardless of the data source we used, we found that on average receive between 2 and 3 times the funding in later stages as they do in earlier rounds.

[17](Biondi et al., 2023)

At the same time, firms supported by EIF appear somewhat less likely to be in the smallest size bin when compared to their non-EIF counterparts. Overall, the key takeaway is that EIF-backed investments lean toward relatively larger firms in both early and later stages of the funding cycle. We show in the Appendix that these patterns show when categorizing firms as young v.s. old relative to age 5 instead of comparing early-stage and late-stage deals.

Figure 5: *Share of Employees in Deals Backed by the EIF*

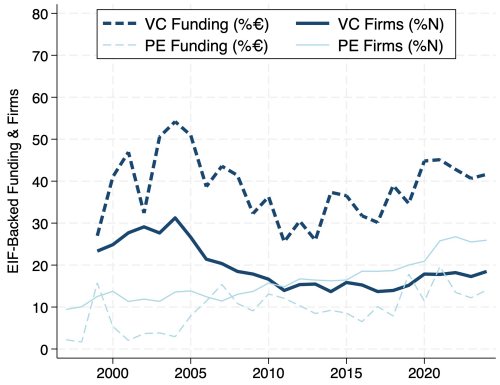


Notes: This figure shows the share of employees at firms involved in deals backed by the EIF in each size bracket and funding stage. The data are from PitchBook for the period 2010-2019.

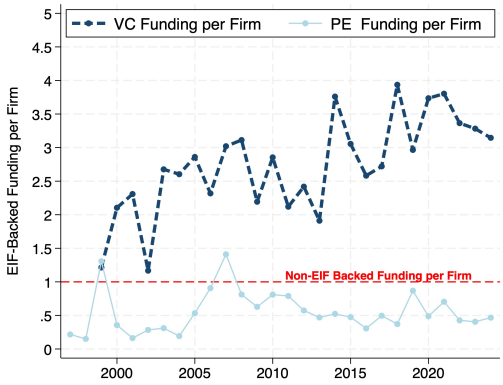
Another way to summarize the allocation of EIF funds is to look at the share of employees in EIF-backed deals across different funding stages and firm size brackets. In Figure 5, we show that EIF-supported firms employ close to 30% of all employees supported by VC in the EU. This is despite the fact that EIF-supported firms make up less than 20% of all firms supported by VC in the EU, and reinforces the idea that the EIF invests in relatively larger firms. When we focus on specific categories of firm age and size, the gap becomes even more striking. For example, among medium-sized firms (20–249 employees) receiving early-stage VC funding, EIF-backed companies account for around 40% of the employees in that group. These figures emphasize the scale and significance of the government's intervention in the European VC market.

Figure 6: *Government-Backed VC and PE Financing in the EU*

(a) *Share of EIF-backed Investment & Firms*



(b) *EIF-backed Investment per Firm*



Notes: The first panel shows the rising funding per firm for firms that receive funding from the EIF relative to firms that were not linked to the EIF within a given investment class (VC or PE). The second panel plots the share of aggregate investment and firms financed that are linked to the EIF within a given investment class (VC or PE). The data are from the EIF's annual reports (first panel) and the reports linked to Pitchbook (second panel).

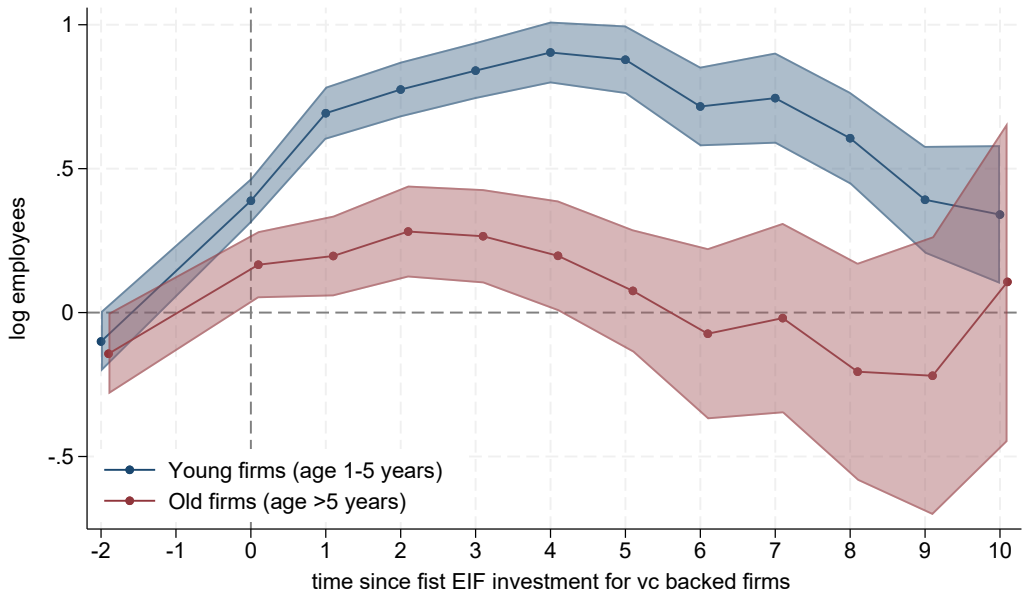
Finally, Figure 6 documents the importance of the EIF in the EU's VC and PE market and how this instutition's investment strategy has evolved over time. Figure 6a shows EIF-backed funds accounted for a consistently large share of nearly 40% out of the aggregate supply of early- or late-stage VC since the EIF's inception in the 1990s.[18] Further, Figure 6b shows that their VC investments per firm has increase significantly since its early days, going from investing amounts comparable to the rest of the market to investing 3 times more per firm, consistent with our earlier findings.[19] In contrast to VC, the weight of the EIF in the EU's PE market is much more limited, representing under 10% of the overall supply of both buyout and growth funding and their PE investments are on average slightly smaller than those of the market.[20] These numbers confirm the

[18]While these numbers come from our EIF-Pitchbook linked sample, Figure 1 shows government agencies were the source of 37.4% of all European funding for VC in 2023 using data from an independent association in the European VC/PE industry.

[19]We confirm this rise in VC funding per firm holds among all stages of financing: seed, early, and later VC; thus, it is not due to a changing composition towards deals where funding sizes are larger. If anything, their weight in seed funding has increased.

[20]Again, we do not think these numbers are unique to Pitchbook, since alternative industry reports indicate government agencies are responsible for 7.5% of PE investment money in Europe in 2023.

Figure 7: *Firm Dynamics Post EIF Investment*



Notes: This figure shows a stacked diff-in-diff run separately for young and old firms using data on longitudinal employment from Pitchbook and EIF treatment indicators from annual reports.

EU government acting through the EIF (and various national government agencies) is a major source of funds for seed and VC (rather than PE) in the EU, motivating our focus on these forms of financing where the EU government has become a key player.

3.3 Firm Dynamics Post EIF Investment

We study the dynamic effects of EIF financing on firm-level outcomes among treated firms relative to their peer firms in EU VC data. We show significant, positive, and persistent effects of EIF VC funding mainly when funds are allocated towards young firms via early-stage VC. In contrast, we observe little persistent effects when funds are allocated towards older firms via late-stage VC.

We estimate the main result using a stacked differences-in-differences regression on firm-level employment from an Orbis-based panel, with time since first EIF-linked fund-

ing as the treatment indicator. Our control group consists of peer firms selected via Propensity Score Matching following the private equity empirical literature.[21] We assess robustness to alternative specifications, including synthetic control and shift-share instruments, as detailed in the Appendix. We also show there robustness to different variables (e.g., revenue, valuations) from Orbis, using a longitudinal panel and outcomes only from Pitchbook, as well as to within-firm impulse responses using local projections (Jorda, 2005; Dube et al., 2023).

$$y_{ict} = \alpha_i + \alpha_t + \sum_{-L \leq t-c < -1} \beta_k^{\text{pre}} \, x_{i,c,t}^{\{c=t-E_i\}} + \sum_{0 \leq t-c \leq F} \beta_k^{\text{post}} \, x_{i,c,t}^{\{c=t-E_i\}} + X_{ist}'\theta + \epsilon_{it}$$

Our main specification confirms that EIF financing significantly boosts different measures of firm performance relative to EIF-backed firms themselves before the first financing and relative to market-financed firms not VC funded by the EIF. This evidence is not meant to be causal nor taking a stance on the structural mechanisms that underlie these effects. Our goal here intends merely to show that there is reduced form support for the fact that EIF funds seem to be associated with persistent post-investment positive dynamics of a large magnitude among young firms funded in the early stages even relative to peer firms that may receive funding from sources that are not EIF related (perhaps of a smaller volume or with different non-cash associated benefits).

Further, we show that the effects among older firms following later-stage VC investments are much more muted and do not seem to persist relative to a control group of peers that were also older at the time of treatment and may be receiving funding from other sources. In the Appendix, we present further subgroup analyses that show the effects are only significant among older firms that are relatively large, and that the effects among older firms disappear when focusing on old and small. In contrast, when the EIF invests in young firms they seem to have significant, positive, persistent effects.

[21] While we describe it in more detail in the appendix, the PSM procedure uses the treated firm in our sample and a set of characteristics such as age, size, several key ratios, and sector to find a comparable set of control firms that are similar at least along observables. We further have also checked there are no signs of pre-trends. Naturally, spillovers between treated and control firms would challenge the validity of the preliminary estimates discussed here, and thus, we view these estimates as merely suggestive.

4 Model

We develop a general equilibrium firm dynamics model of venture finance where workers that have business ideas have the option to become entrepreneurs that can be funded in the early or later stages by private financial markets funded by the government. A central contribution of our analysis is to study the aggregate and distributional consequences of a "Big Push" via venture capital inspired by the Draghi Report where the government injects funds to entrepreneurs today (like lump-sum transfers) in exchange for future equity shares (like corporate taxes) to try to stimulate business dynamism.

4.1 Setup

There are two types of agents: (1) workers, and (2) entrepreneurs with a business idea. Each agent has some stock of assets a and productivity z, and all agents have utility $u(c)$ over consumption c. Time is discrete, and the time horizon is infinite.

Workers can become entrepreneurs with probability ζ, and with some probability ϕ_E, they receive seed funding F_E from the government. Both probabilities are unaffected by the agent (for now), but the probability of getting funded is endogenous to government funding policy choices.

Workers' value function is given by

$$\begin{aligned} v_w(z,a) = \max_{c,a'>0} \; & u(c) + \beta(1-\zeta)\,\mathbb{E}_{z'|z}\left[v_w(z',a')\right] \\ & + \beta\zeta\left[(1-\phi_E)\,\mathbb{E}_{z'|z}\,v_e(z',a',u) + \phi_E\,\mathbb{E}_{z'|z}\,v_e(z',a'+F_E,f)\right] \end{aligned}$$

subject to the budget constraint

$$c + a' = wh(z) + (1+r)a$$

where $h(z)$ is an exogenous function that maps productivity to hours worked, w is the wage rate, a' denotes savings for the next period, and r is the interest rate. We use letters f and u to indicate whether the firm has been funded or not, respectively. Finally, $v_e(z, a, s)$ is the value function of a firm operated by an entrepreneur, where $s \in \{u, f\}$ denotes the funding status of the firm.

The value function $v_e(z, a, s)$ of a firm owned by an entrepreneur depends on whether the firm has been funded in the past or not. If the firm has been funded, with some probability η (exogenous for now), the entrepreneur continues to operate the firm, and with some probability $1 - \eta$, the entrepreneur exits, losing the option to run their business, and becomes a regular worker.

$$v_e(z, a, f) = \max_{c, a' > 0} u(c) + \beta \left[\eta \, \mathbb{E}_{z'|z} \, v_e(z', a', f) + (1 - \eta) \, \mathbb{E}_{z'|z} \, v_w(z', a') \right]$$

subject to the budget constraint

$$c + a' = \max \left[\pi(z, a, f), wh(z) \right] + (1 + r)a$$

where $\pi(z, a, f)$ denotes profits from operating a *funded* firm with productivity z and asset holdings a.

If a firm has not been funded in the past, with some probability ϕ_L, it receives later-stage financing F_L from the government. Its value function is given by

$$\begin{aligned} v_e(z, a, u) = \max_{c, a' > 0} \; & u(c) + \beta(1 - \eta) \, \mathbb{E}_{z'|z} \left[v_w(z', a') \right] \\ & + \beta\eta \left[(1 - \phi_L) \, \mathbb{E}_{z'|z} \, v_e(z', a', u) + \phi_L \, \mathbb{E}_{z'|z} \, v_e(z', a' + F_L, f) \right] \end{aligned}$$

subject to the budget constraint

$$c + a' = \left[\pi(z, a, u), wh(z) \right] + (1 + r)a$$

where $\pi(z, a, u)$ denotes profits from operating an *unfunded* firm with productivity z and

asset holdings a.

Firm Profits. Profits from operating a firm with funding status s are given by

$$\begin{aligned}\pi(z,a,s) &= (1-\tau\cdot\mathbb{1}\{s=f\})\cdot\widetilde{\pi}(z,a,s)\\ &= (1-\tau\cdot\mathbb{1}\{s=f\})\cdot\max_{l,k}\left(z\cdot Z_e\cdot\left(k^{\alpha}\ell^{1-\alpha}\right)^{1-\nu}-w\ell-(r+\delta)\,k\right) \qquad (1)\\ k &\leq \lambda(s)a, \quad s\in\{u,f\}\end{aligned}$$

where k and ℓ are the capital and labor inputs, respectively, τ is the share of firm owned by the government in exchange for venture capital, and Z_e is the productivity of the private sector. Unfunded firms retain all of their profits.

Note that firms are subject to an asset-based borrowing constraint, governed by the parameter $\lambda(s)$. We allow this parameter to be a function of the funding status of the firm to allow for the possibility that being "funded" makes it easier for firms to access credit markets.

Skill Dynamics. Skill z evolves according to the following law of motion where γ governs persistence

$$z_{i,t+1}=\begin{cases}z_{i,t} & \text{with probability } \gamma\\ z'\sim\mathcal{P}(z_{min},\eta_z) & \text{with probability } 1-\gamma\end{cases}$$

where $\mathcal{P}$ is Pareto distribution with scale parameter z_{min} and shape parameter η_z. Note that the PDF of a Pareto distribution is given by

$$f(z)=\eta_z\cdot z_{min}^{\eta_z}\cdot z^{-\eta_z-1}$$

Government-Backed Venture Capital. Let total government budget be given by G. This budget can be broken into funds given to entrants (G_E) and funds given to unfunded firms (G_L).

$$G = G_E + G_L$$

where

$$G_E = \zeta \cdot \phi_E \int F_E(z) \cdot D_w(z, a)$$
$$G_L = \eta \cdot \phi_L \int F_L(z) \cdot D_e(z, a, u)$$

where D_w and D_e are the distributions of workers and entrepreneurs, respectively. The funding amounts $F_E(z)$ and $F_L(z)$ are assumed to be a function of the productivity z of the firm.

Government spending is financed by dividends from funded firms and exogenous net transfers:

$$R = \int \tau \cdot \pi(z, a, f) \cdot D_e(z, a, f) + \bar{T}$$

Thus, the following equation must hold:

$$G = G_E + G_L = R$$

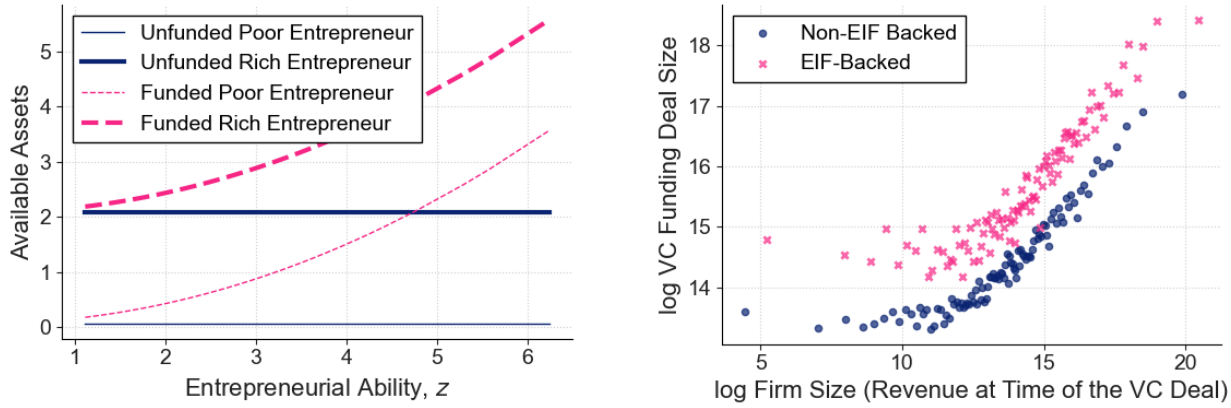
or more explicitly,

$$\zeta \cdot \phi_E \int F_E(z) \cdot D_w(z, a) + \eta \cdot \phi_L \int F_L(z) \cdot D_e(z, a, u) = \int \tau \cdot \pi(z, a, f) \cdot D_e(z, a, f) + \bar{T}$$

which states that the government's funding of entrants and unfunded firms must be equal to the revenue from funded firms and exogenous net transfers.

Figure 8: *Funding Amounts in the Model and the Data*

(a) *Model* **(b)** *Data*



Notes: Panel A shows our simulated VC funding policy rule in the model $\varphi_i = \varphi$ and $\tau_i = \tau$, which increases with productivity and shifts uniformly with the government funding parameter μ. Panel B shows how that the relationship between average VC deal size and firm size at the time of funding from our PitchBook deal data matched to EIF reports is similar qualitatively than in the model.

Funding Amounts. The government-backed VC follows a funding rule that injects funding proportional to the expected discounted value of the company, computed under the assumption of no borrowing constraints. This assumption is supported by the data as shown in Figure 8. This lifetime value of an unconstrained firm, denoted by $v(z)$, only depends on its productivity z. For funds offered to a new entrant, we assume that the government supplies amount $F_E(z)$ and takes an ownership share τ_E of the firm. For funds offered to a later-stage unfunded firm, we assume that the government supplies amount $F_L(z)$ and takes an ownership share τ_L of the firm. Thus, the amount offered to a firm depends on its productivity and whether it as a new entrant or a later-stage firm. These amounts are given by

$$\begin{aligned} F_E(z) &= \mu \cdot \tau_E \cdot v(z) \\ F_L(z) &= \mu \cdot \tau_L \cdot v(z) \end{aligned} \tag{2}$$

The factor μ is a common multiplier which determines the amount received by

funded firms. We can think of μ as a "wedge" that arises from the technology and constraints behind the government's intervention in VC markets. For example, μ could be a markdown reflecting the profit motives of VC intermediates, it could reflect the marginal cost of searching and monitoring companies due to information assymetry and risk, or simple be the multiplier on a budget constraint. Regardless of the sources of these technological or inefficiency frictions, we treat μ as one of the parameters that can change in counterfactuals perhaps through government policy.

Given our assumption on the law of motion of productivity, we can derive an analytical expression for $v(z)$. We have

$$v(z) = \frac{\overline{\pi}(w,r)}{1-\eta\beta\gamma} \cdot \left(z^{\theta} + \frac{\eta\beta}{1-\eta\beta} \cdot \frac{\eta_z}{\eta_z - \theta} \cdot (1-\gamma) \cdot z_{min}^{\theta} \right)$$

where $\theta = \frac{1}{\nu}$, $\overline{\pi}(w,r) = \nu \cdot \overline{y}(w,r)$, and η_z is the shape parameter of the Pareto distribution.

With this expression, we can compute the funding amount for a firm with productivity z as given in (2). This funding rule is shown in Figure 8a. Intuitively, more productive firms will get a higher funded amount if they happen to become funded since the funding rule $F(z) = \mu \cdot \tau \cdot v(z)$ increases with z due to its effect on firm value. In the baseline where entrepreneurs are self-financed, the level of wealth of a person determines whether entrepreneurs can carry out production after getting a good business idea. If a poor entrepreneur gets a good business idea, due to the borrowing constraint, their level of production will be constrained to be lowered than its unconstrained level $y(a,z) \leq y^*(z)$, inducing productivity and output losses from misallocation. When allowing VCs to intermediate government funds skewed towards highly productive entrepreneurs, low-wealth yet highly productive productive entrepreneurs, when funded, can reach a level of assets that at least gets them in equal footing to compete with their wealthy counterparts that have a business idea of much lower quality.

Table 1: *Calibration*

Parameter	Description	Value
Table 1: Calibration		
η	Business idea destruction rate	8%
ζ	Business idea creation rate	1.6%
Z_e	Entrep productivity	1
Z_c	Corporate productivity	0.6
α	Capital elasticity	0.33
δ	Depreciation rate	0.06
β	Discount factor	0.9115
σ	Inter-temporal Substitution	0.8
λ	Borrowing constraint	0.25
ν	Returns to scale	0.6
γ	Productivity persistence	0.8
$\underline{z}, \eta_z, M$	Pareto param., $\frac{\eta_z}{\eta_z - \frac{1}{1-\nu}}$	$1.11, 4.15, 3$

Equilibrium. In general equilibrium, we solve for the equilibrium values of w and r that make the labor and capital markets clear (and goods market clearing follows by Walras Law). Note here that the economy also features a zero-profit corporate firm with a constant return to scale technology given by $Y_c = Z_c K_c^{\alpha} L_c^{1-\alpha}$.

Labor market clearing is given by

$$\int h(z) \cdot D_w(z,a) = \underbrace{L_c + \int h(z) \cdot D_e(z,a,f) + \int h(z) \cdot D_e(z,a,u)}_{\text{Demand for labor}}$$

Capital market clearing is given by

$$\int aD_w(z,a) + \int aD_e(z,a,f) + \int aD_e(z,a,u) = \underbrace{K_c + \int aD_e(z,a,f) + \int aD_e(z,a,u)}_{\text{Demand for capital}}$$

4.2 Calibration

We consider a baseline European economy in which the government does not fund any firms.

Table 1 presents a preliminary parametrization of the model. We choose the business idea destruction rate $\eta = 8\%$ and idea creation rate $\zeta = 1.6\%$ to target the firm exit and entry rates in EuroStat (note in the model, since ζ is the share of workers that get ideas, the firm entry rate is ζ times average workers per firm). We choose $\lambda = k/a$ for all firms from Orbis between 1997 and 2007 to target the ratio of capital to assets in the data. We use a CRRA utility function $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$ with a standard value for the EIS. We set β to target a desired level of the interest rate in the 1997-2007 period in Gopinath et al (2017). For the worker human capital to ability relation we use $h(z) = \log(z)$. We use a decreasing returns to scale Cobb-Douglas production function $f(k, \ell) = \left(k^{\alpha} l^{1-\alpha}\right)^{\nu}$, with a standard δ and α. We normalize the productivity shifters to make sure corporate firms are larger than entrepreneurs. In our model, long run life cycle growth profile of firms since entry is determined by η_z, z_0, λ, and ν. Entrepreneurial skill evolves according to the following law of motion where $z_{it+1} = z_{it}$ with probability γ and $z' \sim \mathcal{P}(z_0, \eta_z)$ with probability $1-\gamma$, where $\mathcal{P}$ is Pareto distribution with scale parameter z_0 and shape parameter η_z $CDF(z) = 1 - (z/z_0)^{-\eta_z}$. Note that we have to calibrate η_z (describing the productivity process) and ν (the degree of returns to scale) jointly so that the following factor is non-negative: $M = \frac{\eta_z}{\eta_z - \frac{1}{1-\nu}}$.

Untargeted moments. The model reproduces remarkably well two key objects that were not directly targeted in the calibration: the distribution of firms by age and (importantly) its size-weighted counterpart, the distribution of employment across firms of different ages. In EuroStat data, roughly 35% (65%) of firms are "young" ("old") defined as being less (more) than 5 years old, while in the model 37% (63%) of firms are young (old) in equilibrium. In the data, because size increases with firm age, roughly 20% (80%) of employees work at young (old) firms, while 22% (78%) in the model. Since in this simple version of the model employment is proportional to output, the distribution

of output is similarly skewed towards older firms.

4.3 Policy Analysis

Armed with our calibrated model, we now turn to evaluating industrial policy interventions in the form of government-backed venture capital. In our counterfactuals — which we think of as "Draghi Big Push via Venture Capital" experiments —– we examine the long-run effects of injecting VC capital into the economy through government investment, relative to a baseline in which no firms receive government funding. This exercise is motivated by proposals such as those advanced in Draghi's recent report, and it is intended to capture dynamics similar to the early, modest investments of the EIF between 1997 and 2006, as well as subsequent increases in funding capacity. Between 1997 and 2006, the EIF committed a relatively modest amount of about 500 million euros per year on average to equity investments through venture capital funds. Since then, the spending capacity of the EIF has risen significantly to around 5 billion euros per year, $10x$ its initial spending capacity, and may increase even more in the future if the recommendations made in the Draghi report end up influencing the 2027 budget discussion.

We consider four policy scenarios:

1. **Low Share, Low Funding Size:** Only a small share of firms (15%) receives funding, and the per-firm funding amount is modest (low μ).
2. **Low Share, High Funding Size:** A small share of firms (15%) is funded, but the deal sizes are large (high μ).
3. **High Share, Low Funding Size:** A larger share of firms (30%) is funded, with small funding amounts per firm (low μ).
4. **High Share, High Funding Size:** A large share of firms (30%) is funded, and the per-firm funding is large (high μ).

Figure 9: *Change in Outcomes Relative to Baseline (No Government Funding)*

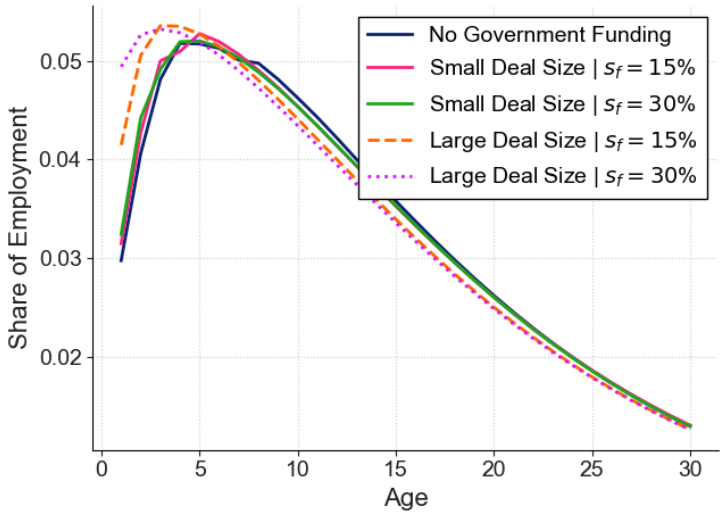


Notes: This figure shows the percentage changes in aggregate output, total factor productivity (TFP), and the output shares of young and old firms relative to the baseline scenario of no government funding, across different policy counterfactuals.

For a given share of funded firms, s_f, we solve for the implied funding probabilities φ_E and φ_L that satisfy the government's budget constraint. In our preliminary results we impose symmetry across early and later stages ($\varphi_i = \varphi$ and $\tau_i = \tau$) so that the policy does not explicitly target younger firms. Additionally, we temporarily shut down the revenue side of government VC spending to focus on the expenditure effects.

Below, we highlight some of the key results from our simulations.

Figure 10: *Employment Share by Age*



Notes: This figure shows employment share by firm age under different combinations of deal size and funding rate.

Impact on young firms. Since our model features an asset-based borrowing constraint, young firms which have not had the time to accumulate assets are more likely to be constrained than older firms. As a direct consequence of government funding, the borrowing constraint of young firms is relaxed, allowing them to expand their output and employment relative to the baseline scenario. This can be seen in Figures 9c and 10 – as more firms are funded and deal sizes increase, the share of output and employment from young firms increases. Correspondingly, share of output by old firms decreases, as shown in Figure 9d. Thus, these interventions change the composition of firms contributing to economic activity, shifting production towards younger firms.

Aggregate Output and Total Factor Productivity (TFP). While production is reallocated towards younger firms under all scenarios, the net impact of these government interventions on aggregate outcomes like output and TFP depends on the exact design of the policy. In some cases, the counterfactual policy raises overall output while lowering TFP, and in other cases both output and TFP improve. We present the impact on aggregate output and TFP relative to the baseline scenario in which no firms receive gov-

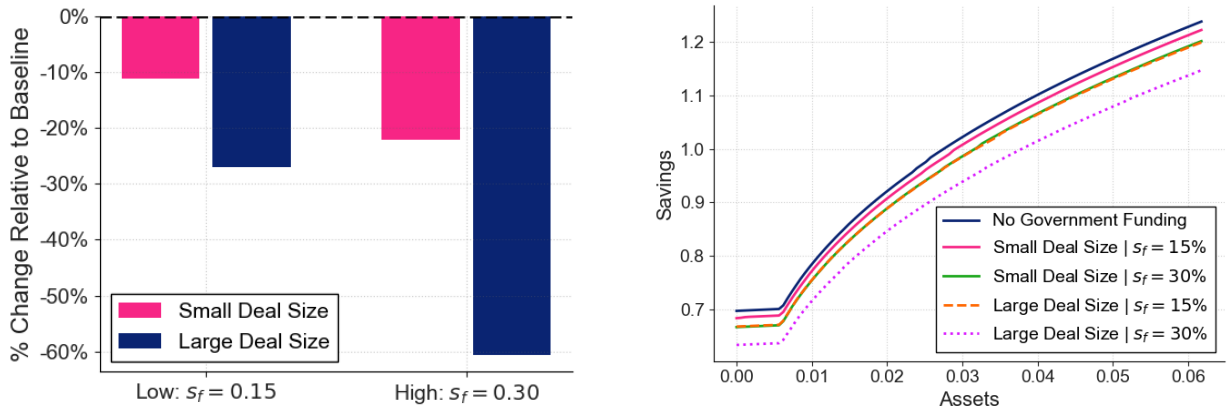
ernment funding in Figures 9a and 9b. As shown in these figures, funding a small share of firms with large deal sizes raises aggregate output but lowers TFP, whereas funding a larger share of firms with large deal sizes raises both output and TFP.

In scenarios where only a small share of firms is funded, the funding policy tends to capture many low-productivity firms. Because firm productivity is drawn from a Pareto distribution, high-productivity "unicorns" are relatively rare. A narrow funding scope may therefore miss these outliers, leading to capital being allocated primarily to firms that are, on average, less efficient which shows up as lower overall TFP. However, if large deal sizes are combined with a a large share of firms being funded, overall TFP can be higher as some of these highly productive firms (who remain highly productive) are able to grow and expand their output. This also brings up a related but important point: the persistence of productivity is crucial. Since funding is allocated based on productivity, if this productivity is fleeting, the benefits of funding may dissipate more quickly, making the policy less effective at boosting long-run TFP. However, if productivity is more persistent, relaxing borrowing constraint of highly productive firms (which will continue to be highly productive) can lead to higher TFP.

Impact on Unfunded Firms. Our analysis also uncovers an important unintended consequence: a "discouragement effect" among unfunded firms. The mere possibility of receiving government funding appears to reduce these firms' incentives to accumulate assets through savings, as illustrated in Figure 11b. As unfunded firms adjust their savings behavior downward, they become more capital-constrained, which in turn reduces their output and overall productivity. Output per unfunded firm goes down in all scenarios, as shown in Figure 11a. This discouragement not only affects individual firm performance but can also have aggregate implications. By dampening the self-financing efforts of a significant fraction of firms, the policy may inadvertently slow overall capital accumulation and innovation. In effect, while the funded firms benefit from relaxed constraints, the resulting reallocation of resources and reduced investment by unfunded firms may undermine the potential gains from the intervention, suggesting the need for

Figure 11: *Impact on Unfunded Firms*

(a) *Output Per Unfunded Firm* **(b)** *Savings Policies*



Notes: This figure shows the impact of government funding on the output per unfunded firm and the savings policies of unfunded firms under different combinations of deal size and funding rate, relative to the baseline scenario in which firms do not expect to receive government funding.

careful policy design to mitigate these adverse spillovers.

In summary, our preliminary evaluation of the Draghi Big Push via Venture Capital experiment — motivated by the proposals in the Draghi report — suggests that government-backed VC interventions can reallocate resources towards high-growth, younger firms, thereby boosting aggregate output. However, there are also countervailing effects of these policies. For example, they shift economic activity towards younger firms, which on average are less productive, which may result in a lower TFP. Additionally, these policies may discourage investment among unfunded firms, and therefore, lower growth over their life cycle. In sum, the effects of the policies are ambiguous and depend critically on the exact nature of the policy and the details of the economic environment. We are actively refining our model and calibration to ensure that our findings robustly inform policy recommendations.

5 Conclusion

This paper investigates the allocation and impact of industrial policy investments by the European government via venture capital (VC) markets in Europe, where it makes up 30% of the total VC investments. We focus on one particular agency: the European Investment Fund (EIF). We show the EIF is a major provider of capital in the EU's VC market: around 15% of the EU's VC-backed firms receive support from a government-financed VC fund. Further, the EIF seems to have become an important source of capital for relatively large, young European firms: around 30% of all employees at VC-backed EU firms work for an EIF-backed company, while among young VC-backed firms with 20-250 workers, EIF-backed firm account for nearly 40% of all workers.

Along with showing the significance of the EIF as a source of capital in the VC markets in the EU, we also show that funding from EIF is associated with significant effects on firm dynamics. In particular, we show that young firms which receive a particularly large allocation of funds from the EIF also experience the most positive and persistent dynamics associated with such private equity injections.

Motivated by these empirical facts, we build a model of firm life-cycle dynamics in which the EU government takes the role of a VC fund. We use this model to shed light on the role of EU industrial policy in the presence of financial frictions. In particular, we conduct policy experiments in the model to shed light on the aggregate and distributional effects of a government-sponsored venture capital supply shock as proposed by a recent report by Mario Draghi. Consistent with the empirical evidence, we show that such a shock reallocates resources towards young firms that outgrow their borrowing constraints and expand their output. However, the net effects of industrial policy intervention through VC funds on aggregate output and TFP are nuanced and depend on the details of the implementation and the economic environment. Our findings are preliminary and we are currently actively working on extending the model to study these questions in more detail.

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