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Innovation and Cohesion Policies in the context of Global Competition: towards a European "Venture Commons"

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Innovation and Cohesion Policies in the context of Global Competition: towards a European "Venture Commons"

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Abstract

This paper focuses on factors triggering break-through and disruptive innovations, notably deeptech, which crucially depend upon the development of entrepreneurial ecosystems (EES). The later are made of complementary players building and sharing a common pool of resources. These pools highlight place-based economies of scale as the interpersonal networks aimed at sharing information and knowledge, fixed cost of physical infrastructures, and capabilities to attract and re-allocate capital result into decreasing entrepreneurial cost as the number of projects/stakeholders increases. The resulting strong economies of agglomeration translate into a quasi-"power law" distribution characterizing EESs at the global level: a small number of EES concentrate most successful innovation ventures, and a large set of EESs lag in terms of capabilities to innovate. We link this phenomenon to the crucial role of venture capital and its ability to generate "venture commons" within EES, suspecting the existence of strong economies of scale and scope in the funding of entrepreneurial ventures. We derive recommendations for the EU innovation policy.

Résumé

Cet article s'intéresse aux facteurs favorisant les innovations de rupture, notamment deeptech, qui dépendent de manière cruciale du développement d'écosystèmes entrepreneuriaux (EE). Ces derniers sont constitués d'acteurs complémentaires construisant et partageant un ensemble commun de ressources. Ces « pools » sont marqués par des économies d'échelle localisées car les réseaux interpersonnels visant à partager des informations et des connaissances, le coût fixe des ressources physiques et les capacités d'attirer et de réallouer le capital entre projets permettent de diminuer le coût de l'entrepreneuriat à mesure que le nombre de projets/parties prenantes augmente. Les fortes économies d'agglomération qui en résultent se traduisent par une distribution type « loi de puissance » caractérisant les EE au niveau mondial : un petit nombre d'EE concentre les aventures entrepreneuriales les plus réussies, et un grand nombre d'EES ont des difficultés à passer à l'échelle en termes de capacités à générer des succès industriels et commerciaux. Nous relions ce phénomène au rôle crucial du capital-risque et à sa capacité à créer de véritables « communs » au sein des EEs, soupçonnant l'existence de fortes économies d'échelle et de gamme dans le financement de la création et du développement d'entreprises. Nous en déduisons des recommandations pour la politiques d'innovation de l'Union Européenne.

Introduction: Is anything wrong with the current EU Innovation Policy

In professional conferences, the idea that Europe should promote the development of a number of "deeptech valleys" — the figure of 100 being often quoted in policy slogans — to catch up with its two main technological competitors — the US and China — has recently been raised (e.g. Sifted, 2022). Many policymakers, whether at the EU level or at the infra-national levels, seem convinced that a wide number of 'innovation clusters' mimicking the Silicon Valley ecosystem should be developed. A great deal of middle size cities promotes their own incubation system and call for support to their local start-ups by the Union or the National authorities. At the EU level, many of these requests are welcomed, and backed by member-states; which does not mean, however, that they are appropriately satisfied.

This current approach to support innovation seems to be related to the idea that one of the essential roles of the Union is to guarantee equal opportunity to all (countries, regions, cities). Given the logic of the treaties establishing the EU, it is indeed essential and relevant to guarantee to all citizens equal opportunities as far as it concerns education, social benefits, access to major infrastructures, etc. However, whether this approach is relevant to support innovation should be open to debate. Indeed, innovation is a "best shot" public good (Hirshleifer, 1983). Only the most efficient innovators and innovation ecosystems are necessary to guarantee an optimal level of innovation, and equal access means then favoring the spread of innovation to all potential users (including subsidizing adoption). Innovation policies should therefore concentrate on supporting the most promising innovators. However, this might favor a permanent and growing geographic (and social) divergence, since spillovers of innovation (further opportunity to innovate, better jobs and remuneration, higher amenities in matter of education or culture, etc.) result into strong positive economies of agglomeration. This explains why EU and national public policies aimed at supporting a system of distributed clusters of innovation are so popular among public decision makers. Moreover, this echoes the legitimate will of each local community to highlight its innovative capabilities (reinforced by natural endowment, heritage, and traditions). This approach seems however to be driven by a misunderstanding of how innovative ecosystems work and what they are.

More precisely, while there is a general agreement around the idea that innovation capabilities do not depends upon specific individuals or organizations per-se, but from the fact that entrepreneurs and firms are embedded in an ecosystem made of stakeholders pertaining to different "species" — research labs, expertise tanks, governmental agencies, innovators, investors, etc. —, the exact nature of these innovation (or entrepreneurial) ecosystems is still debated. In a nutshell, at one end of the spectrum, lies the idea that the clustering of the set of capabilities/stakeholders listed above should allow innovation. Whether a place-based set of entrepreneurs, firms and universities succeeds in becoming an innovation cluster is before all a question of management and governance. Either an historical heritage of entrepreneurship resulting in accumulated experience and appropriate behavioral patterns, or an adequate policy favoring alignment of interests and the development of infrastructures aimed at sharing knowledge and risks, and often the combination of the two, explain why a specific ecosystem succeed in being innovative or not.

At the other end of the spectrum lies the idea that some (or a combination of) key ingredients — world class academic institutions, venture capitalists, incubators, etc. — are necessary to turn an eco-system into an innovative one. Both approaches might also correspond to different types of innovation: incremental vs. break-through or disruptive. This tension and debate has recently received a renewed and increased attention, in a post-Covid era, since the aim of a twin, green and digital, transition is seen by many as implying a more pronounced shift towards disruptive and break-through innovations (Buti and Szekely, 2021).

In this paper we will focus on the second type of innovation ecosystem; those who are able to generate a critical mass of start-up firms, and to turn some of them into unicorns. This does not mean that innovation is only driven by unicorns, since some successful start-ups can be acquired by large corporations. The capability to generate unicorns is however a signal of the ability of an innovative ecosystem to turn entrepreneurial projects into successful industrial ventures. This will therefore lead us to discuss entrepreneurial ecosystems (EES), a notion that has become common to describe the geographical concentration, and interdependence, of the many actors allowing the creation and development of innovative startups (Autio et al., 2014). The term was initially coined by business and public decisionmakers seeking to improve the conditions under which entrepreneurship and innovation can thrive. Entrepreneurial ecosystems have rapidly become central in local, national, and international innovation policies (Gilbert, et al. 2004; Minniti, 2008), as innovative startups were drawing ever-increasing investments from venture capitalists and benefited from an intensified attention because of their potential to create jobs and economic growth (Birch, 1987; Thurik and Wennekers, 1999; Wong, et al., 2005). Following the leading example of San Francisco and the Silicon Valley, Austin, Boston, Los Angeles or New York in the US, Berlin, London, or Paris in Europe (Slush, 2017), among numerous others, have started competing against one another as entrepreneurial ecosystems, to support entrepreneurs and attract investors. In this context, the notion of entrepreneurial ecosystem has started to be actively investigated by economics and management sciences, both theoretically and empirically (e.g., Audretsch et al., 2018). We believe it is important to build on these on-going advances to explore more in depth the drivers of the competition among entrepreneurial ecosystems in order to contribute to the design of innovation policies and strategies.

We start by getting back to two alternative visions of innovation and innovation policies in the aim of highlighting that the vectors of innovation are different whether one consider incremental or break-through and disruptive innovation (section 1). The later crucially depends upon the development of entrepreneurial ecosystems, whose key characteristics are then explored (section 2). In a third section, we then highlight that a "power law" characterizes the distribution of EES at the global level; meaning that a few EES concentrate most successful innovation ventures. We link that to the crucial role of venture capitalism within EES, suspecting the existence of strong economies of scale and scope in the funding of entrepreneurial ventures. In a fourth section we derive policy recommendations for the EU, since what seems lacking in the European innovation eco-system is a networking of investments capabilities spread across poorly inter-connected place-based systems of innovation.

I. Innovation vs./and Cohesion

At first sight, two views of innovation policies seem to conflict. First, are policies oriented toward the promotion of "best-in-class" inventors or entrepreneurs. They are in line with a macroeconomic approach of endogenous growth — as illustrated by Phelps (2006) or Aghion (2016) — highlighting how radical innovations allowing the emergence of general-purpose technologies (GPTs), stimulate spillovers across the whole productive system and, *in fine*, substantial productivity gains in the long run. The focus is then on unlocking potential barriers to innovations (e.g., regulations), leveraging incentives for entrepreneurs and investors (e.g., lowering taxes), and supporting the development of clusters aimed at generating knowledge and facilitating transfers with the industry (i.e., world class research universities combined with an innovative entrepreneurial system). Second, in line with a microeconomic approach of innovation processes, insisting on the role of localization effects and highlighting that the reality of innovation is not reduced to high-tech and cutting-edge research, is the Smart Specialization Strategy (3S) developed by Foray et al. (2009, 2011), which became a central reference for the European Commission policy from the 2010s. In a nutshell it consists in analyzing the local endowment of each 'Region' (recognized as such within EU member states) so as to identify the potential bottom-up processes of innovation that could improve the competitiveness of the (regional) productive system, and then to support through specific (regional) industrial policies — combining a planning and an "entrepreneurial discovery" logics[1] — a transformation/agile specialization of the industry[2]. The focus is then on decentralized governance allowing local authorities, in close cooperation with the local entrepreneurship ecosystem, to target support to specific branches and technologies; this support being a mix of subsidies, public service provision (e.g. targeted professional training), and active development of relational networks aimed at favoring the emergence, adhesion and implementation of a shared vision of the adequate regional differentiation relying on an appropriate distribution of roles among stakeholders in function of their preexisting capacities, and of the possible co-evolutions of the later.

Being grounded on different approaches of innovation — a top-down one driven by scientific progress vs. a bottom-up one based on marginal and cumulative improvements —, the policies translate into contrasted strategies: a structural policy based on competitive selection, vs. a targeted industrial policy based on strategic political choices. On the one hand, these two policies can be considered as alternatives since they rely on different approaches — free market (once innovation occurred) vs. governmental interventionism — with contrasted levels — national vs. regional — and distinctive channels of public intervention — provision of generic vs. specific inputs and capabilities (in the sense of Hausmann and Rodrik, 2006) —, triggering different distributive consequences in the short run; social and territorial cohesion not being priorities in the first case.

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[1] This combination is supposed to allow benefitting from coordination among the stakeholders of a regional ecosystems (thus minimizing market failures), while avoiding traditional governmental/bureaucratic failures resulting in wrong choices of specialization, biased selection of winners, and market distortions. Discovery is based on a principle of deliberation among the stakeholders of the regional ecosystem to identify, select and support adequately the targeted specialization.

[2] As pointed out by Foray et al. (2011), and in line with the development orientation of Haussmann and Rodrick [2003], "For many regions and countries it may be the case that the most important « innovations » are not technical but instead consist in the revelation of the particular business orientation that currently should be pursued in directed inventive and innovative activities". (p.7), Smart Specialization is less oriented toward radical/paradigmatic innovation than toward regional development.

Moreover, they rely on contrasted economic logics and dynamics. Generic innovations are more capital intensive because of the requested volume of R&D and industrial investments necessary to guarantee successful innovation efforts, and the quick scaling up at the global level to appropriate the benefits of innovation, before being imitated or bypassed by other global players. Incremental innovation requests percolation by cooperation and imitation to allow a collective appropriation of the innovation and its benefits. The strategic arena is also different: global vs. inter-regional.

On the other hand, these two policies might be considered as complementary since the first clearly targets generic and break-through or disruptive innovations, fed by frontier research and aimed at developing new GPT and related business models, while the second considers incremental transformation anchored in each regional industrial heritage, specific capabilities, and accumulated experience.

Both approaches built on the accumulated academic and practitioners' knowledge on innovation processes, but do not pertain to the same policy logic. In fact, the "endogenous growth" one is clearly aimed at boosting total factor productivity in the long run. It takes for granted that that the world economy is now involved in a knowledge-based growth regime, in which innovation is driven by science, and competition is inherently global. Players are in a global head-on competition, and national governments have to provide (institutional) infrastructures to support their research and entrepreneurial communities to maximize their ability to innovate, absorb innovations made elsewhere, articulate the necessary resources to appropriate the benefits of innovation (i.e. industrial and marketing capabilities), and built on all these components to develop successful businesses, hopefully resulting in the long run into collective benefits (jobs, internal demand, fiscal and exportation revenues, not forgetting innovation spillovers). Moreover, the propagation of generic technologies triggers the development of new applications in a great deal of sectors as well as the formation of new capabilities which result in pervasive productivity gains (Bresnahan, 2010).

By contrast, the 3S approach has been clearly developed as a regional development policy aimed at leveraging the local capabilities to innovate observed in the context of historic "industrial districts" (Marshall, 1919; Becattini et al. 2009) to favor a better integration of regions in the transnational division of labor (Foray, 2018a, 2019)[3]. The political aim is to favor economic and political convergence by triggering industrial and commercial differentiation across regions allowing each of them to leverage its comparative advantages. It relies on the idea that (European) regions having very contrasted capabilities, levels of wealth, institutional and cultural endowment (Boschma and Gianelle, 2014; Frenken et al., 2007), uniform development policies would inevitably fail and result into reinforced inequalities across regions, and polarization among those which would be included in the core of the global economy and those who would stay at the periphery. Each region is therefore invited to identify some key domains in which new combinations between capacities and opportunities would be explored.

[3] That said 3S reccognizes the fact that there are three types of innovation processes — Modernization (of an existing productive system), Transition/Diversification (toward new markets), and radical (re)foundation — that lead to different modes of insertion in the global economy.

We are keen to embrace the “complementarity” approach of the two policies. However, it leads to establish a distinction between what pertains to an “innovation” policy and what is a component of a “cohesion” policy. According to us, the support to start-up firms should clearly be a driver/central piece of an “innovation” policy. Indeed, as pointed by the 3S literature, regional innovation dynamics are based on pre-existing economics stakeholders, which innovation capabilities might be boosted by an adequate public support. To the opposite, start-ups are key links between the new knowledge developed by scientific organizations, networks of highly skilled professional experts (i.e., epistemic communities), and large corporations operating R&D capabilities. Their aim is clearly to recombine existing knowledge, often at the frontier of research (or at least of professional practices), to articulate it with the one of industrial and commercial experts, and to turn it into consistent projects to be proposed to investors as well as to industrial or commercial partners to disrupt a market, a business, or a techno-economic paradigm. The uncertainty is high, not only because a wide set of technological, organizational, and industrial challenges have to be overcome to result into a marketable product or competitive process, but also because success is depending upon reception/adoption by the demand side (which articulate the users and the public authorities, which might consider the collective interest, and sometime the vested interest), as well as of the reactions and competitive innovations by incumbents and other new entrants.

While these two policies might be complementary, they have different targets and should rely on distinct tools and levers, since they address contrasted logic of innovations associated to distinct systems of innovations.

The smart specialization theory relies on case studies as the one of the eye-glasses industry in Morez in the French region of Jura, where an entrepreneur in the early 19th century was able to shift from the production of hobnails to the production of thin metal frames for spectacles, triggering imitation and complementary innovation by competitors, as well as support policies by local authorities. In the early 21st century innovation conditions are different from the one of the first industrial revolution. First, in this fourth phase of the industrial revolution, innovation tends to be more science-based, which make the access to scientific knowledge crucial, and the innovative process less bottom-up (i.e., by production engineers involved in workshops and factories). Second, and in line with the previous point, the raising capital intensity of innovation result into a more head-on competition among innovators who have a strong incentive to write off their fixed R&D cost on the widest market they can, which is facilitated in the context of a globalized economy. Third, the combination of globalization and development triggered a proliferation of innovative eco-systems resulting in more distributed capabilities to imitate first innovators and scale-up (see map 1). Lead-time advantage tends therefore to shorten and capacities to accelerate “maturation” processes are essential. As a result, entrepreneurial-based competitive advantage should rely more on capabilities to leap-frog (i.e., generate disruptive innovation) on a repetitive, if not permanent, basis. The receipts from the past might be of insufficient help, at least when it comes to policy aimed at favoring radical innovation.

II. Entrepreneurial Ecosystems (EES) and the role of “venture commons”

It is now widely recognized that innovation draws from ecosystems made of complementary players building and sharing a common pool of resources. These resources include “entrepreneurial knowledge”— which combines knowledge about science, technology, and engineering with knowledge of market growth potential and possible competitors — as well as the whole set of inputs and services required for launching a new activity.

An important dimension of these ecosystem is that they are placed-based[4], since part of the circulating knowledge is tacit (non-codified). It is certainly the case of a large part of the technical and managerial know-how that is necessary to launch and scale-up a new project. This is also linked to the fact that individual characteristics matter a lot in small teams, which is one of the essential features of start-up firms. Not only the characteristics of the lead-persons matter, but also those of the members of the core group are essential since they must be complementary and need to trust each other. Thus, the forming of teams, their recompositing and their enlargement occur in an environment where people need to meet in-person and in different contexts. Moreover, exchanges of information and knowledge develop beyond the frontiers of each start-up, that is, at the ecosystem level, and again, proximity plays an important role in allowing them. Beyond information and knowledge , members of innovation ecosystems share a whole set of resources: the externalities provided by academic and research institutions, by the concentrations of talents, and by the flow of inputs — from public money to services provision — that comes with the attractiveness of a fast-growing agglomeration. As it will developed below the wide set of requested capabilities to fund the launching and development of new projects is also a strong driver of agglomeration effects. It has been widely documented that venture capitalists and bankers play an essential role of counseling and go-between among entrepreneurs… who they need therefore to know in person.

In other words, access to other people and their ideas and experiments, as well as the information they generate or circulate is essential. What Potts (2022) qualifies as “innovation commons” are requested because of the uncertainty about the nature of new ideas and the entrepreneurial opportunities they represent, because cooperation among different skills is needed, because re-distribution of project-monitoring rights might be necessary to foster the development of projects (including to allow the development of complementary projects necessary to ensure the adoption and diffusion of a given technology).

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[4] The 3S literature does not develop a specific analysis of “local”/place-based innovation systems. The unit of analysis is clearly the “region”, and the goal is to design “policies” aimed at promoting development at this level, whatever the initial endowment of the socio-economic system. It is therefore a methodology grounded in innovation studies aimed at providing public decision makers with principles to design a policy adapted to the specific capabilities available in the considered region thanks to the combination of strategic choice/planning logic and a decentralization of initiatives/ entrepreneurial discovery logic. Clearly break-through/disruptive innovation and frontier research are not viewed as the only sources of productivity, growth, and development. To the opposite, each region is invited to particularize itself by identifying some combinations between opportunities and capacities, to establish and strengthen a competitive advantage. See, in particular, Foray (2018a, 2019)

All these elements request multi-directional and multi-dimensional interactions among individuals, and are boosted in the context of dense and relevant social networks[5], allowing information sharing and screening, revelation of latent externalities, as well as network and coalition forming. It might contribute to reduce the risks and costs of failures, either for inappropriate design of the technology, or of the business model, or of the organizational arrangement, or even for unexpected coalitions competing and fighting incumbents' innovation.

According to Potts (2022) and many others who refer to the notion of "commons", two key dimensions seem to be intertwined: the existence of a "common pool" of resources and principles of co-operative governance (see Box 1). However, even if some resources can be managed «co-operatively", common pools are not necessarily governed cooperatively. Indeed, alternative regimes of governance can be relied upon to manage the pool of resources. The reference to commons is frequently made to qualify a regime of governance by which a "democratic" system allows all the "commoners" to cooperatively manage a common pool. However, as highlighted by many historical examples, key elements of the common pool could be privatized, or 'nationalized', transforming the co-operative governance regime, into, respectively, either a quasi-corporate governance one (with tradeable shares and coalitions among shareholders), or a public policy one (in which political coalitions make decision about the government owned assets). Moreover, historical analysis of commons show that co-operative governance regimes may fail, and often do as time goes (de Moor, 2023). Therefore, it is important to qualify the nature of the resources involved in the common pool to analyze their economic properties, before analyzing in a second step the principles of governance to align actions and incentives of the stakeholders involved in the development and management of the pooled resources.

As pointed above, entrepreneurial ecosystems, rely before all on place-based social networks aimed at sharing/circulating, then pooling, a wide set of information, knowledge and skills embodied in individuals. These "information circulation" capabilities facilitate identification of opportunities and projects screening. In addition, they provide a mechanism to collectively develop entrepreneurial capabilities, and a related market for skills (labor market but also consulting services). Second, ecosystems provide shared access to physical resources (e.g., labs, workshops, logistic platforms, industrial capabilities, etc.), that are essential to develop, test and upscale concepts. Third, entrepreneurial ecosystems provide access to funding capabilities, which are needed to finance the detour of production; i.e., the time gap between revenue collection (industrial exploitation) and expenditures (R&D and industrialization). On that matter, two major challenges need to be addressed: first, the ability to mobilize large volumes of capital — the more radical the innovation, the higher the critical mass of investment requested to bring the outcome to the market —, and second the speed at which a given project could be funded; the ability of reaching the market before competitors being a key competitive advantage, since it allows to influence the dominant design of the technology (Anderson and Tushman, 1990). Entrepreneurial ecosystems allow entrepreneurs to access funding capabilities, and investors to pool risks. We propose to identify as "venture commons" this combination of information circulation capabilities, physical capital, and funding capacities that are pooled in an entrepreneurial ecosystem.

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[5] Typically, a network exhibiting a low diameter and a scale-free structure — which results into a power law distribution of connections among nodes/individuals, resulting into a hierarchy of connectiveness across individuals — allows some central/star individuals to connect a wide set of individuals and to increase the "conductivity" of the whole network. For more on network see Jackson (2008).

Entrepreneurial ecosystems are in practice mechanisms allowing different stakeholders to be involved in a "co-opetitive" process (Brandenburger and Nalebuff, 1996) of information sharing, ideas selection, skills articulation, collective deliberation, and capabilities coordination allowing to explore alternative concepts, develop and test prototypes, launch innovation, and scale up those which seems promising. In such ecosystems, the few successes are largely the result of accumulated experience, which include the one derived from the many failures. The ecosystem is key, both to allow recombination and to support socialization of losses and benefits. Socialization of losses allows reallocation of capabilities instead of losing them and is key in guaranteeing a willingness to take (significant) risks[6]. Socialization of benefits is one of the drivers of the attractiveness of an ecosystem for talents, on the one hand, for investors, on the other. In such a "co-opetitive" system, governance is key. It consists mainly in selecting the projects to be developed further and reallocating the means among projects and among stakeholders.

When it comes to governance, and in line with the economic literature on common pools (e.g., Ostrom, 1990; de Moor, 2023), proximity plays an essential role in allowing the contributors to the common pool to align their interests. This is true both because a minimal level of trust is needed, and because competition by those who are external to the commons is a strong factor of cohesion and discipline.

The contribution of Ostrom also highlights a very important dimension for the governance of commons: polycentric governance; that is a complex form of governance with multiple centers of decision making, each of which operating with some degree of autonomy. This is precisely what is characteristic of entrepreneurial ecosystems. In many 'innovation policy' discussions, two main types of players are often considered: on the one hand the entrepreneurs (mainly understood as technology or marketing specialists) and, on the other hands, the policy makers (mainly understood as 'neutral' third parts among the stakeholders, driven by the will to promote the collective interest, and therefore able to play the role of facilitators). The specificity of investors/venture capitalists tends then to be under-estimated, and the public authorities are often considered as those which should solve the "market failures" resulting from the externalities characterizing an innovation ecosystem (i.e., the need to share information, to develop common resources, to coordinate investments, and to select some players/solutions against competitors in the same eco-system to avoid means dilapidation)[7]. It has been widely documented, however that the venture capital industry plays a major role in the coordination of entrepreneurial ecosystems, that requires a detailed understanding of the externalities and of the innovative complementarities.

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[6] 9 out of 10 startups no longer exist ten years after they were launched. 20% of startups fall apart after a year. 30% of startups close within two years. 50% of startups shut their doors within five years. 70% of startups dissolve within 10 years. Source: https://firstsiteguide.com/startup-stats/.

[7] In the context of the break-through, disruptive innovation, the figure of the investor is central, while in context of the less capital-intensive incremental innovation process and 3S policy monitoring is in the hands of the industrial firms and the policy makers. The later are responsible for favoring coordination of strategies, providing specific public goods, boosting knowledge sharing, and managing redistribution. Indeed, imitative entry by the firms involved in the ecosystem constitutes a key ingredient of smart specialization, in order that agglomeration externalities can be realized, economies of scale can be reached, and, also, because, by pushing market prices towards marginal costs, competition allows translating innovation into a collective competitive advantage on the interregional market, triggering collective benefits. Imitation within the ecosystem, calls however for a redistribution from those who are the beneficiaries of the increased competitivity/productivity (typically by exporting from regions) in favor of those innovators that suffer from an imperfect appropriation of the benefits of their innovation. Hence the fiscal role of (local) public authorities in this model.

Venture capitalists and investment bankers organize hearings of entrepreneurs, seat in the boards of the firms they support, are involved in the training and selection of CEOs, provide them with consulting service, etc. They have the right incentives to select and support entrepreneurs and allowing them to rapidly reach a critical mass, once they have demonstrated the sustainability and perspectives or their model. Of course, they might be individually/organizationally biased, but they form de-facto a distributed community of independent decision makers, limiting the risk of systemic errors. Moreover, an entrepreneurial ecosystem also gathers all types of public decision makers (pertaining also to partly independent bodies: local governments, national ministries, European agencies) and private ones (industrial firms, NGOs, entrepreneurs, etc.), who have also a say in the distributed system of selection and reallocation.

Box 1:
The Governance of Commons, the Organization of Innovation Ecosystem, and Innovation Policy

The "Commons model" has been recognized as an institutional arrangement likely to support innovation (e.g., von Hippel, 2005; Benkler, 2006, Ostrom and Hess, 2007 Frischmann et al., 2014; Potts, 2019). By cooperatively pooling ideas, data, and experiments about news uses of technology and de facto sharing the costs of development, Schumpeterian entrepreneurs can discover new opportunities under conditions of extreme uncertainty. It is the model behind the so-called "open-source" technologies (e.g., Allen 1983, Harhoff et al 2003, Bessen and Nuvolari 2016).

For some authors, like Potts (2022), the open-source model is adaptable to all kind of technologies, not only digital ones, and should also inspire public policies. Thus, innovators should create communities mimicking the software developers' ones, and exchange resources through contracts inspired by the open-source licenses (e.g., copyleft), while public authorities should develop digital platforms aiming at favoring the matching between the various stakeholders of innovation ecosystems and allowing these players to benefit from low-cost self-governance solutions fully embedded in the technology (i.e., blockchains and Web 3).

That said, open-source software communities perform because contributors are subsidized by their public or private employers (which expect returns on their investments in terms of externalities provided by a vast reservoir of skills; cf. Lerner and Tirole, 2005), and because the need for interoperability discipline players (common standards). Moreover, software is a specific "technology", since the writing of code immediately turns into usable outcome (or input). There are no constraints of industrialization, logistic management, and access to complementary inputs, and therefore, no need for funding anything beyond the design of the concept. It is therefore not for sure that the organizational arrangement characterizing ppen-source innovation could be relied upon for any type of innovation.

When it comes to policy intervention, Potts (2022) opposes two policy models : the "free innovation" one — which emphasizes the discovery and welfare-enhancing qualities of a bottom-up, civil-society-led, global innovation framework powered by information platforms — and the "traditional" one — mostly based on state subsidies to the supply side either by providing generic infrastructure or by hear marked grants to entrepreneurs, which suppose bureaucratic/political selection of the targets[8]. These two "policies" rely therefore on different tools; respectively information exchange and funding provision and address two different sets of "markets failures": information externalities among the different stakeholders of an innovation ecosystem vs. capital market failures due to the uncertainties characterizing the innovation process that make difficult to reach the critical mass for funding the requested R&D and industrial investments. It is not for sure, however, that this second class of market failures would be resolved by information platforms.

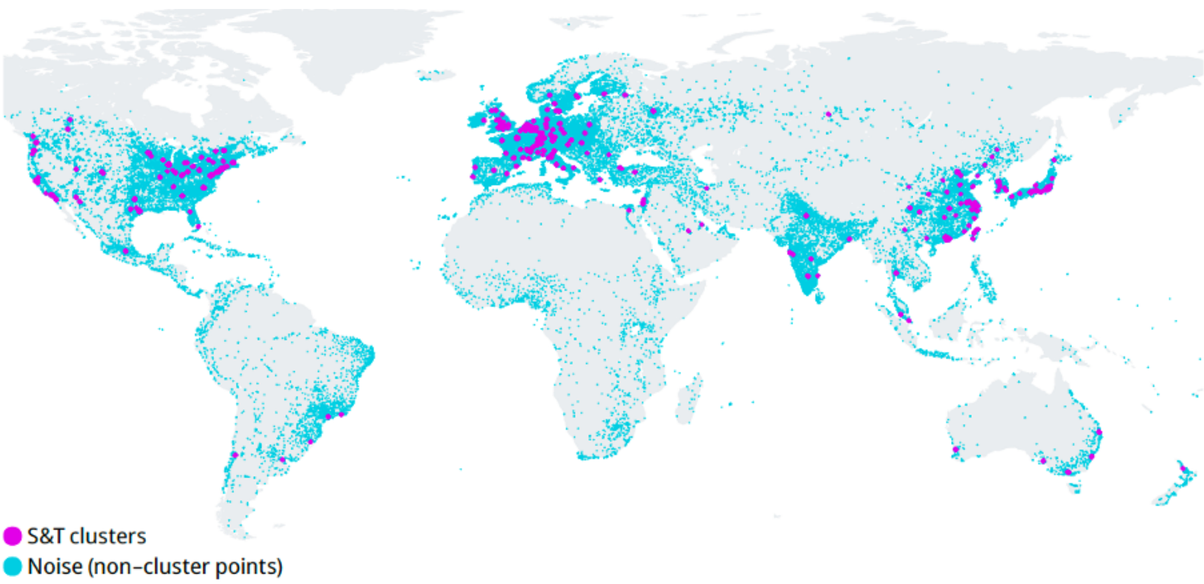
[8] From that perspective, both the "endogenous growth" innovation policy and the 3S inspired policy pertain to the same category of traditional policy since they rely on political/bureaucratic capabilities to detect and decide which innovation process should be supported. The 3S policy is simply more decentralized; relying on the efforts of local entrepreneurs to discover new opportunities, and of local authorities to evaluate potential and identify the actors to be supported). It is certainly not led by users and by (more) democratic processes of decision.

These developments about the nature of ventures commons allow to highlight some of their economic properties. In particular, they are characterized by economies of scale (and scope) as the interpersonal networks aimed at sharing of information and knowledge, fixed cost of physical resources, and capabilities to attract and re-allocate capital result into decreasing entrepreneurial cost as the number of projects/stakeholders increases. Moreover, these economies are boosted as an appropriate regime of polycentric governance — i.e. with a diversity of decision makers, and the presence of skilled venture capitalists — allows to maximize screening effectiveness, learning capabilities, and socialization of risks.

III. The iron (power) law of innovation ecosystems

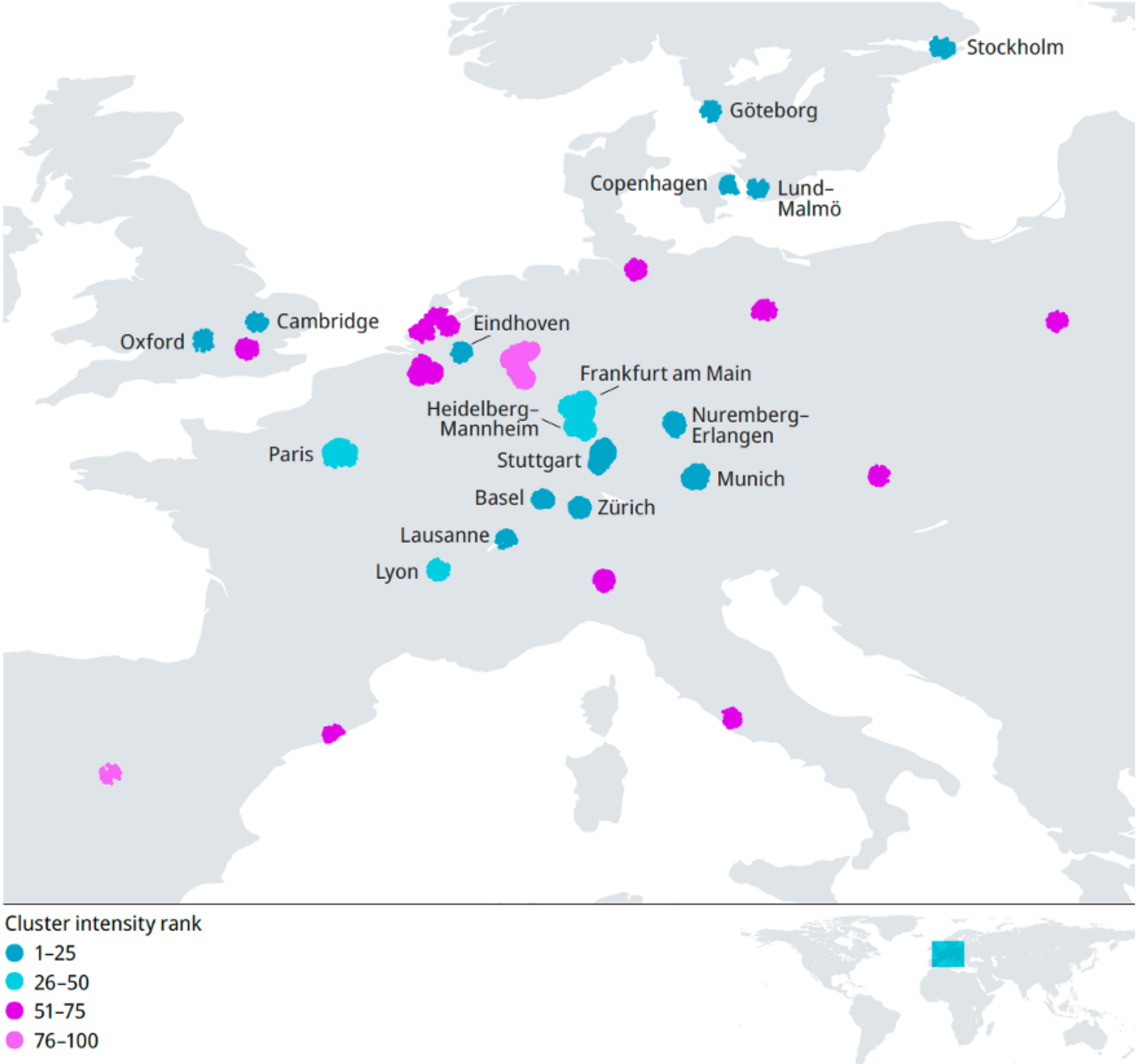
Recognizing that agglomeration effect matter for innovation, the Global Innovation Index published by the World Intellectual Property Organization (WIPO, 2022) highlights the world's largest top 100 science and technology (S&T) clusters (see Map 1) – that is, the geographical areas around the world with the highest density of inventors and scientific authors. Europe (including the UK) accounts for 24 of those 100, while only one cluster (Paris) rank within the top ten. Among the top 10, Tokyo–Yokohama (Japan) is the top-performing cluster, followed by Shenzhen–Hong Kong–Guangzhou (China and Hong Kong, China), Beijing (China), Seoul (Republic of Korea) and San Jose–San Francisco (United States). The US and China have both 21 cluster in the top 100 and many of their clusters are much larger than the European ones. That said, when measured in terms of intensity (size of the ST clusters/size of the local population), Europe ranks very well: 11 EU clusters in the top 25 and 2 for the UK (see Map 2). This first approach of innovation ecosystems highlights the inequalities among clusters as well as the de-facto global competition among places to attract talents and investments which are necessary to become a competitive player.

Map 1: TOP 100 Science and Technology clusters
(Measured by the number of patents and scientific publications)



Source: WIPO Statistics Database, April 2022.
Note: Noise refers to all inventor/author locations not classified in a cluster.

Map 2: EU S&T Science and Technology clusters by intensity (Measured by the number of patents and scientific publications/inhabitant)



Source: WIPO Statistics Database, April 2022.

Although the existence of inequalities between entrepreneurial ecosystems is well-known, the magnitude of these inequalities is not always properly considered when designing innovation and cohesion policies. Entrepreneurial ecosystems indeed are characterized by the emergence of strong, power-law like inequalities, fueled by strong economies of agglomeration at the city level with positive spillovers organized in concentric circle. Moreover, as in the case of the spatial distribution of cities, the geographic organizations of Entrepreneurial Ecosystems (EES) seems to follow a spatial so-called fractal structure (smaller EES are sub-sets of larger/more central EES as the imbrication of smaller city economies into the economy of larger cities; cf. Mori et al, 2022 and box 2 and figure 1).

In this respect, in the previous section we highlighted that the “venture commons” characterizing entrepreneurial ecosystems are sources of economies of scale, which are plausibly at the origin of the central place property (CPP) and the hierarchy property (HP) characterizing entrepreneurial ecosystems. In a globalized economy, there are several reasons why these power-law inequalities increase. The global structure of the economy — thanks to a common info-structure and a wide scale logistic and commercial infrastructure, as well as institutions favoring global trade (from intergovernmental trade agreements to industry associations; see Brousseau and Glachant, 2023) — allows entrepreneurs to scale up their activity at a very high pace (e.g., US and Chinese big tech, but also pharmaceutical innovation, services, etc.). And, while adoption is becoming potentially global, imitation, and further innovation/development by multiple competitors tend to be rapid, raising the intensity of the competition in innovation. To tackle this speed challenge, innovators should benefit from an ecosystem allowing them to improve their innovation at the appropriate pace (accelerate the management of the learning process, both within organizations and by interactions with the users, and other stakeholders) and to fund their development: hence the cruciality of the acceleration and consolidations phases after the seed stage, and the importance of the entrepreneurial ecosystem benefiting to a startup.

Box 2:
The economics of agglomeration

In a recent paper, Mori et al (2022), explore the origin of power law in city size. The so-called Common Power Law (CPL) highlights not only a difference in size across cities but also in diversity (which larger cities experience more) (Mori et al, 2020). It results into a Hierarchy Property (HP) by which larger cities perform more diverse activities than smaller ones. Moreover, the city system exhibits a fractal structure by which larger cities are spaced apart to serve as centers for surrounding smaller cities, generating a similar pattern across different spatial scales (Batty and Longley, 1994).

Mori et al. demonstrate that this phenomenon might have its root in endogenous economic forces that govern agglomeration and dispersion of different industries, in line with the central place property (CPP) identified by Christaller [1933] . It asserts that diverse city sizes accrue from diverse scale economies across industries. Larger cities concentrate activities characterized by higher economies of scale resulting in a hierarchy across cities (Hsu, 2012). At each layer, every city is associated with its hinterland where it supplies its goods to smaller cities in the lower layers, where those goods are not self-supplied. The size of cities is limited by the cost of distributing/accessing the goods and the services away from the city. As a result, the city system exhibits a hierarchical ladder in which the set of industries found in a smaller city is a subset of that found in a larger city (hence, the hierarchy property, HP).

The origin of the phenomena is linked to the interaction between supply and demand. Consumers prefer locations with better access to a wider range of goods. A large concentration of firms promotes a large concentration of consumers, which in turns provides an incentive for firms in different industries to spatially coordinate. Then, for a given population distribution, some cities are not profitable for investors in industry Đ, because they are too close to Đ-industry’s competitors in nearby cities, explaining also strategic choices of localization by investors and the geographical dispersion of investments in each industry given the specific economies of scale and distribution characterizing it.

The model ignores exogenous differences across locations due to geographical advantages, available natural resources, and other historical factors that may explain the precise location and characteristic of each large city ecosystem. However, the interplay between preference for diversity, cost of access to industry output and economies of scale seems to explain the power law characterizing city ecosystems.

The recognition of entrepreneurial ecosystems as a central dimension of the dynamic of innovation has been accompanied by an increased availability of datasets of startups and investors, opening avenues for measurements (e.g., Leendertse et al., 2021) and empirical investigations. We attempt to rely on these data to clarify the magnitude of the inequalities among EES. Although innovation is intrinsically difficult to measure (the limitations of patents and publications as proxies for industrial achievement and conceptual advances are well known; R&D expenditures are inputs not outputs; etc.), and most significant dimensions of EES are subject of discussions among specialists, the situation where policymakers need to take decisions with respect to innovation on the basis of very limited, imprecise and incomplete, often anecdotal information (focused on some success stories), is not satisfactory. Used with caution, empirically grounded metrics and tools can help analysts and decisionmakers tackle analytical and strategic challenges, notably by contributing to raise their collective awareness about the relevance of venture funding as a key driver of the growth and development of entrepreneurial ecosystems.

In this vein, not only is the volume of fund raised an indicator of the ability of an ecosystem to generate several new ventures, and to turn some of them into success (i.e., unicorns), but fundraising speed is also a crucial element to guarantee the competitive development of innovative startups (since it is the determining factor of the pace at which a startup can hire talents, perform its R&D, and develop its operations and sales), and the ability of an ecosystem to reach the critical mass of innovative businesses (triggering strong economies of scope among them). The ability to raise funds is of course influenced by characteristics of any given startup, notably by the experience of its founders, by its competitors, etc. But, independently of these individual criteria, the speed at which startups raise funds is a key characteristic of its ecosystem considered by entrepreneurs and founders when assessing the dynamism and vibrancy of any ecosystem, and a key element that policymakers should take into account when considering innovation policies.

Using data from Crunchbase (Dalle and den Besten, 2017), and following Gastaud et al. (2019)[9], in making use of the TreeMaps FoamTree package that allows to display hierarchical data as nested polygons tiling the plane, each cell having a surface proportional to a specific dimension of the data, as is general in tessellations and TreeMap representations, Figure 1 presents a visual comparison of the larger international entrepreneurial ecosystems in terms of startup funding, as of December 2022. Each cell of the map corresponds to a startup, its surface representing the amount of funding received by the startup and its color the speed (in dollars/month) at which these funds were raised, darker colors being associated with higher fundraising speeds.

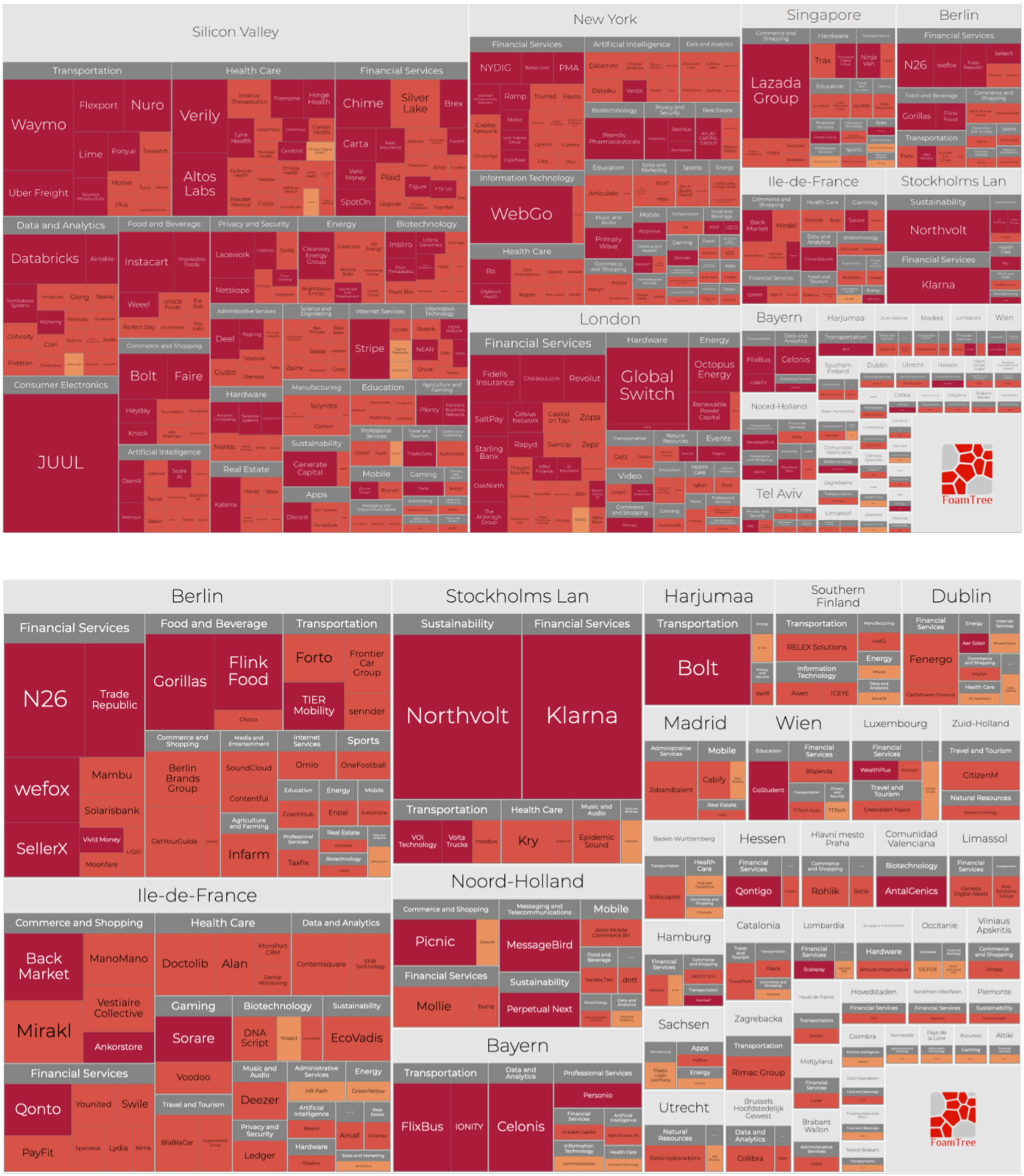
[9] Gastaud, et al. [2019] present empirical evidence suggesting that entrepreneurial ecosystems increase in sectoral diversity as they grow larger and therefore tend to be more robust i.e., both resilient to the economic climate and less subject to specific industry trends. They explain this through the successive rounds of allocation of funding to startups in a given entrepreneurial system which mix exploration of new opportunities in other industries and exploitation of financially successful ventures in existing ones.

Figure 1a corresponds to a set of international ecosystems, in order to compare the largest European ones with several others in the US (Silicon Valley, New York) and elsewhere (London, Singapore, Tel Aviv), while Figure 1b focuses on EU27 entrepreneurial ecosystems. Both figures clearly suggest a sharp prevalence of a limited number of ecosystems with respect to others: in the world (Figure 1a), the Silicon Valley and New York, followed by London, largely outperform Singapore, Berlin, Paris or Stockholm in terms of startup funding; while in the EU27 (Figure 1b), Berlin and Paris, followed by Stockholm, clearly outperform others in this same respect[10].

When focusing on the 200 largest startups (in terms of funds raised), Silicon Valley startups represent more than 153 B$, with an average funding speed of 110 M$ per year, compared to $72B and 53.5 M$/year for New York, while Berlin represents $24B with a fundraising speed of 22.5M $/year and Madrid $4.5B with an average speed of 3.3 M$/year. To put it differently, Silicon Valley startups have raised 6.4 times more funding than startups in Berlin and 34 times more than startups in Madrid, and they raise funds 5 times more rapidly than startups in Berlin and 33 times more rapidly than startups in Madrid.

[10] The leading role of Berlin as a startup ecosystem is markedly different from its ranking as a cluster (see Map 2 above), which could be related to the importance in the Berlin ecosystem of successful B2C startups and on the leading role that players such as Rocket Internet could have had in this context. It also strengthens the argument according to which the success achieved by an agglomeration in developing a S&T cluster is not necessarily correlated to its success in generating a vibrant entrepreneurial ecosystem, and that deeper analyses are needed to understand better the interplay between both. It highlights also the role of institutions and notably universities with respect to their contribution to human capital accumulation (Tebaldi and Elmsie, 2013; Buti and Szekely, 2021).

Figure 1: A comparison among a set of Entrepreneurial Ecosystems at the Global Level (1a, top) and in the EU27 (1b, bottom)

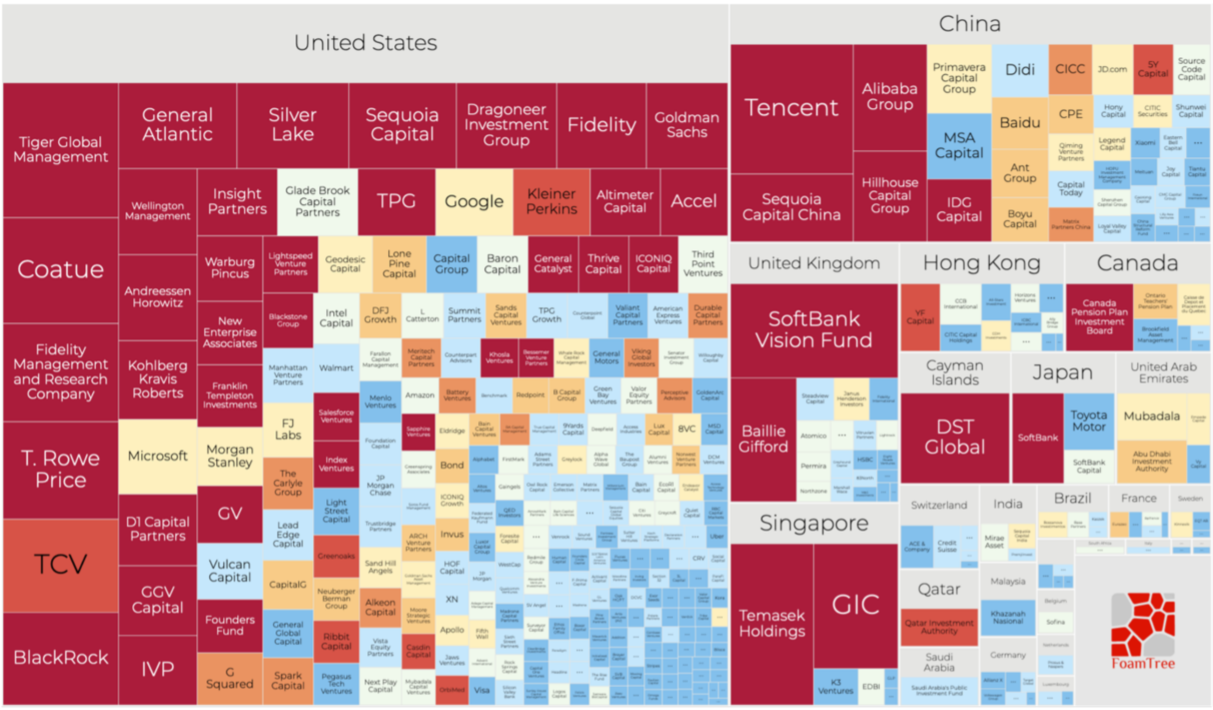


Surface of tiles represents the amount of funding received by a startup; color represents its fundraising speed in dollars per month, darker colors being associated with higher speeds. Sources: Agoranov & Crunchbase, startups created between 1995 and 2022.

Figure 2 presents the global startup funding landscape, in terms of funding players, still as of December 2022. The size of the tiles represents the total funding of the startups funded by a given investor, while their color represents the number of investments made by a given investor, darker colors being associated with more numerous investments. EU27 investors are almost invisible on this map that highlights the power of US-based investors, followed by China, the UK and Singapore.

Here again, and probably in an even more pronounced way, the magnitude of the inequalities between entrepreneurial ecosystems is clearly visible. While investments by US investors have on average grown by 8.9 billion $ per year over the period from 1995 to 2022, this figure is only of about 550 million $ per year for a country like France, i.e., around 16 times less rapidly, while it is only 84M$ in Spain i.e., 6.5 times less than in France and 105 times less than in the Silicon Valley.

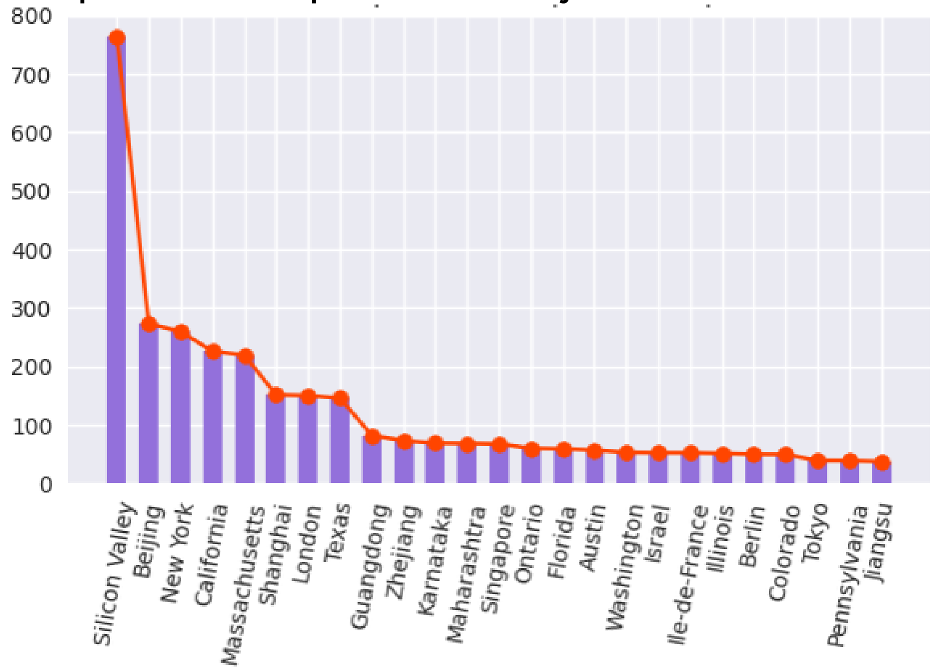
Figure 2: Startup investors, by countries



Size of tiles represents the total funding of the startups funded by a given investor, color represents the number of investments, darker colors being associated with more numerous investments. Sources: Agoranov & Crunchbase, startups created between 1995 and 2022.

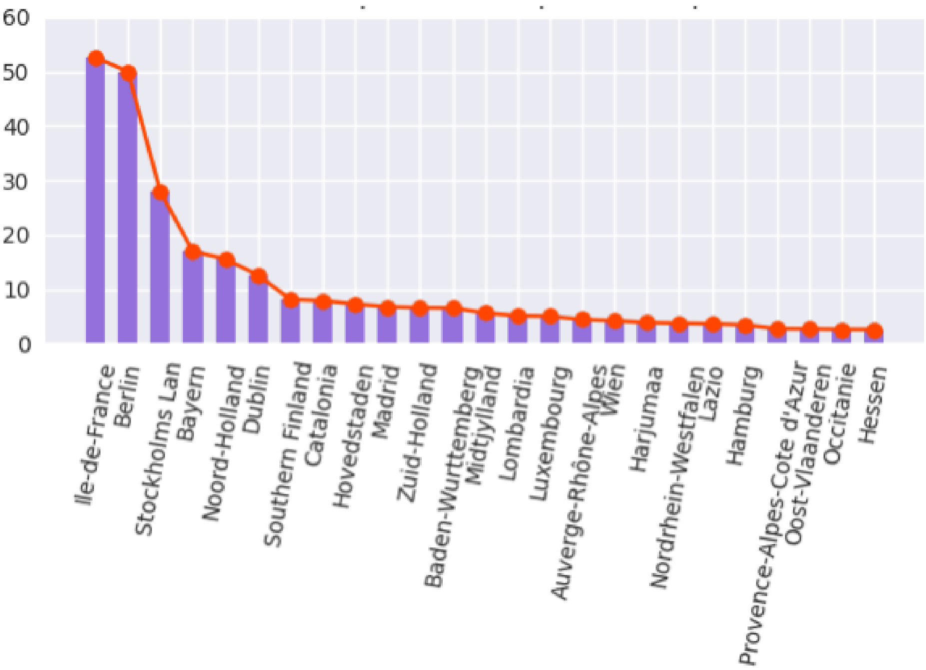
Another way to present this data is proposed in Figure 3 and 4, which highlight the ranking of the 25 most prominent entrepreneurial ecosystems, respectively, at the global level (figure 3) and in the EU (figure 4). Both distributions clearly highlight the quasi-power law characterizing them. Moreover, the two EU champions are ranked 19th and 21st at the global level clearly pointing out the challenges faced by European innovation ecosystems.

Figure 3: The 25 top Global Entrepreneurial Ecosystems:



The height of bars represents the total funding (in billion USD) of the startups created since the year 2000 (updated in March 2023) Sources: Agoranov & Crunchbase, startups created between 1995 and 2022.

Figure 4: The 25 top EU- Entrepreneurial Ecosystems:



The height of bars represents the total funding (in billion USD) of the startups created since the year 2000 (updated in March 2023) Sources: Agoranov & Crunchbase, startups created between 1995 and 2022.

Whatever their limitations, these maps and the associated figures are presented here to emphasize the importance of accounting for the wide differences that exist between entrepreneurial ecosystems, in terms notably of investment capabilities. Again, although these differences are largely acknowledged, we have the feeling that their magnitude have n not been properly addressed by current policies. However, and contrary to what is conversely suggested sometimes, the magnitude of these differences does not mean, at all, that any policy would be structurally doomed to failure. Simply, this magnitude signals what is feasible, and what is not. Whatever the relevance of various approaches to innovation or cohesion in the EU, we fear that the potentiality of any policy will be severely challenged, if not hindered, as long as the international imbalance of funding power will not be taken into account, as a key element to any innovation strategy.

Once these agglomeration effects, and the critical role of venture capital (especially at the development/scaling up stage), are acknowledged, comes the question of the factors leading a significant entrepreneurial ecosystem to emerge here rather than there. As illustrated by London or New-York, the presence of a significant financial place, with the related ecosystems of investors, may certainly help. But it is not a necessary condition if we think to the Silicon Valley. A network of academic institutions, well connected to the industry and to 'strategic' segments of public procurement (think of energy or defense), seem to be alternative decisive factors of localization of entrepreneurial ecosystems. Then, once those pre-conditions are met, an ecosystem might become successful because the conjunctions of public and private initiatives allows organically developed institutions — to echo the one that prevail in Internet Governance (Brousseau, 2023) — to endogenously develop, ensuring an appropriate polycentric governance sustaining the development of an efficient and dynamic set of pooled resources supporting the entrepreneurial dynamic. These institutional frameworks resulting from a bottom-up process are then difficult to replicate because of the economies of scale characterizing them, and because their development takes time. This results into strong place-based competitive advantages of already developed venture commons.

IV: Reconciling Innovation and Cohesion Policies

Innovation policy traditionally works by creating property rights in ideas and by tax-funded support for inputs to innovation, including skilled labor, primary research, tax credits for R&D, and through industrial policies, including government procurement to directly and indirectly support new technologies (Bloom et al 2019). Still, one important point highlighted by Foray (2018b) is that while "neutral" innovation policies aimed at providing generic resources facilitating innovation and entrepreneurship (e.g. Intellectual property framework, tax cut, research institutions) can be designed at a generic/national level, "non-neutral" policies (preferential interventions in favor of a type of actor or of a technological or industrial domain) should be managed at a more decentralized level, both because of the information requirements and risk (or wrong choices) they entail.

Along this line, and applying it to entrepreneurial ecosystems, VCs and other ecosystem players appear as key coordinators of entrepreneurial action. Moreover, they might well be more skilled and better incentivized than public decision makers who might be in practice less able to understand innovative complementarities and less concerned by the long-term actual economic performance of the ecosystem they deal with. Indeed, in line with the public choice approach, investors (both banks and VCs) and ecosystem players (i.e. entrepreneurs and corporations) should be considered as decision makers balancing the potential boundaries of biases of governments and bureaucracies… which obviously does not mean that the later should not play a role. As written above, they are legitimate in contributing to fixing market failures, but their action is reinforced when complemented by those of intermediaries who also contribute to the design and implementation of actions dealing with these failures. To put it differently, traditional approaches based on subsidies to initiate local innovation clusters are doomed to failure because they ignore the magnitude of the inequalities between ecosystems: they underestimate the role and importance of venture commons, to which a wide variety of players contribute. Public money, if it can allow entrepreneurs to emerge and initiate a virtuous loop, does not allow to replace the collective learning in screening, counseling, and matching capabilities of investors and other ecosystem players.

Paradoxically, the magnitude of the inequalities between entrepreneurial ecosystems, with a quasi-fractal structure, creates an important potential which would be exploited by appropriately linking entrepreneurial ecosystems in the EU. Indeed, less developed ecosystems can considerably benefit from establishing strong connections with more advanced ones, while the advanced ones would benefit a lot from working together, to further improve their screening, counseling and matching capabilities. In terms of venture commons, it means that less advanced ecosystems would benefit from being able to "tap" from the deeper venture commons of more advanced ecosystems, while the more advanced ones would also benefit from being able to "pool" their respective venture commons. It might seem obvious but it implies that not too much support should be given to the endogenous development of the less advanced ecosystems: that, on the very contrary, it should be clear that the main path towards becoming a deeptech valley starts by articulating the strengths of a given ecosystem in relation to some larger neighbors, and in the EU notably to the more advanced ecosystems in Berlin, Paris, Stockholm, The Netherlands, etc.

In this respect, more than just allowing peers, as is currently the case, to exchange their experience horizontally, proper recognition should be given to "asymmetric" links, according to which more advanced players can coach willing peers from other ecosystems, notably by designing joint programs. These joint programs could typically help the best startups from less advanced ecosystems benefit from soft landing schemes in these more advanced ecosystems, where they would have access to skills, knowledge and funding, i.e., access to deeper innovation commons, while reassuring local authorities against fears or relocation. And in parallel, "leading" collaborations between advanced ecosystems should also be supported at the proper level i.e., not among others, but with an explicit and conscious recognition that fostering further the advancement of the most advanced should be, in the current international context, not just a side-effect but a true landmark of innovation policies, perfectly compatible with cohesion policies. Up to now, the level of collaboration, in the EU, between the most advanced ecosystems, typically through some of their key ecosystem players and investors, not only through local authorities and public bodies, is limited, especially compared to the potential that actual, full-flight collaborations would represent.

Beyond the development, exploitation and pooling of entrepreneurial resources and venture commons by the support that could be provided to both asymmetric and leading collaborations, the issue of an European governance of the European venture commons should also be directly addressed. In this respect, it is quite puzzling that only limited efforts have yet been devoted to support the emergence of several large European venture capital funds able to compete with international players. Even if VC financing in the EU has been significantly supported by public funds of funds, these funds have remained small compared with many of their international competitors and have mostly addressed early-stage investment, whereas international competition is mostly active at the growth stage, whenever startups scale-up. In this context, only very recently, under the French Presidency of the Union, during in the Spring of 2022, was an initiative announced, involving several countries, including Germany and France, that would contribute to create a large 3B+ fund, to be managed by the European Investment Fund, with an expected launch in late 2023. It is difficult to understand why it took so long to give such an impetus, considering the magnitude at which international funding players were able to operate in plain sight for years, and especially for the last decade with the proliferation of so-called "mega-rounds" of funding (several hundred million euros) following the emergence of Softbank's 1 billion "Vision Fund".

There might be various explanations for such a lack of action. A possible meta-explanation is that the role of venture commons was not properly understood, or that their importance was underestimated specially for the EU, whereas the structure of the European Union, made of numerous ecosystems in 27 different countries, clearly calls for such a structural approach. The Silicon Valley and other leading ecosystems have designed, through time and collective action, a remarkable machinery to fuel innovation and new ventures in a way that rests a lot, among other things, on their venture commons; i.e., the shared, collective ability of their investors and ecosystem players to screen, counsel and match. The EU is fragmented in terms of entrepreneurial ecosystems and their venture capabilities. In addition to fostering cooperation and interactions between the most advanced European ecosystems, and in allowing less advanced ecosystems to benefit from the coaching of more advanced ones, the emergence of a true European venture capital industry is not simply a goal in itself, to remain competitive globally: it would certainly contribute to developing venture commons and therefore a better screening, counseling and matching capabilities to select and articulate innovations, talents, and investments.

Finally, the potential outcomes in terms of cohesion of such policies should not be neglected. Even if break-through, disruptive innovation and high-tech industries are expected to generate socially positive outcomes associated in the long run, in the short term, policies favoring 'bests in class' entrepreneurial ecosystems will be discriminating, even if smart soft-landing programs — such as described above, where startups do not relocate, could help mitigate these effects —. High-tech entrepreneurial policies will remain beneficial to a limited part of the economy only; hence the necessity of national/ EU public interventions in order to manage redistribution both across regions and across the various layers of the social scale, and of course the necessity to continue to stimulate regional dynamism through 3S-inspired policies.

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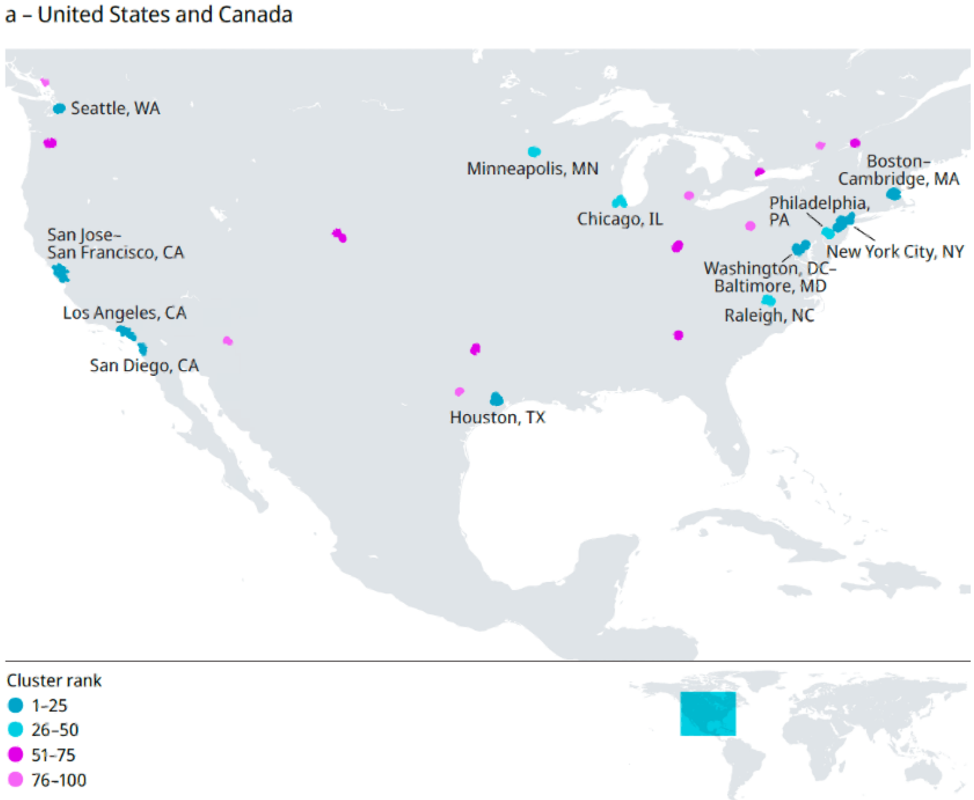
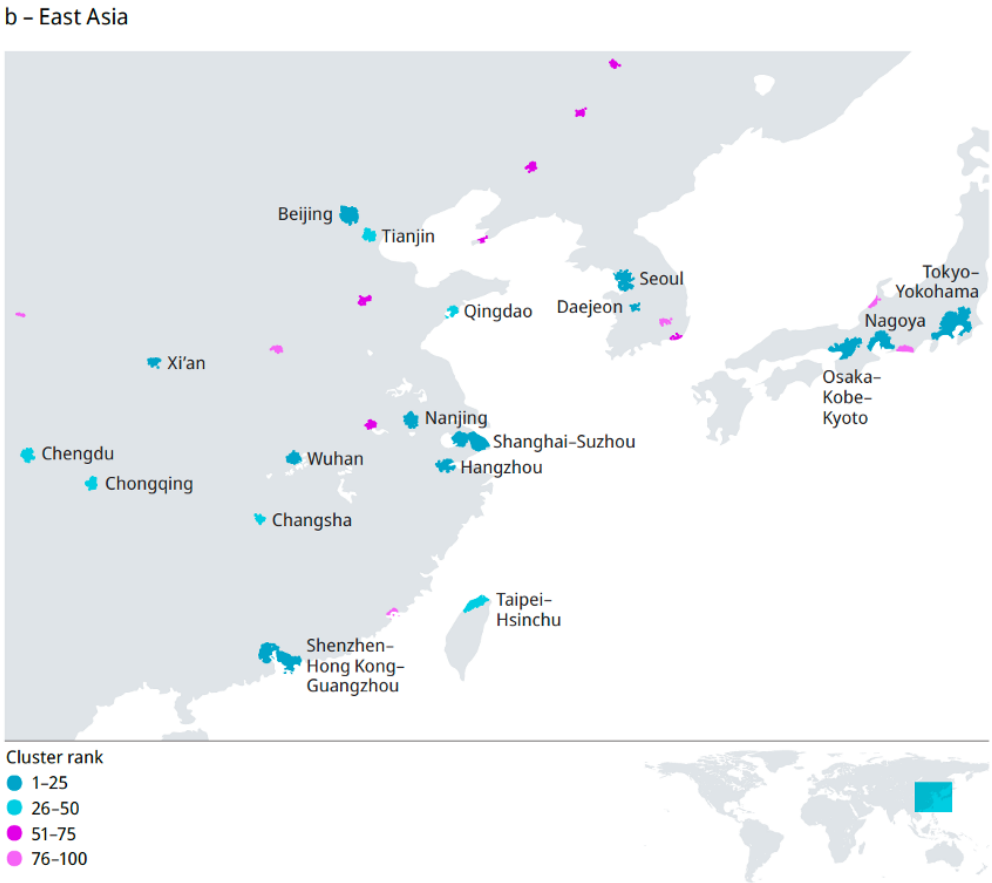
Appendix: American and Asian S&T Science and Technology clusters by intensity (Measured by the number of patents and scientific publications/inhabitant)





Source: WIPO Statistics Database, April 2022.

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