Capital Market Integration for Innovation-Led Growth*

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Abstract

This paper studies how capital market integration shapes innovation-led growth. I develop a multi-country endogenous growth model in which venture capitalists channel household savings to domestic and foreign entrepreneurs. In the model, locations are heterogeneous in innovation opportunities and VCs face bilateral frictions that make cross-border investments more costly. A reduction in frictions reallocates savings towards higher-return innovation opportunities, reducing misallocation and increasing growth. To quantify this framework, I use micro-level data on venture capital deals to construct bilateral investment matrices across US states and EU countries. In the US, a large share of startup funding is provided by out-of-state investors. In Europe, financing is more home-biased, and cross-border flows within the EU are no larger than funding coming from the US. I calibrate the model to match these investment patterns and study the effects of deeper financial integration. Lowering intra-EU investment frictions to US levels would increase cross-border VC, strengthen innovation agglomeration in high-return hubs, and raise aggregate productivity growth.

Keywords: Capital market integration, Innovation, Endogenous growth, Venture capital.
JEL Codes: F36, F43, G24, O31, O40.

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1 Introduction

Growth in the European Union has been subdued over the past two decades, and the productivity gap relative to the United States has widened since the 1990s. A central policy hypothesis is that Europe's fragmented equity markets limit the ability of savings to finance high-growth innovative firms, a concern often discussed in the context of the Capital Markets Union (Lagarde, 2024). European startups frequently report financing constraints and struggle to scale across national markets, despite high household saving rates (EIB, 2024b). While integration has increased in bond markets, equity portfolios still display a strong degree of home bias (Beck et al., 2024). If capital cannot move easily across regions, savings may remain trapped in lower-return domestic projects even when more productive innovation opportunities exist elsewhere.

Venture capital (VC) is a source of equity finance that is particularly important for financing young innovative firms. A large empirical literature shows that VC-backed firms innovate more and generate higher quality patents than similar firms financed through other channels (Lerner and Nanda, 2020). However, the European VC sector remains smaller and less integrated than its US counterpart (Asdrubali, 2023; Arnold et al., 2024). Factors such as limited knowledge of foreign markets, distance to target firms, and the regulatory and bureaucratic burdens are often cited as key barriers to cross-border investments within the EU (EIB, 2024a). Whether these frictions are large enough to meaningfully distort the allocation of risk capital, and reduce growth and innovation, remains an open question.

This paper studies how lowering the cost of cross-border venture capital investment shapes innovation, growth, and the spatial allocation of entrepreneurial activity. Using data on venture capital deals, I construct bilateral matrices of VC investment across US states and across EU countries, and document three patterns. First, cross-border VC flows are much more developed across US states than across EU countries. Second, US investors account for a share of funding into European startups that is comparable to that coming from cross-border investment within the EU itself. Third, home bias is larger and VC activity is more spatially dispersed in Europe, while the US exhibits stronger agglomeration of funding in a small number of high-return hubs.

To interpret these facts I develop a multi-country endogenous growth model in which entrepreneurs require external finance to undertake R&D, and competitive venture capitalists allocate household savings across destinations. Investors face idiosyncratic return shocks drawn from a Fréchet distribution and iceberg-style bilateral frictions that make investing abroad more costly, as in standard quantitative spatial models (Kleinman et al., 2023b). When capital markets are fragmented, savings tend to remain invested domestically even when innovation opportunities are better elsewhere. Financial integration relaxes these constraints and allows savings to flow towards higher-return innovation

opportunities, improving the allocation of R&D investment and raising growth.

The model yields two main predictions. First, reductions in bilateral investment frictions increase cross-border VC flows and strengthen the sensitivity of funding to destination fundamentals (expected innovation returns and investment efficiency). Second, lower frictions tend to increase the concentration of VC and innovative activity in high-return hubs, consistent with the contrast between the US and the EU observed in the data.

I use this framework to derive a gravity equation for VC flows and estimate the elasticity of VC flows to geographical distance. The results suggest that VC in Europe is more sensitive to distance than in the US, consistent with higher cross-border frictions in Europe and greater linguistic and cultural barriers. Finally, I use the bilateral VC matrix to discipline the model and evaluate counterfactual reductions in intra-EU frictions.

Literature Review. This paper connects to several strands of the literature. First, it relates to work on endogenous growth, innovation, and knowledge spillovers (Grossman and Helpman, 1991; Jaffe et al., 1993; Keller, 2002; Aghion and Howitt, 2005; Acemoglu and Cao, 2015; Akcigit and Kerr, 2018; Kerr and Robert-Nicoud, 2020; Moretti, 2021; Bergeaud et al., 2022; Berkes et al., 2022; Bergeaud and Verluise, 2022), in particular to the work of Howitt (2000) and Aghion et al. (2005) on financial development and convergence clubs.

Second, it contributes to the literature on financial integration and growth (Matsuyama, 2004; Broner and Ventura, 2016; Cole et al., 2016; Benigno et al., 2025; D'Amico and Alekseev, 2025). Recent papers have studied how bilateral frictions shape capital flows and growth (Kleinman et al., 2023b; Capelle and Pellegrino, 2025; Pellegrino et al., 2025; D'Amico and Alekseev, 2025). A close contribution with an endogenous growth model is Akcigit et al. (2024), who focus on cross-border corporate venture capital financing and how foreign financing can affect national security. Instead, I focus on how financial integration can give rise to a diversification motive and how barriers to cross-border investment can act as a source of misallocation in the European Union.

This paper builds on previous work on spatial models of entrepreneurial activity and venture capital by Chatterji et al. (2014), Kleinman et al. (2023a), Kerr and Robert-Nicoud (2020) and Moretti (2021). Relative to this literature, my contribution is to embed bilateral venture capital frictions into a multi-country endogenous growth framework, allowing financial integration to affect both aggregate growth and the spatial allocation of innovation.

Finally, this work contributes to the empirical and theoretical literature on venture capital and growth (Kortum and Lerner, 2000; Bernstein et al., 2016; Akcigit et al., 2022; Greenwood et al., 2022; Lerner et al., 2024; Akcigit et al., 2024; Karlsen et al., 2024; Keuschnigg, 2004; Lerner and Nanda, 2020; Jovanovic and Szentes, 2013). Opp

(2019) introduces endogenous growth and venture capital in a closed economy setting, while Ewens and Farre-Mensa (2020) study empirically the effect of integration policies in private equity markets but with a focus on the US.

Roadmap. Section 2 documents the motivating facts. Section 3 presents the model and characterizes balanced growth path implications. Section 4 discusses the model's predictions for autarky versus integration and maps the mechanisms to the data. Section 5 presents the gravity estimation. Section 6 concludes.

2 Motivating Facts

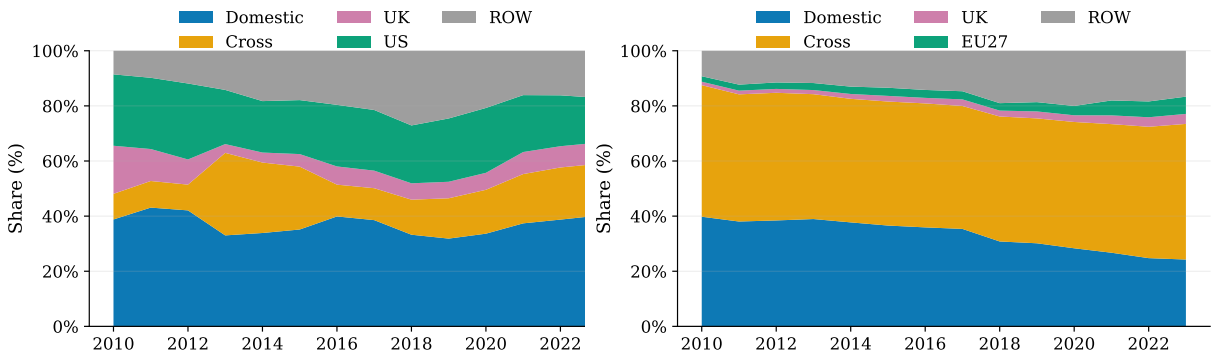
This section presents stylized facts on venture capital (VC) flows that motivate the model in Section 3. I use Crunchbase funding rounds and construct investor–startup investment volume at the investor-location × target-location level. Funding round amounts are allocated across participating investors using a lead-investor weighting scheme: if a round has both lead and non-lead investors, 50% of the round amount is split equally across lead investors and the remaining 50% is split equally across non-lead investors; if no lead is identified in the round, amounts are split equally across all investors.

In all figures labeled "VC filtered sample", I keep only funding rounds with a positive disclosed raised amount and an announced date in the stated time window. I restrict the data to standard venture financing categories (angel, pre-seed/seed, convertible note, corporate round, and Series A and later). Appendix A reports robustness checks using alternative benchmarks and the full set of private-equity investment types (i.e., without the VC-type restriction).

I compare market integration, home bias, and agglomeration between the US and the EU. "within" refers to investment where investor and target are in the same location (same US state or same EU country), while "cross within" refers to cross-location investment within the same block (cross-state within the US or cross-country within the EU27).

I first look at how investors in each block allocate capital across destinations. Figure 1 plots the destination shares for EU27 and US investors, respectively. Two patterns stand out. First, US investors allocate a large and persistent share of their portfolio to out-of-state deals ("cross within"), consistent with a highly integrated national market. Second, EU27 investors remain more domestic: the within-country component is large throughout the sample, and the "cross within" (cross-country) component rises only modestly over time. Cross-Atlantic positions exist in both directions, and the UK accounts for a non-trivial share of European outward investment, consistent with its role as a financial hub.

Figure 2 summarizes market integration by plotting, for each block $b \in \{\text{US}, \text{EU27}\}$



(a) EU27 Investors (b) US Investors

Figure 1: EU27 Investors: Destination Shares over Time

Notes: Crunchbase funding rounds, 2010–2023. VC filtered sample. Shares by destination block (US, EU27, UK, rest of world).

and year t, the ratio of "cross within" to "within" investment volume:

$$\text{Ratio}_{b,t} \equiv \frac{\sum_{i \in b} \sum_{n \in b} \mathbb{1}\{i \neq n\} V_{in,t}}{\sum_{i \in b} \sum_{n \in b} \mathbb{1}\{i = n\} V_{in,t}}, \tag{1}$$

where $V_{in,t}$ denotes VC investment volume from investor location i to target location n in year t, and locations correspond to US states in the US block and to countries in the EU27 block. A value of 1 implies parity between cross-location and within-location investment.

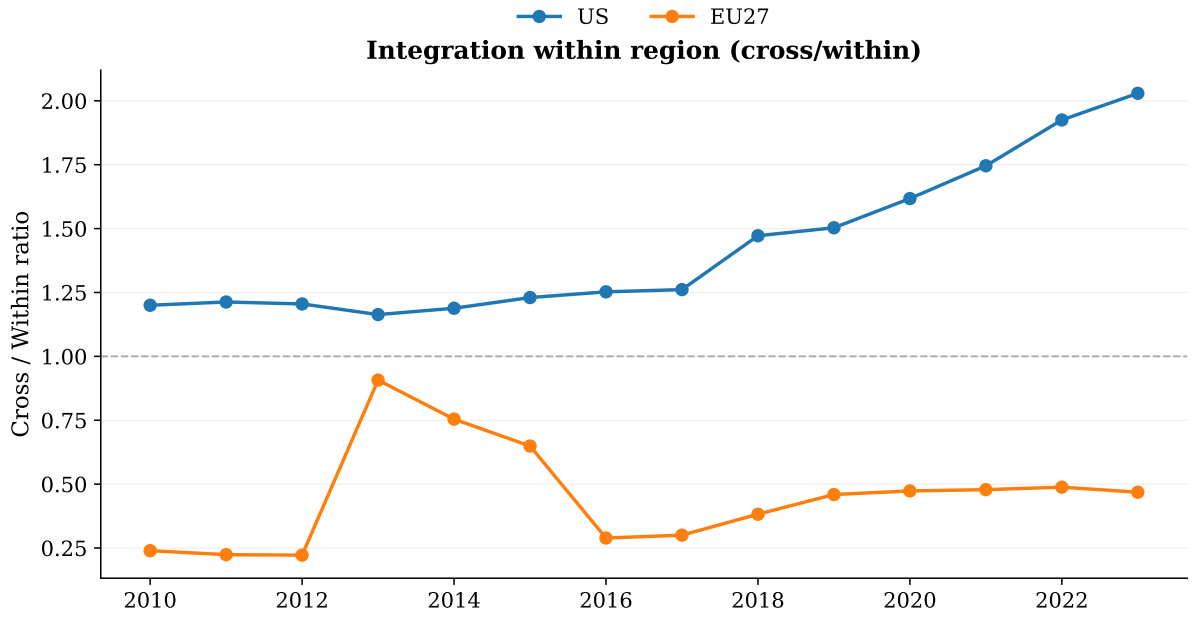
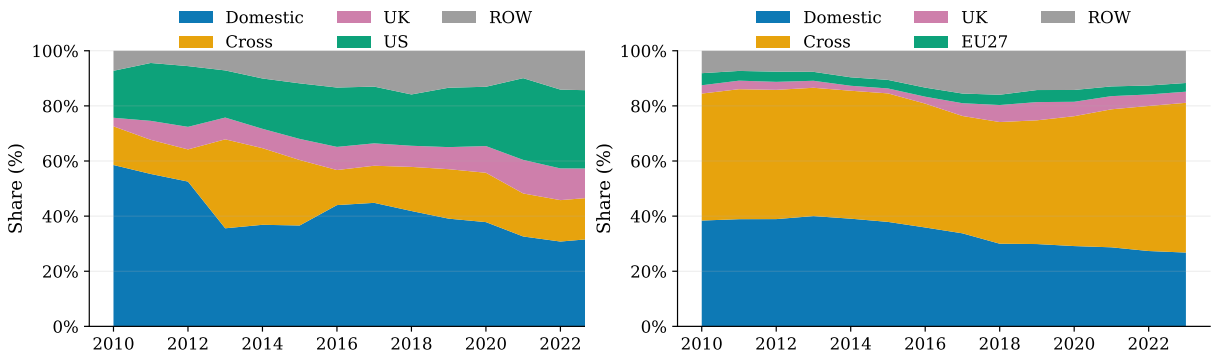


Figure 2: Cross-Region Venture Capital Investment over Time

Notes: Crunchbase funding rounds, 2010–2023. VC filtered sample. The figure plots the ratio of cross-region to within-region investment volume (cross-state within the US and cross-country within the EU27). A value of 1 implies parity between cross and within investment.



(a) EU27 Startups (b) US Startups

Figure 3: Investor Source Shares over Time

Notes: Crunchbase funding rounds, 2010–2023. VC filtered sample. Shares by investor source block (US, EU27, UK, rest of world).

Figure 3 reports the same decomposition from the perspective of targets. It highlights an asymmetry in cross-Atlantic exposure: US investors represent a visible share of funding into EU27 startups, whereas EU27 investors account for a comparatively smaller share of funding into US startups. This asymmetry is consistent with a global market in which US-based intermediaries play an outsized role in financing high-growth innovation outside their home market, while European capital remains more segmented along national borders.

2.1 Home bias

I follow Santamaría et al. (2021) and measure home bias by comparing a location's observed domestic share of funding to a "naive gravity" benchmark implied by a capital-share allocation within a block. Fix a block $b \in \{\text{US}, \text{EU27}\}$ and year t, and restrict attention to flows where both investor and target are in b. Let $Q_{in,t}$ denote investment volume from investor location i to target location n in year t, $Q_{n,t}$ total funding received by location n, and $S_{i,t}$ total capital supplied by location i to the block. Then, within each block,

$$Q_{n,t} \equiv \sum_{i \in b} Q_{in,t}, \qquad S_{i,t} \equiv \sum_{n \in b} Q_{in,t}, \qquad S_t \equiv \sum_{i \in b} S_{i,t}. \tag{2}$$

The observed domestic share for location n is $Q_{nn,t}/Q_{n,t}$. The benchmark domestic share under proportional allocation by investor capital is $S_{n,t}/S_t$. The capital-benchmark home-bias index is then

$$Z_{nn,t} \equiv \frac{Q_{nn,t}/Q_{n,t}}{S_{n,t}/S_t}. \tag{3}$$

In this analysis the total amount of capital supplied by all investors equals the total amount of funding received by all targets, i.e. $S_t = \sum_{i \in b} S_{i,t} = \sum_{n \in b} Q_{n,t} = Q_t$. If location did not matter, all investors would allocate the same share of their portfolio to

each target. This implies that each investor i would allocate to entrepreneurs in location i its own share of capital supply. Thus, a value of $Z_{nn,t} > 1$ (or $\log Z_{nn,t} > 0$) indicates excess domestic investment relative to the benchmark. To compare the degree of home bias between the US and the EU, I compute the funding-received weighted mean

$$\overline{\log Z}_{b,t} \equiv \sum_{n \in b} \omega_{n,t} \log(Z_{nn,t}), \qquad \omega_{n,t} \equiv \frac{Q_{n,t}}{\sum_{m \in b} Q_{m,t}}. \tag{4}$$

Figure 4 shows that home bias is on average higher in the EU than in the US. Figures 5 and 6 map $\log(Z_{nn})$ across locations for 2015–2019 under the same capital benchmark. They show substantial cross-sectional heterogeneity in home bias. Home bias is generally higher in the EU27 than in the US, consistent with stronger national segmentation in Europe, while in the US the distribution is shifted closer to a benchmark of integrated capital allocation across states.

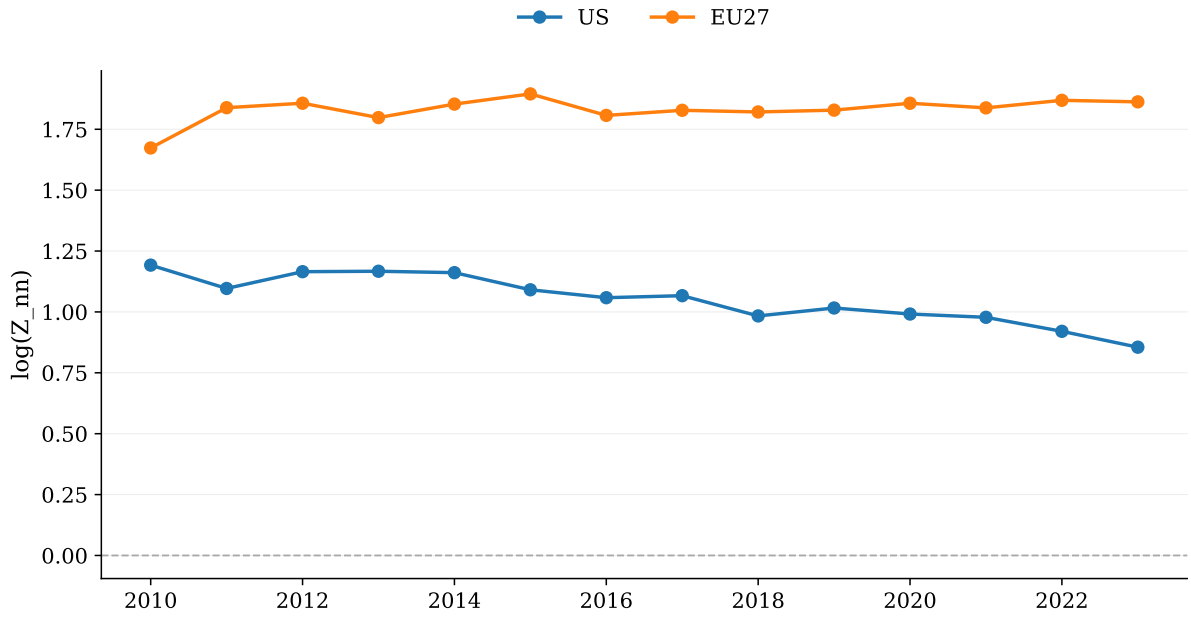


Figure 4: Home Bias over Time: Weighted Average $\log(Z_{nn})$

Notes: Crunchbase funding rounds, 2010–2023. VC filtered sample. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figure reports the investment-weighted average of $\log(Z_{nn,t})$.

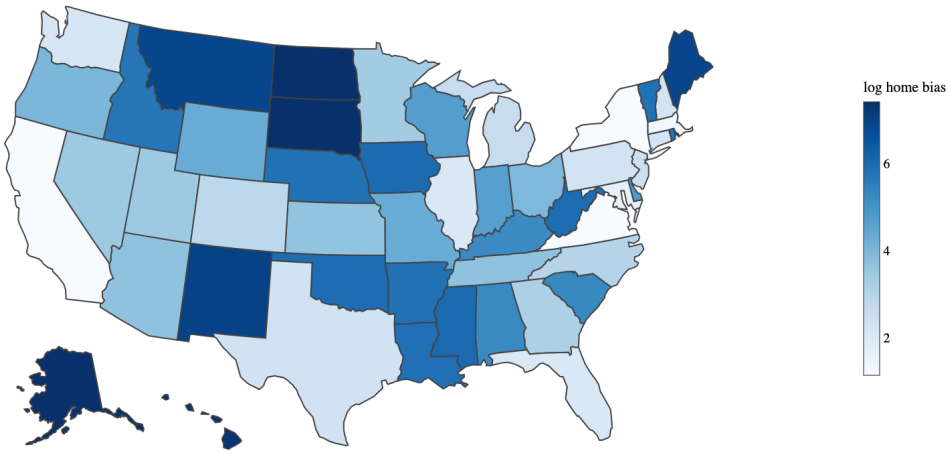


Figure 5: Home Bias Across US States (Capital Benchmark): $\log(Z_{nn})$

Notes: Crunchbase funding rounds, 2015–2019. VC filtered sample. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figures report $\log(Z_{nn,t})$.

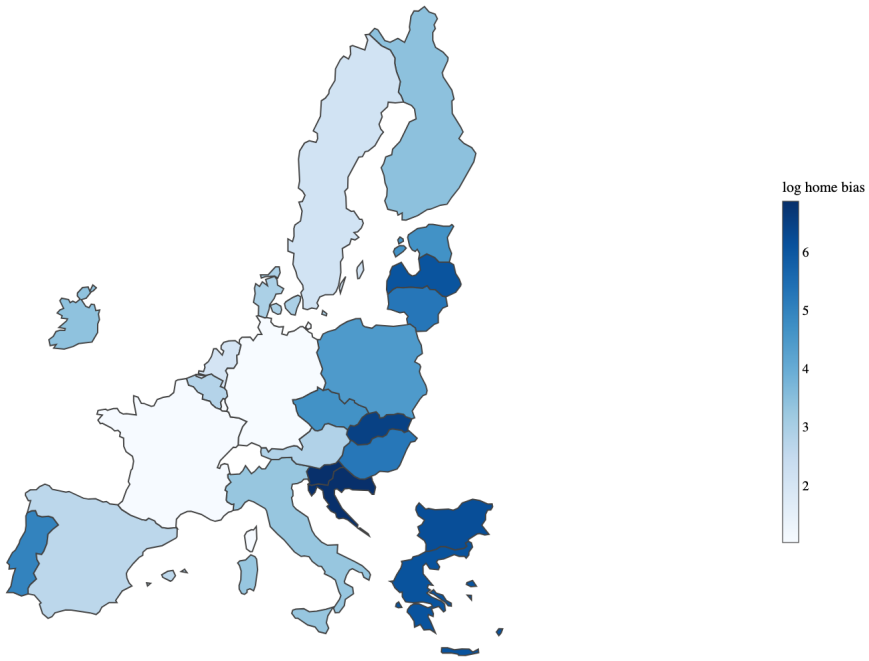


Figure 6: Home Bias Across EU Countries (Capital Benchmark): $\log(Z_{nn})$

Notes: Crunchbase funding rounds, 2015–2019. VC filtered sample. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figures report $\log(Z_{nn,t})$.

2.2 Agglomeration

Figure 7 compares VC shares and population shares across US states and EU countries[1]. Venture capital activity is concentrated in both regions, but the degree of agglomeration is higher in the United States. California, New York, and Massachusetts alone absorb approximately 76% of all US VC, with California capturing 53.2% of funding despite hosting only 11.7% of the population. In the EU, while some smaller countries such as Sweden and Ireland attract VC volumes above their population shares, the overall distribution is less concentrated. This contrast is consistent with a scenario where a more integrated capital market reallocates resources towards a small number of high-return hubs, whereas cross-border frictions in Europe may limit similar agglomeration forces.

To quantify agglomeration I compute the Herfindahl–Hirschman Index (HHI) of funding received across locations within each target block. For block b in year t, let $Q_{n,t}$ denote total VC funding received by location $n \in b$ (defined in (2)) and let $z_{n,t} \equiv Q_{n,t} / \sum_{m \in b} Q_{m,t}$ be its funding share. The HHI is

$$\text{HHI}_{b,t} \equiv \sum_{n \in b} z_{n,t}^2. \tag{5}$$

Higher values indicate that VC is concentrated in a small number of states (US) or countries (EU27). Figure 8 plots $\text{HHI}_{b,t}$ over time. The US VC market seems to be characterized by higher spatial concentration, consistent with capital reallocating towards a small set of high-return hubs.

These agglomeration patterns seem to be specific to venture capital. When all types of private equity are included (Appendix A.2), the concentration gap between the US and the EU narrows, and VC shares become more closely aligned with population and economic size. Locations that are above their weight in the VC filtered sample—such as Sweden, Ireland, and Massachusetts—are precisely innovation hubs. This suggests that the spatial concentration documented above might be specific to funding of innovative start-ups.

[1] Chatterji et al. (2014) have a similar figure for the US for the period 1990-2010.

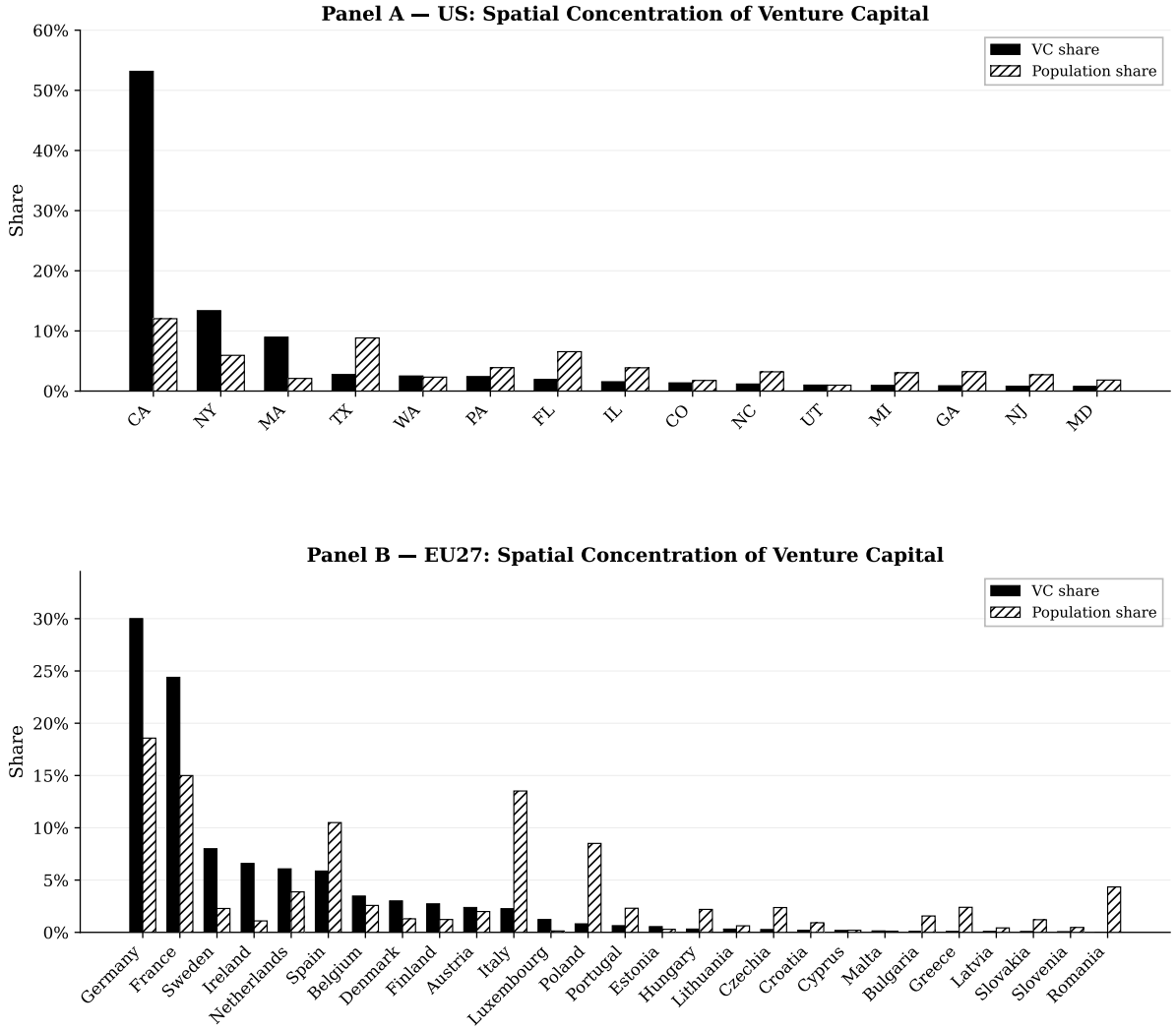


Figure 7: VC is More Concentrated than Population in Both the US and Europe

Notes: Crunchbase funding rounds, 2015–2019. VC filtered sample. VC shares are computed from total (lead-weighted) investment volume into targets within each region, pooling all years 2015–2019. Population shares as of 2019. Panel A displays the top 15 US states by VC share. Panel B displays EU27 countries. "VC Share" is the percentage of total region-wide VC invested in that state/country.

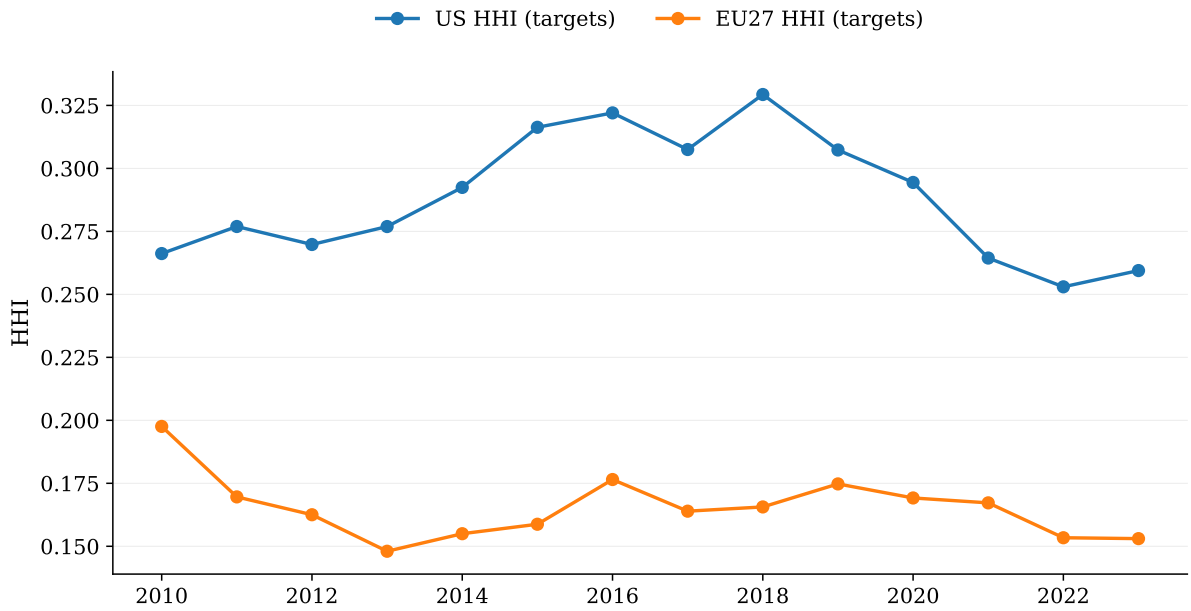


Figure 8: Agglomeration over Time: Herfindahl Index of VC Across Locations
Notes: Crunchbase funding rounds, 2010–2023. VC filtered sample. Higher values indicate more spatial concentration of VC across states (US) or countries (EU27).

3 Model Overview

There are N countries indexed by $i \in \{1, \ldots, N\}$. Time is discrete and indexed by t. In each country, a representative household has a fixed endowment of labour. In each period, she chooses consumption and savings. She delegates the portfolio formation to financial intermediaries that can invest in international capital markets but are subject to bilateral capital market frictions. These financial intermediaries form the VC sector.

The final good is produced by a competitive final firm that combines a continuum of intermediate goods normalized to 1. Intermediate goods are produced by monopolists that own a patent of the good. Intermediate goods are not tradable, but the final good is freely tradable and is the numeraire, so that funding can be transferred across countries.

In each period, entrants invest in R&D projects to produce a new patent and replace incumbents. They do not have sufficient internal funds to finance R&D and therefore rely on domestic and foreign venture capitalists for funding.

3.1 Households

A representative household in country i solves

$$\max \sum_{t=0}^{\infty} \beta_i^t \log C_{it} \tag{6}$$

where C_{it} is consumption and $0 < \beta_i < 1$ is the discount factor.

The representative agent's budget constraint is

$$C_{it} + S_{it+1} = W_{it}L_i + R_{it}S_{it} + D_{it} \tag{7}$$

where W_{it} is the wage; L_i is labour; S_{it} denotes savings; R_{it} is the gross return on period t wealth; and D_{it} are profits from financial intermediation and domestically-owned incumbent firms. The Euler equation implies

$$\frac{1}{C_{it}} = \beta_i R_{it+1} \frac{1}{C_{it+1}}. \tag{8}$$

3.2 Final Goods, Intermediates, and Profits

Producers of the final good operate in a sector with perfect competition using labour and a continuum of intermediate goods x_{it}^j indexed by $j \in [0, 1]$. Final output Y_{it} is given by

$$Y_{it} = L_i^{1-\alpha} \int_0^1 \left(A_{it}^j\right)^{1-\alpha} \left(x_{it}^j\right)^{\alpha} dj. \tag{9}$$

where L_i is the fixed labour supply, A_{it}^j is the productivity level of intermediate good j, and $0 < \alpha < 1$. Let P_{it}^j denote the price of intermediate input j. The first order conditions are

$$(1-\alpha)\left(L_i\right)^{-\alpha} \int_0^1 \left(A_{i,t}^j\right)^{1-\alpha} \left(x_{i,t}^j\right)^{\alpha} dj = W_{it} \tag{10}$$

$$\alpha \left(L_i\right)^{1-\alpha} \left(A_{it}^j\right)^{1-\alpha} \left(x_{it}^j\right)^{\alpha-1} = P_{it}^j \tag{11}$$

3.3 Intermediate goods production and profits

A single monopolist produces each intermediate good. Production is linear, using one unit of the final output to produce one unit of the intermediate good. The monopolist sets a constant markup over marginal cost:

$$P_{it}^j = \frac{1}{\alpha}. \tag{12}$$

Combining the demand function (11) with the price (12) gives the quantity produced of good j:

$$x_{it}^j = \alpha^{\frac{2}{1-\alpha}} A_{it}^j L_i. \tag{13}$$

Substitute this back into the production function (9) to get aggregate output:

$$Y_{it} = \alpha^{\frac{2\alpha}{1-\alpha}} A_{it} L_i, \tag{14}$$

where $A_{it} \equiv \int_0^1 A_{it}^j dj$ is the aggregate technology level.

Finally, profits earned by the monopolist in sector j are price minus cost, times quantity:

$$\pi_{it}^j = \left(P_{it}^j - 1\right) x_{it}^j = \left(\frac{1}{\alpha} - 1\right) \alpha^{\frac{2}{1-\alpha}} A_{it}^j L_i = \bar{\omega} A_{it}^j L_i \tag{15}$$

where $\bar{\omega} \equiv (1/\alpha - 1)\, \alpha^{\frac{2}{1-\alpha}}$ is a constant. Profits are linear and increasing in the sector's technology level A_{it}^j.

Equation (10) can be combined with equation (13) to obtain an expression for wages

$$W_{it} = (1-\alpha)\, \alpha^{\frac{2\alpha}{1-\alpha}} A_{it} \tag{16}$$

Value added in the final output sector is equal to the production of the final good minus the amount that is used in the production of intermediate goods. Value added can be written as

$$Y_{it} - \int x_{it}^j = \Psi A_{it} L_{it}, \tag{17}$$

where $\Psi = \alpha^{2\alpha/(1-\alpha)} \left(1 - \alpha^2\right)$

3.4 Innovation and R&D spending

Define a sector-level frontier as

$$\bar{A}_t^j \equiv \max_i \left\{A_{it}^j\right\}, \text{with } i = 1, ..., N, j \in [0, 1], \tag{18}$$

and the world technological frontier as

$$\bar{A}_t \equiv \int_0^1 \bar{A}_t^j dj, \tag{19}$$

where the world frontier aggregates the sectoral frontiers across product lines.

Growth occurs as entrepreneurs invest in R&D to improve the quality of intermediate goods. I follow Aghion et al. (2005) and assume that there are entrepreneurs in each country i and product line j that are capable of producing an innovation for the next period. If they invest Q_{it}^j units of the final good in research they will succeed with probability:

$$\eta_{it}^j = \chi_i \left(\frac{Q_{it}^j}{\bar{A}_t}\right)^{\frac{1}{\gamma}}, \tag{20}$$

where $\chi_n > 0$ is R&D efficiency and $\gamma \geq 1$ governs congestion due to scarcity of talent. Scaling by $\bar{A}_t$ captures that research becomes harder as the frontier advances. I interpret η_{it}^j as the per-period innovation arrival probability over a short interval. Hence, the

probability that two or more countries produce a successful frontier-updating innovation in the same product line within a period is negligible.

If an entrant from country i succeeds in line j, it becomes the next period incumbent with productivity

$$A^j_{i,t+1} = b\,\kappa \bar{A}^j_t + (1-b)\,A^j_{it}, \tag{21}$$

where $\kappa \geq 1$ is a step size parameter common across countries. If innovation does not occur, the incumbent continues producing with $A^j_{i,t+1} = A^j_{it}$.

The parameter $b \in [0,1]$ controls the strength of spillovers from the world frontier. Following Aghion et al. (2004), I assume that the new level of technology will depend on the frontier and local technology. This mechanism allows laggard countries to benefit from innovations at the technological frontier, creating a convergence force that ensures all countries grow at a common rate growth rate in the steady state. Also note that producing a successful innovation in sector j does not necessarily mean that the country will have the most advanced technology in that product line. This will only happen if $b = 1$. If $b < 1$, the new productivity level also depends on the level of past productivity A^j_{it}, which can differ across countries and sectors. Country i becomes the country with the highest technology in sector j only if $b\kappa\bar{A}^j_t + (1-b)A^j_{it} > \bar{A}^j_t$. This allows for the presence of persistent productivity gaps, consistent with the evidence that knowledge diffusion is not immediate and might depend on country-specific factors (Keller, 2002; Cai et al., 2022).

Sectors are symmetric within the same country and research is undirected, so I focus on a symmetric equilibrium where the probability of a successful invention in the same country and period is the same across sectors, i.e. $\eta^j_{it} = \eta_{it}$. Assuming that within a period at most one innovation effectively updates the frontier per product line, aggregate productivity in country i evolves according to

$$\begin{aligned} A_{i,t+1} &= \eta_{it}\Big[b\,\kappa\bar{A}_t + (1-b)\,A_{it}\Big] + (1-\eta_{it})A_{it} \\ &= \eta_{it}\,b\,\kappa\bar{A}_t + \big(1-\eta_{it}b\big)A_{it}. \end{aligned} \tag{22}$$

An entrepreneur that innovates in period t obtains a perpetual patent for its invention. This patent will give the right to produce in that product line until the next successful inventor obtains a new patent for that good j. The value of this patent equals the present value of the stream of future profits. An incumbent in sector j with technology A^j_{it} receives π^j_{it} in profits in each period and faces a probability of being replaced equal to η_{it} in the symmetric equilibrium . Let V_t denote the present value of becoming the next incumbent at $t+1$. The value of being an incumbent firm in sector j at time t with

productivity A_t^j is

$$V_t(A_{it}^j) = \frac{\pi_{it+1}^j + (1-\eta_{it+1})\, V_{t+1}(A_{it}^j)}{R_{it+1}}. \tag{23}$$

The value of the patent is computed using the market return in country i because patents are held by domestic agents.

Since profits are linear in productivity, I conjecture that the value function is linear in productivity, i.e.

$$V_t(A_{it}^j) = v_{it}\, A_{it}^j. \tag{24}$$

Substituting into (23) implies

$$v_{it} = \frac{\bar{\omega} L_i + (1-\eta_{it+1})\, v_{i,t+1}}{R_{it+1}}. \tag{25}$$

Entrepreneurs in each country have ideas but no internal funds, so R&D must be VC-financed. Let $Q_{it} \equiv \int_0^1 Q_{nt}^j\, dj$ denote total VC-funded R&D spending in destination n. Under symmetry across product lines, innovation arrives with intensity

$$\eta_{it} = \chi_n \left(\frac{Q_{it}}{\bar{A}_t} \right)^{1/\gamma}. \tag{26}$$

A successful innovation in line j yields a patent with value $V_t(A_{i,t+1}^{j,\text{new}})$. I define the gross payoff to a marginal unit of VC funding in i as the value created by an additional unit of R&D spending:

$$\rho_{it} \equiv \frac{\partial}{\partial Q_{it}} \left[\eta_{it}(Q_{it})\, \bar{V}_{it}^{\text{new}} \right] = \eta_{it}'(Q_{it})\, \bar{V}_{it}^{\text{new}} = \frac{1}{\gamma} \frac{\eta_{nt}}{Q_{nt}} \bar{V}_{it}^{\text{new}}, \tag{27}$$

where $\bar{V}_{it}^{\text{new}} \equiv \int_0^1 V_t(A_{i,t+1}^{j,\text{new}})\, dj$. Because η_{it} is concave in Q_{it} for $\gamma > 1$, the return ρ_{it} is decreasing in aggregate funding and is pinned down jointly with VC flows in equilibrium.

3.5 Venture Capitalists

Competitive venture capital intermediaries in country i raise household savings S_{it+1} and allocate them to R&D projects across all N countries. I follow Kleinman et al. (2023b) and Pellegrino et al. (2025) in assuming that investments are affected by an idiosyncratic return shock denoted by ϕ_{int} and cross-border capital market frictions τ_{in}.

For each unit of wealth investor i draws an idiosyncratic shock ϕ_{int} for each producer n from a Frechét distribution:

$$F_{nt}(\phi) = e^{-(\phi/\mu_{nt})^{-\epsilon}}. \tag{28}$$

The idiosyncratic shock reflects the sources of uncertainty associated with investments in venture capital in country n. Its distribution is independent across countries. The Fréchet parameter μ_{nt} controls the average return from investments in producer n. The Fréchet parameter ϵ controls the dispersion of idiosyncratic shocks.

Investors also face bilateral capital market frictions τ_{in} which take the iceberg form. I assume that investing abroad is more costly than investing in domestic entrepreneurs and normalize $\tau = 1$ for domestic investments: $\tau_{in} > \tau_{ii} = 1$, for $i \neq n$. This parameter accounts for different factors that might affect cross-border investments, such as regulatory barriers, information asymmetries or differences in the legal system.

The realized rate of return to an investor in location i from allocating one marginal unit of savings to location n is:

$$\nu_{int} = \frac{\phi_{int}\rho_{nt}}{\tau_{in}}. \tag{29}$$

A competitive VC intermediary allocates each marginal unit to the destination that maximizes ν_{int}. Using the properties of the Fréchet distribution, the share of savings from i allocated to n is

$$z_{int} = \frac{(\mu_{nt}\rho_{nt}/\tau_{in})^{\epsilon}}{\sum_{j=1}^{N}(\mu_{jt}\rho_{jt}/\tau_{ij})^{\epsilon}}. \tag{30}$$

Bilateral flows increase with the expected per-unit return ρ_n, which is increasing in R&D efficiency, market size and the innovation step of the host country. Hence, countries that are more efficient at innovating and have larger markets are more attractive to VCs because the same innovation generates higher profits. Flows from investor country i to n also increase with the capital use efficiency μ_{nt} of the receiving country, and decrease with the bilateral friction τ_{in}. Because portfolio shares are determined by relative returns across all destinations, bilateral capital holdings depend not only on τ_{in} but also on the vector of frictions $\{\tau_{ij}\}_{j=1}^{N}$ and on the attractiveness of alternative locations. Hence, capital might not be allocated to the countries with the best innovation opportunities if barriers are sufficiently large. Thus, frictions to capital flows may act as a source of misallocation.

As shown in Kleinman et al. (2023b), $z_{in,t}$ is also the weight of country n in the portfolio of country i, and I interpret it as being the probability that country n provides the best opportunity for a VC from country i. Finally, following the derivations in their paper, the mean capital income rate that investor i gets on its investment in country n is

$$\nu_{int} = \nu_{it} = \Gamma\left(\frac{\epsilon - 1}{\epsilon}\right)\left[\sum_{j=1}^{N}(\mu_{jt}\rho_{jt}/\tau_{ij})^{\epsilon}\right]^{\frac{1}{\epsilon}}, \tag{31}$$

where $\Gamma(\cdot)$ is the Gamma function. The expected return to investment from country

i is the same across all producers n. As Kleinman et al. (2023b) show, investors face diminishing marginal returns when allocating a larger share of their portfolio to the same producer. The best idiosyncratic matches are allocated first and successive units have to me matched with progressively less suitable projects. This is a consistent with evidence from the literature on venture capital. Investors spend time and effort screening investment opportunities and monitoring entrepreneurs, and these costs increase with the scale of the project of a given portfolio company (Kaplan and Stromberg, 2001; Cole et al., 2016).

Under perfect competition, financial intermediaries make zero profits and pass through returns to households, so the gross return on savings satisfies $R_{it+1} = \nu_{it+1}$.

3.6 Market Clearing

Let Q_{nt} denote total R&D spending carried out in country n. The global resource constraint is

$$\sum_{n=1}^{N} \Psi A_{nt} L_n = \sum_{n=1}^{N} \left(C_{nt} + Q_{nt} \right), \tag{32}$$

where Ψ is defined in the production section.

VC intermediaries in origin i allocate total savings $S_{i,t+1}$ across destinations. Bilateral flows satisfy

$$Q_{in,t} = z_{in,t}\, S_{i,t+1}, \tag{33}$$

and total R&D spending in destination n is

$$Q_{nt} = \sum_{i=1}^{N} Q_{in,t} = \sum_{i=1}^{N} z_{in,t}\, S_{i,t+1}. \tag{34}$$

Finally, global savings cover all worldwide R&D:

$$Q_t = \sum_{n=1}^{N} Q_{nt} = \sum_{n=1}^{N} \sum_{i=1}^{N} z_{in,t} S_{i,t+1} = \sum_{i=1}^{N} S_{i,t+1} \underbrace{\left(\sum_{n=1}^{N} z_{in,t} \right)}_{=1} = \sum_{i=1}^{N} S_{i,t+1} = S_{t+1} \tag{35}$$

3.7 Balanced Growth Path

I analyze a balanced growth path (BGP) in which the world technology frontier grows at a constant gross rate. For any variable X_{it}, define its frontier-normalized counterpart as $x_{it} \equiv X_{it}/\bar{A}_t$, and define relative productivity

$$a_{it} \equiv \frac{A_{it}}{\bar{A}_t}.$$

Productivity gap. Let $g^W_{t+1} \equiv \bar{A}_{t+1}/\bar{A}_t$ denote the gross growth rate of the world frontier. Using the aggregate law of motion in (22)

$$A_{n,t+1} = \eta_{n,t}\, b\kappa\, \bar{A}_t + \big(1 - \eta_{n,t} b\big) A_{n,t}, \tag{36}$$

and dividing by $\bar{A}_{t+1} = g^W_{t+1}\bar{A}_t$ yields the law of motion for the productivity gap:

$$a_{n,t+1} = \frac{\eta_{n,t}\, b\kappa + \big(1 - \eta_{n,t} b\big) a_{n,t}}{g^W_{t+1}}, \tag{37}$$

On a balanced growth path with constant (a_n, η_n, g^W), setting $a_{n,t+1} = a_{n,t} = a_n$ in (37) implies

$$a_n = \frac{\eta_n b\kappa}{g^W - 1 + \eta_n b}. \tag{38}$$

The distance to the frontier depends on the innovation step κ and on the innovation intensity relative to the world growth rate. A lower innovation intensity η_n relative to world growth g^W implies a larger distance from the frontier. While the growth rate is determined by the aggregate innovation across all countries, the productivity gap is pinned down by individual R&D efforts.

World frontier growth. I now derive the world frontier growth rate g^W_{t+1}. In a product line j, there's no frontier-updating innovation with probability $1-\sum_n \eta_{n,t}$ and $\bar{A}^j_{t+1} = \bar{A}^j_t$. With probability $\eta_{n,t}$ country n is the unique innovator and sets $\bar{A}^j_{t+1} = \kappa b \bar{A}^j_{nt} + (1-b)\kappa A^j_t$. Let $\lambda^j_{n,t} \equiv b\kappa + (1-b)\, a^j_{n,t}$ and $a^j_{n,t} \equiv A^j_{nt}/\bar{A}^j_t$. Productivity in line j evolves according to

$$\begin{aligned}
\mathbb{E}_t[\bar{A}^j_{t+1}] &= \Big(1 - \sum_n \eta_{n,t}\Big)\bar{A}^j_t + \sum_n \eta_{n,t}\lambda^j_{n,t}\bar{A}^j_t \\
&= \bar{A}^j_t\Big[1 + \sum_n \eta_{n,t}(\lambda^j_{n,t} - 1)\Big].
\end{aligned}$$

Integrating over j and using $\bar{A}_t = \int_0^1 \bar{A}^j_t dj$ yields

$$\mathbb{E}_t[\bar{A}_{t+1}] = \int_0^1 \mathbb{E}_t[\bar{A}^j_{t+1}]dj = \bar{A}_t + \int_0^1 \bar{A}^j_t \sum_n \eta_{n,t}(\lambda^j_{n,t} - 1)\, dj,$$

Dividing by $\bar{A}_t$ gives the growth rate of the frontier

$$g^W_{t+1} = 1 + \int_0^1 \frac{\bar{A}^j_t}{\bar{A}_t} \sum_{n=1}^{N} \eta_{n,t}\big(\lambda^j_{n,t} - 1\big)\, dj. \tag{39}$$

Since $\lambda^j_{n,t}$ is linear in $a^j_{n,t}$ and $\frac{\bar{A}^j_t}{\bar{A}_t} \cdot a^j_{n,t} = \frac{A^j_{nt}}{\bar{A}_t}$, integration across the continuum of

sectors yields

$$g_{t+1}^{W} = 1 + \sum_{n=1}^{N} \eta_{n,t}\big(\lambda_{n,t} - 1\big), \tag{40}$$

where $\lambda_{n,t} \equiv b\kappa + (1-b)\, a_{n,t}$ and $a_{n,t} \equiv A_{n,t}/\bar{A}_t$.

Return to VC investment. Using the linear value function (24), the expected patent value across product lines is

$$\begin{aligned} \bar{V}_{nt}^{\text{new}} &= \int_0^1 V_t(A_{n,t+1}^{j,\text{new}})\, dj \\ &= v_{nt} \int_0^1 \left[b\kappa\, \bar{A}_t^j + (1-b)\, A_{nt}^j\right] dj \\ &= v_{nt}\, \lambda_n\, \bar{A}_t, \end{aligned} \tag{41}$$

where $\lambda_n \equiv b\kappa + (1-b)\, a_n$, using $\int_0^1 \bar{A}_t^j\, dj = \bar{A}_t$ and $\int_0^1 A_{nt}^j\, dj = A_{nt} = a_n \bar{A}_t$.

Along the BGP, $v_{nt} = v_n$ and equation (25) becomes

$$v_n = \frac{\bar{\omega} L_n R_n}{R_n - (1-\eta_n)} \tag{42}$$

Substituting into the definition of ρ_{nt}, and using $Q_n = q_n \bar{A}_t$ gives

$$\rho_n = \frac{\eta_n}{\gamma\, q_n} \cdot \frac{\bar{\omega}\, L_n\, R_n}{R_n - (1-\eta_n)} \cdot \left[b\kappa + (1-b)\, a_n\right], \tag{43}$$

where η_{nt} is innovation intensity

$$\eta_{nt} = \chi_n \left(q_{nt}\right)^{1/\gamma}. \tag{44}$$

Returns to innovation are increasing in market size L_n, R&D efficiency (through $\eta_n = \chi_n q_n^{1/\gamma}$), and the effective step size λ_n. Countries closer to the frontier (higher a_n) offer higher returns because successful innovations build on a larger local knowledge base. Bilateral R&D funding satisfies $Q_{in} = z_{in} S_i$. Normalizing by $\bar{A}$ gives

$$q_{in} \equiv Q_{in}/\bar{A} = z_{in}\, s_i, \qquad \text{where } s_i \equiv S_i/\bar{A}_t.$$

Total R&D received by country n is

$$q_n \equiv Q_n/\bar{A} = \sum_{i=1}^{N} q_{in} = \sum_{i=1}^{N} z_{in}\, s_i. \tag{45}$$

Euler equation. Along a BGP, $C_{n,t+1}/C_{nt} = g^W$ and log utility implies

$$R_n = \frac{g^W}{\beta_n}. \tag{46}$$

Balanced growth path. A balanced growth path is an equilibrium in which the world frontier grows at a constant gross rate g^W and all frontier-normalised variables are constant over time. In particular, $\{g^W, a_n, q_n, \eta_n, v_n, \rho_n, R_n, z_{in}, s_i, c_n\}$ are constants such that for all t: (i) $g^W_{t+1} = g^W$ and satisfies (40); (ii) $a_{nt} = a_n$ and satisfies (38); (iii) $q_{n,} = q_n$ and $\eta_{n,t} = \eta_n$ with $\eta_n = \chi_n q_n^{1/\gamma}$ as in (26); (iv) the incumbent value coefficient v_n solves the fixed point of (25) and the marginal return ρ_n satisfies (43); (v) portfolio shares z_{in} satisfy (30) and normalised R&D satisfies $q_n = \sum_i z_{in} s_i$ as in (45); (vi) the Euler equation implies $R_n = g^W/\beta_n$; and (vii) the global resource constraint $\sum_n \Psi a_n L_n = \sum_n (c_n + q_n)$ determines $\{s_i\}$ and $\{c_n\}$.

4 Model Implications: Autarky vs Financial Integration

This section summarizes the model's qualitative predictions about venture capital (VC) allocation under financial fragmentation (high cross-border frictions) versus financial integration (low cross-border frictions). The key object is the portfolio share $z_{in,t}$ in (30), which maps bilateral frictions τ_{in} into bilateral investment flows.

4.1 Bilateral frictions and home bias

By (30), the share of investor-i savings allocated to destination n is increasing in returns to innovation ρ_n and quality of potential matches (mu_{nt}) of the destination, and decreasing in bilateral frictions τ_{in}. In particular, holding destination fundamentals fixed, a higher τ_{in} reduces cross-border investment and increases domestic home bias.

A useful integration statistic in the data is the ratio of cross-region to within-region investment volume (Figure 2). In the model, this statistic is monotone in bilateral frictions. Consider a symmetric block of N locations where all destinations have identical returns and capital-use efficiency, and frictions satisfy $\tau_{ii} = 1$ and $\tau_{ij} = \tau > 1$ for $i \neq j$. Then (30) implies

$$z_{ii} = \frac{1}{1 + (N-1)\tau^{-\epsilon}}, \qquad \sum_{j \neq i} z_{ij} = \frac{(N-1)\tau^{-\epsilon}}{1 + (N-1)\tau^{-\epsilon}}, \tag{47}$$

so that the model-implied "cross/within" ratio is

$$\mathcal{I} \equiv \frac{\sum_{j \neq i} z_{ij}}{z_{ii}} = (N-1)\tau^{-\epsilon}. \tag{48}$$

Thus, lower cross-border frictions (lower τ) raise cross-region investment relative to local investment.

4.2 Autarky vs full integration

Autarky. In the limit $\tau \to \infty$, cross-border investment becomes impossible and $z_{ij} \to 0$ for $i \neq j$. All savings remain domestic, so each location's R&D investment is pinned down by domestic savings rather than global capital market conditions. This case generates strong home bias and a relatively dispersed allocation of VC across locations.

Full integration. Under full integration, $\tau_{in} = 1$ for all pairs. Then portfolio shares depend only on fundamentals:

$$z_{in,t} = \frac{(\mu_{nt}\rho_{nt})^{\epsilon}}{\sum_{j=1}^{N}(\mu_{jt}\rho_{jt})^{\epsilon}}. \tag{49}$$

Locations with higher returns to innovative activity (high ρ_{nt}) and/or more efficient capital use (high μ_{nt}) attract a larger fraction of global savings. This delivers an "agglomeration" force: integration concentrates VC in high-return innovation hubs.

4.3 Growth and reallocation

Financial integration affects growth through the reallocation of R&D financing across locations. The portfolio share allocated by investors in origin i to destination n is

$$z_{in,t} = \frac{(\mu_{n,t}\rho_{n,t}/\tau_{in})^{\epsilon}}{\sum_{j=1}^{N}(\mu_{j,t}\rho_{j,t}/\tau_{ij})^{\epsilon}},$$

which is increasing in destination efficiency $\mu_{n,t}$ and expected return $\rho_{n,t}$, and decreasing in bilateral frictions τ_{in}. Aggregate R&D spending at destination n,

$$Q_{n,t} = \sum_{i=1}^{N} z_{in,t} S_{i,t+1},$$

is therefore increasing in $\mu_{n,t}$ and decreasing in τ_{in}, holding aggregate savings S_{t+1} fixed. Since innovation intensity

$$\eta_{n,t} = \chi_n \left(\frac{Q_{n,t}}{\bar{A}_t}\right)^{1/\gamma}$$

is increasing in $Q_{n,t}$, any reallocation of capital towards destination n raises its innovation intensity. World frontier growth,

$$g_{t+1}^{W} = 1 + \sum_{n=1}^{N} \eta_{n,t} \left(\lambda_{n,t} - 1\right), \qquad \lambda_{n,t} \equiv b\kappa + (1-b)a_{n,t},$$

increases when integration shifts funding towards destinations with higher $\lambda_{n,t} - 1$ or higher R&D efficiency χ_n. This highlights that financial integration only raises aggregate growth in the presence of heterogeneous returns. If regions were identical, a symmetric decline in frictions would alter the geography of innovation without changing aggregate outcomes. However, when innovation opportunities are unevenly distributed, high cross-border frictions generate misallocation by trapping capital in low-productivity domestic markets. Relaxing these frictions allows capital to reallocate towards high-return innovation hubs. Consequently, bilateral investment frictions act as determinants of aggregate growth by shaping the spatial efficiency of R&D.

4.4 Mapping to the motivating facts

The empirical facts in Section 2 can be interpreted through (30) and the ratio (48). The lower cross-border VC intensity within the European Union documented in Figures 1a–2 can imply higher effective bilateral frictions τ_{in} among EU countries relative to the corresponding frictions across US states. Finally, Figures 7 and 8 are consistent with the model's agglomeration prediction: lower internal frictions foster a more concentrated allocation of VC towards a small number of high-return hubs.

5 Gravity Equation Estimation

To quantify the magnitude of cross-border frictions, I estimate a structural gravity equation derived from the model. Using the portfolio shares from Section 3, the total venture capital flow Q_{in} from origin i to destination n can be expressed as:

$$Q_{in} = S_i \frac{(\mu_n \rho_n)^{\theta} \tau_{in}^{-\theta}}{\Phi_i}, \tag{50}$$

where S_i is total funding supplied by i, and $\Phi_i \equiv \sum_j (\mu_j \rho_j / \tau_{ij})^{\theta}$ represents outward multilateral resistance. Assuming that bilateral frictions are a function of geographic distance, $\tau_{in} = D_{in}^{\delta}$, this yields the empirical gravity specification:

$$Q_{in} = \exp\left(\gamma_i + \gamma_n - \beta \ln D_{in}\right) \times \varepsilon_{in}, \tag{51}$$

where γ_i is an origin fixed effect that absorbs capital supply and multilateral resistance, γ_n is a destination fixed effect that controls for local innovation opportunities and productivity, and $\beta \equiv \theta\delta$ is the elasticity of VC flows with respect to distance.

Following Silva and Tenreyro (2006) and Head and Mayer (2014), I estimate this gravity equation both in logarithms using OLS and in levels using Poisson Pseudo-Maximum Likelihood (PPML) to account for zero-flows. I use a geographic distance measure proposed by Pellegrino et al. (2025). Table 1 reports the baseline results for 2015–2019.

Table 1: Gravity equation regressions (EU27 vs US states)

	EU27 countries		US states	
	Log VC	VC	Log VC	VC
	(1)	(2)	(3)	(4)
Geographical distance	-1.25^{***}	-1.31^{***}	-0.43^{***}	-0.05
	(0.23)	(0.21)	(0.08)	(0.04)
Estimator	OLS	PPML	OLS	PPML
Origin & destination FE	Yes	Yes	Yes	Yes
Observations	318	650	1,272	2,500
R^2	0.64		0.65	

Note: Cross-section of origin and destination pairs, 2015–2019. **VC filtered sample.** All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination.

Distance is negatively associated with bilateral VC flows in both regions, but the magnitude is larger within the EU than within the US. The log-distance elasticity is -1.25 for EU country pairs versus -0.43 for US state pairs. Under PPML, the EU distance coefficient remains large and significant (-1.31), while the US coefficient is close to zero and statistically insignificant (-0.05). This pattern suggests that effective frictions rise more steeply with distance across EU countries than across US states. Appendix Tables 3–6 show that the qualitative ranking is robust across alternative time windows (2010–2019, 2010–2014, and 2018), and that EU estimates remain substantially more negative than US estimates under both estimators.

The effect of geographical distance could reflect other challenges that influence business deals between EU countries but not between US states. In fact, a key challenge often cited by European authorities is that European citizens face language and cultural barriers that Americans do not. To examine whether cross-border flows are correlated with language and cultural frictions and whether the effect of geographical distance still holds, I use the linguistic and cultural distance measures of Pellegrino et al. (2025) . Table 2 reports the results. Geographic distance remains negatively associated with bilateral VC flows after controlling for these additional bilateral frictions. Linguistic and cultural distance also enter with negative coefficients, indicating that venture capital flows can be lower between locations that are more linguistically or culturally distant.

Table 2: Geographical, linguistic, and cultural distance in bilateral VC flows

	EU27 countries	
	Log VC	VC
	(1)	(2)
Geographical distance	-0.90***	-0.79***
	(0.22)	(0.17)
Linguistic distance	-2.53	-3.32**
	(1.83)	(1.32)
Cultural distance	-20.26	-26.22
	(14.39)	(18.67)
Estimator	OLS	PPML
Origin & destination FE	Yes	Yes
Observations	318	650
R^2	0.66	

Note: Cross-section of origin and destination pairs, 2015–2019. VC filtered sample. All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination. Higher linguistic and cultural distance indicate greater dissimilarity.

6 Conclusion

This paper studies how capital market frictions shape innovation-led growth in a multi-country setting. Empirically, I document a large internal integration gap between venture capital allocation across US states and across EU countries, alongside a sharper spatial concentration of venture capital in the United States. These patterns suggest that cross-border frictions remain an important barrier to the efficient allocation of risk capital within Europe.

To interpret these facts, I develop a multi-country endogenous growth model in which competitive intermediaries allocate household savings to R&D projects across locations, subject to bilateral investment frictions and idiosyncratic return shocks. The model highlights that lower frictions allow savings to flow towards higher-return innovation opportunities regardless of location, reducing misallocation and increasing the growth rate of the world technology frontier. At the same time, financial integration strengthens agglomeration forces by concentrating innovative activity in high-return hubs.

The gravity estimates show that bilateral VC flows are more sensitive to distance within the EU than within the US, pointing to higher cross-border frictions in Europe. Ongoing work disciplines the model quantitatively with the estimates of bilateral frictions from the VC flow matrix and incorporates additional moments, such as patenting outcomes, to evaluate the magnitude of potential growth and welfare gains from deeper European capital market integration.

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A Additional Charts

A.1 Alternative home-bias benchmark

Figures 9–10 replicate the home-bias maps of Figures 5–6 using an investor-count benchmark instead of the capital benchmark described in Section 2.

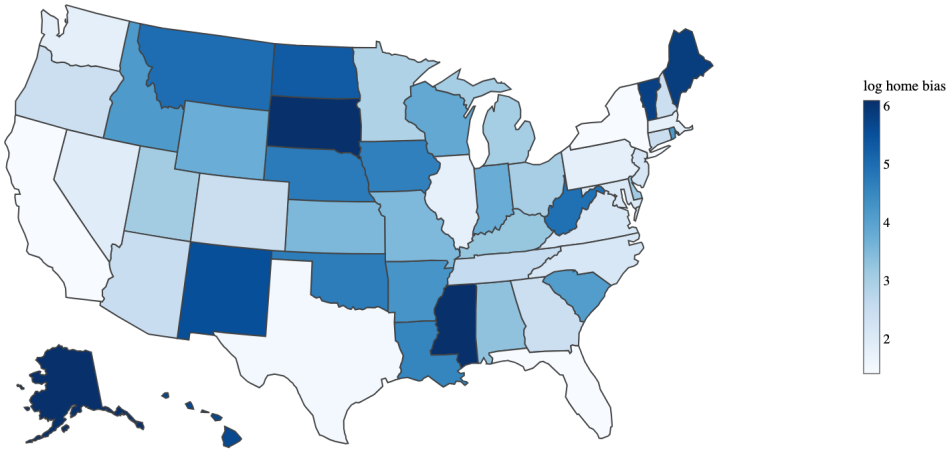


Figure 9: Home Bias Across US States (Investor-Count Benchmark): $\log(Z_{nn})$

Notes: Crunchbase funding rounds, 2015–2019. VC filtered sample. Z_{nn} compares the observed domestic share to an investor-count benchmark. The observed domestic share is the share of deals (investor participations) in which investors from n fund targets in n. The benchmark domestic share is the share implied by investor counts in n relative to total investor counts within the block. The figure reports $\log(Z_{nn})$.

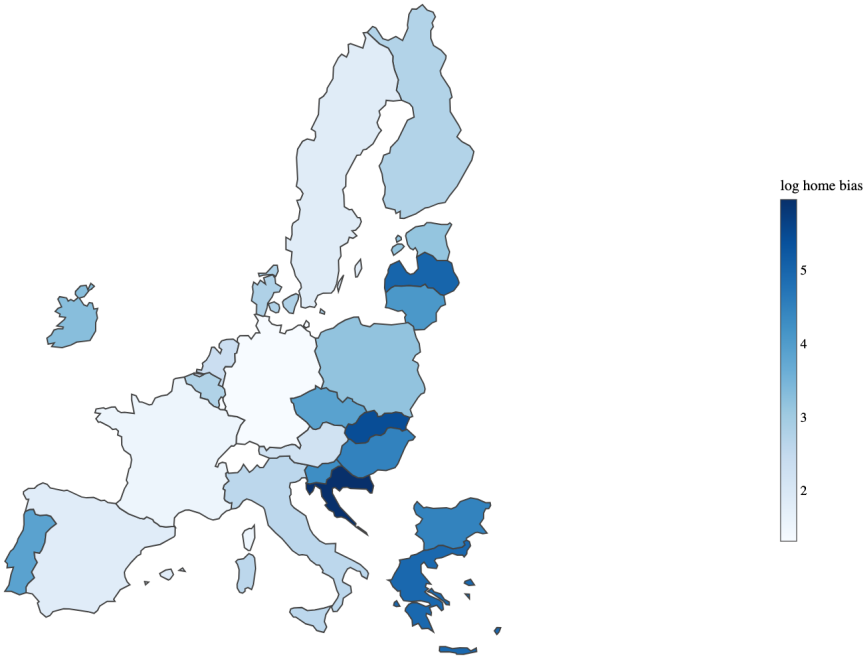


Figure 10: Home Bias Across EU Countries (Investor-Count Benchmark): $\log(Z_{nn})$

Notes: Crunchbase funding rounds, 2015–2019. VC filtered sample. Z_{nn} compares the observed domestic share to an investor-count benchmark. The observed domestic share is the share of deals (investor participations) in which investors from n fund targets in n. The benchmark domestic share is the share implied by investor counts in n relative to total investor counts within the block. The figure reports $\log(Z_{nn})$.

A.2 All types of private equity

This subsection replicates the motivating facts of Section 2 using all types of private equity investment recorded in Crunchbase (including grants, debt financing, post-IPO rounds, etc.), rather than the VC filtered sample used in the main text.

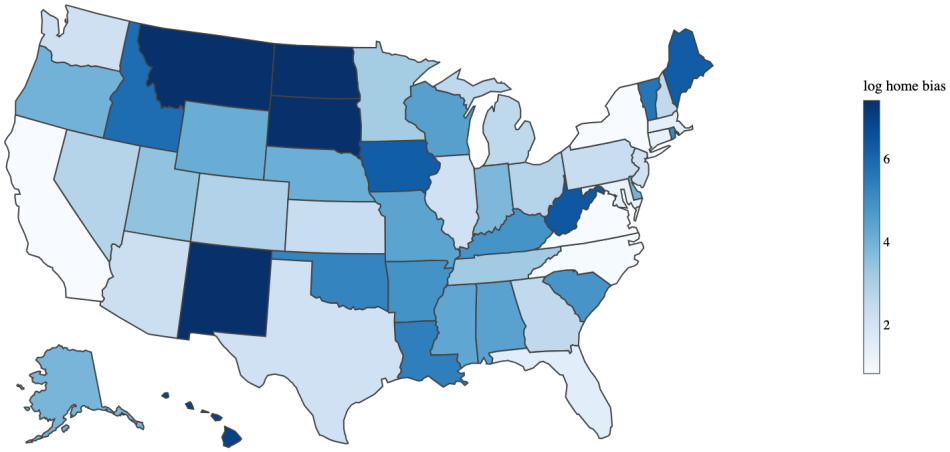


Figure 11: Home Bias Across US States (Capital Benchmark): $\log(Z_{nn})$ – All PE Types
Notes: Crunchbase funding rounds, 2015–2019. All private equity types. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figures report $\log(Z_{nn,t})$.

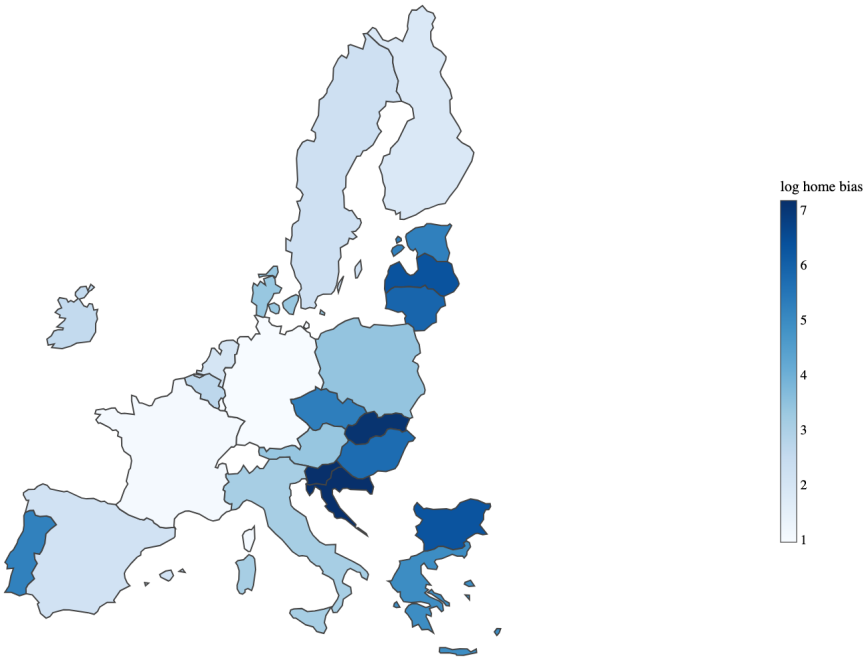


Figure 12: Home Bias Across EU Countries (Capital Benchmark): $\log(Z_{nn})$ – All PE Types

Notes: Crunchbase funding rounds, 2015–2019. All private equity types. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figures report $\log(Z_{nn,t})$.

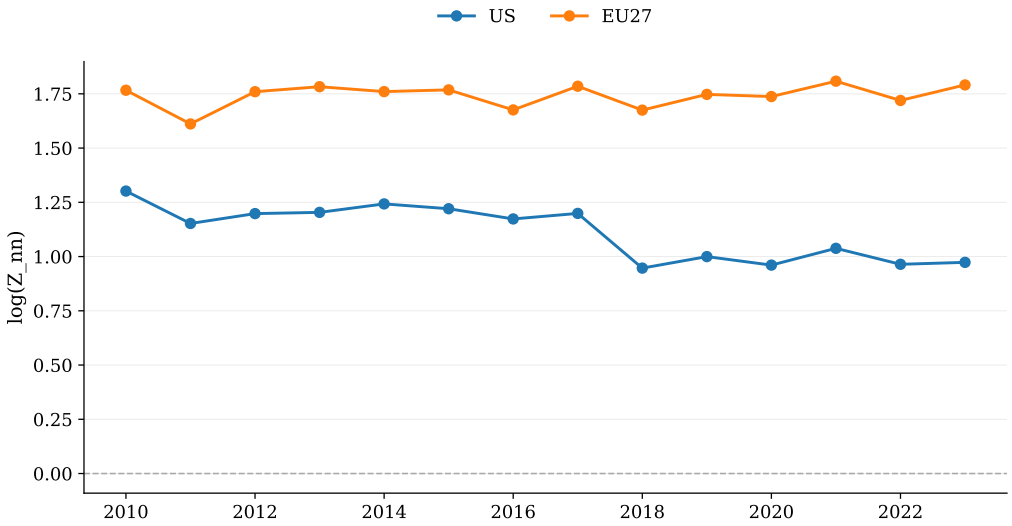
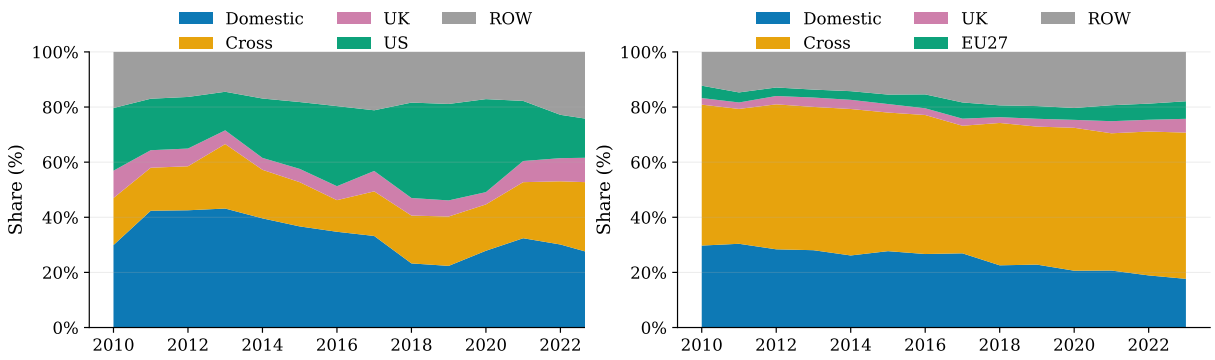


Figure 13: Home Bias over Time: Weighted Average $\log(Z_{nn})$ – All PE Types

Notes: Crunchbase funding rounds, 2010–2023. All private equity types. $Z_{nn,t}$ compares the observed domestic share $Q_{nn,t}/Q_{n,t}$ to the capital benchmark $S_{n,t}/S_t$; the figures report $\log(Z_{nn,t})$.



(a) EU27 Investors (b) US Investors

Figure 14: Destination Shares over Time

Notes: Crunchbase funding rounds, 2010–2023. All private equity types. Shares by destination block (EU27, US, UK, rest of world).

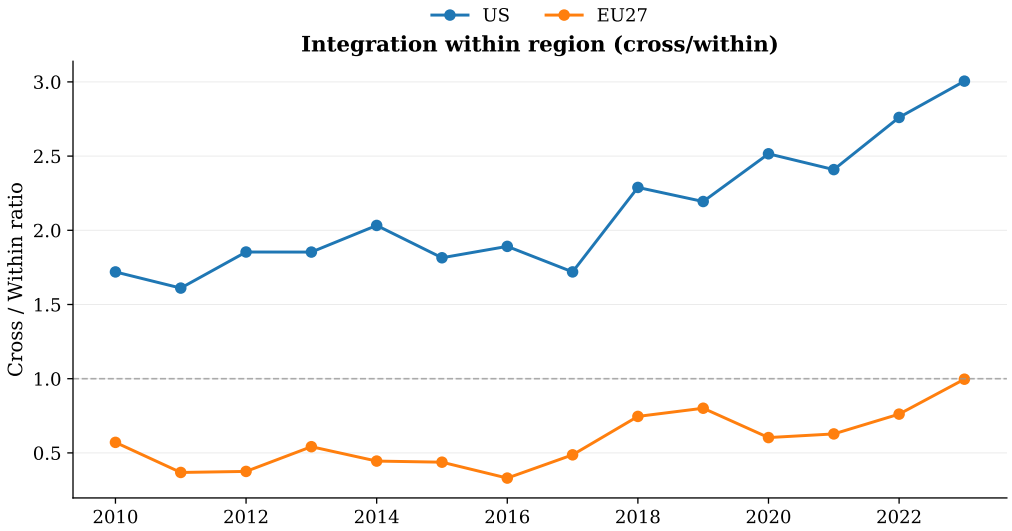
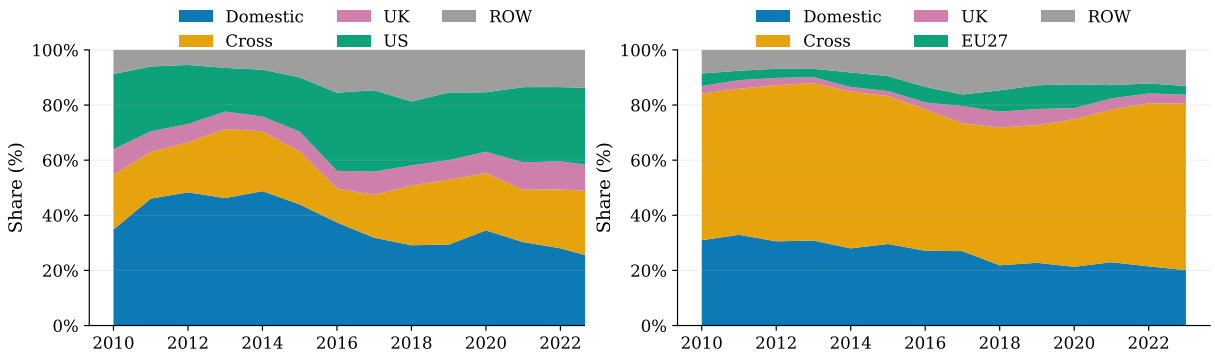


Figure 15: Cross-Region Investment over Time – All PE Types

Notes: Crunchbase funding rounds, 2010–2023. All private equity types. The figure plots the ratio of cross-region to within-region investment volume (cross-state within the US and cross-country within the EU27). A value of 1 implies parity between cross and within investment.



(a) EU27 Targets (b) US Targets

Figure 16: Investor Source Shares over Time

Notes: Crunchbase funding rounds, 2010–2023. All private equity types. Shares by investor block (EU27, US, UK, rest of world).

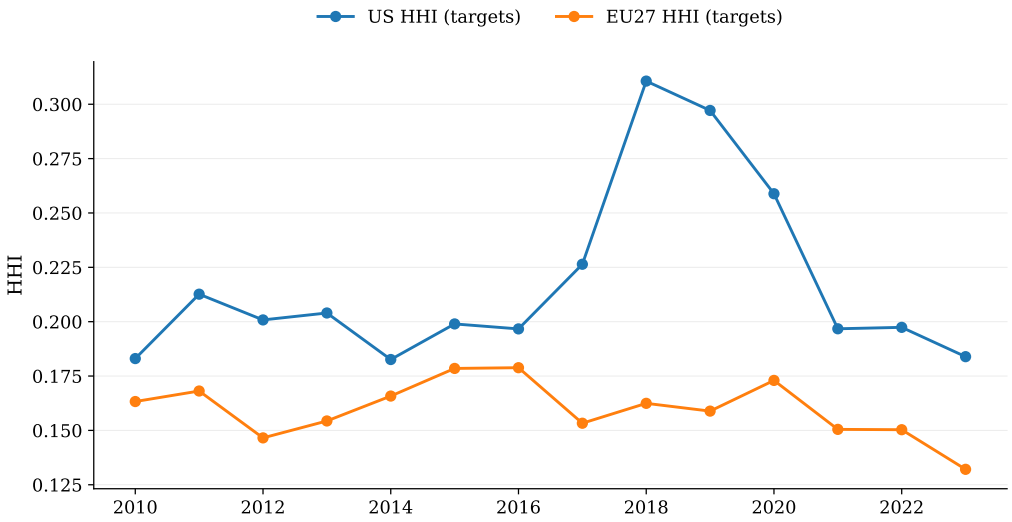


Figure 17: Agglomeration over Time: Herfindahl Index Across Locations – All PE Types

Notes: Crunchbase funding rounds, 2010–2023. All private equity types. Higher values indicate more spatial concentration across states (US) or countries (EU27).

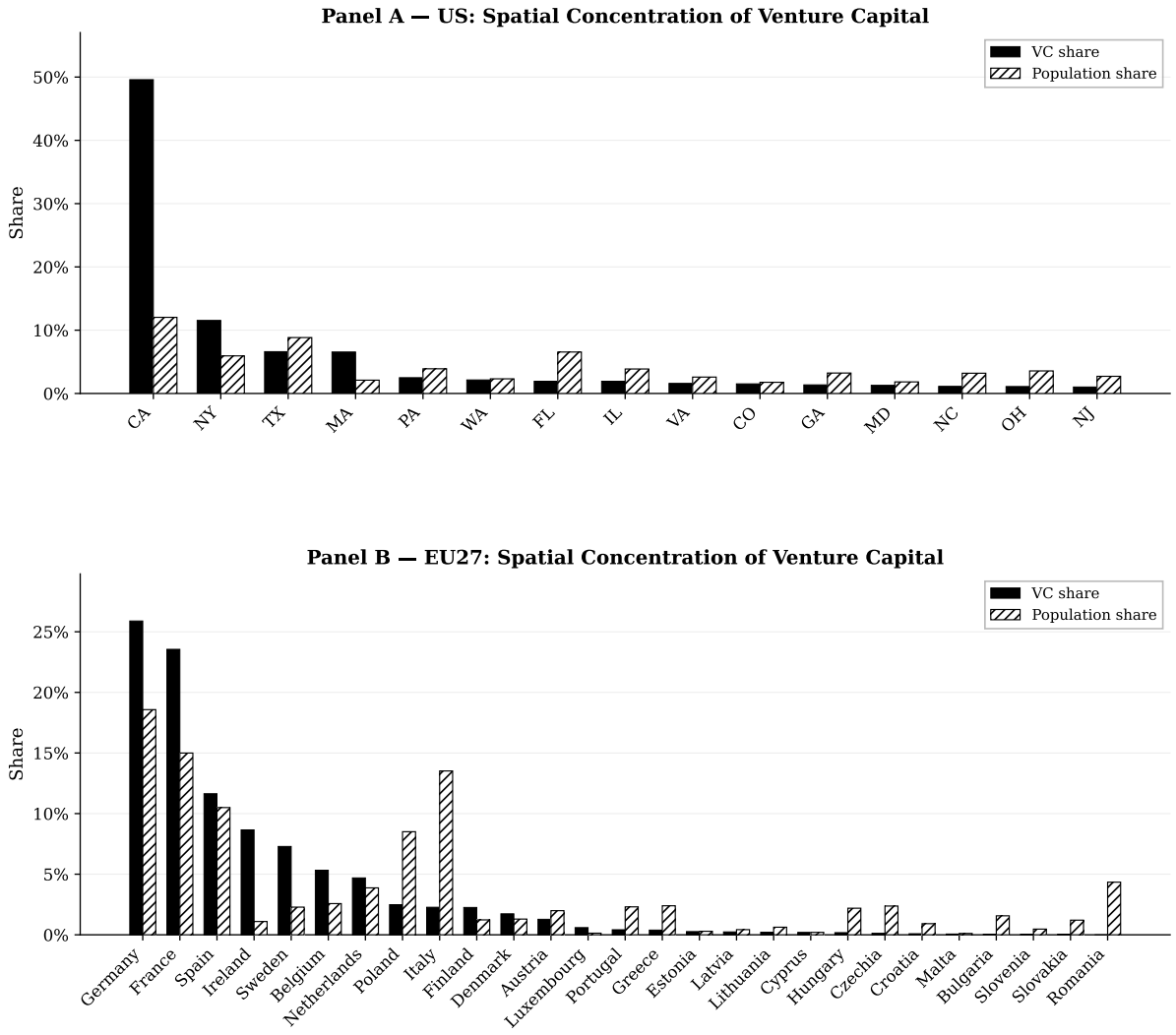


Figure 18: Spatial Concentration of Private Equity: VC Share vs. Population Share – All PE Types

Notes: Crunchbase funding rounds, 2015–2019. All private equity types. Investment shares are computed from total (lead-weighted) investment volume into targets within each region, pooling all years 2015–2019. Population shares as of 2019. Panel A displays the top 15 US states by investment share. Panel B displays EU27 countries.

Table 3: Gravity equation regressions (EU27 vs US states)

	EU27 countries		US states	
	Log VC	VC	Log VC	VC
	(1)	(2)	(3)	(4)
Geographical distance	-1.43^{***}	-2.00^{***}	-0.60^{***}	-0.08^{**}
	(0.25)	(0.57)	(0.07)	(0.04)
Estimator	OLS	PPML	OLS	PPML
Origin & destination FE	Yes	Yes	Yes	Yes
Observations	350	650	1,408	2,550
R^2	0.61		0.67	

Note: Cross-section of origin and destination pairs, 2010–2019. VC filtered sample. All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination.

Table 4: Geographical, linguistic, and cultural distance in bilateral VC flows

	EU27 countries	
	Log VC	VC
	(1)	(2)
Geographical distance	-0.92***	-0.53***
	(0.23)	(0.11)
Linguistic distance	-4.96**	-9.16***
	(2.24)	(2.62)
Cultural distance	-16.80	-20.01
	(14.18)	(16.60)
Estimator	OLS	PPML
Origin & destination FE	Yes	Yes
Observations	350	650
R^2	0.63	

Note: Cross-section of origin and destination pairs, 2010–2019. VC filtered sample. All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination. Higher linguistic and cultural distance indicate greater dissimilarity.

Table 5: Gravity equation regressions (EU27 vs US states)

	EU27 countries		US states	
	Log VC	VC	Log VC	VC
	(1)	(2)	(3)	(4)
Distance	-1.36^{***}	-2.69^{***}	-0.66^{***}	-0.14^{**}
	(0.18)	(0.80)	(0.07)	(0.06)
Estimator	OLS	PPML	OLS	PPML
Origin & destination FE	Yes	Yes	Yes	Yes
Observations	183	625	1,018	2,550
R^2	0.59		0.59	

Note: Cross-section of origin and destination pairs, 2010–2014. **VC filtered sample.** All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination.

Table 6: Gravity equation regressions (EU27 vs US states)

	EU27 countries		US states	
	Log VC	VC	Log VC	VC
	(1)	(2)	(3)	(4)
Distance	-1.00^{***}	-1.41^{***}	-0.18^{**}	0.11
	(0.19)	(0.44)	(0.08)	(0.14)
Estimator	OLS	PPML	OLS	PPML
Origin & destination FE	Yes	Yes	Yes	Yes
Observations	164	529	810	2,400
R^2	0.69		0.60	

Note: Cross-section of origin and destination pairs, 2018. **VC filtered sample.** All columns include origin and destination fixed effects. Columns estimated using OLS in logs or PPML in levels. Standard errors in parentheses are two-way clustered by origin and destination.