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Innovative Entrepreneurship as a Collaborative Effort: An Institutional Framework

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Abstract: We demonstrate how successful entrepreneurship depends on a collaborative innovation bloc (CIB), a system of innovation that evolves spontaneously and within which activity takes place through time. A CIB consists of six pools of economic skills from which people are drawn or recruited to form part of a collaborative team, which is necessary for innovation-based venturing to flourish. The six pools include entrepreneurs, inventors, early- and later-stage financiers, key personnel, and customers. We show how the application of the CIB perspective can help make institutional and evolutionary economics more concrete, relevant, and persuasive, especially regarding institutional prescriptions. Generally, we envision an institutional framework that improves the *antifragility* of CIBs and the economic system as a whole, thus enabling individual CIBs and the broader economic system to thrive when faced with adversity.

Keywords: Institutional economics; Evolutionary economics; Antifragility; Entrepreneurship; Innovation; Institutions.

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1. Introduction

At the time of writing in the spring of 2020, the world is on the brink of an economic recession, the severity of which remains unknown. While few economies are expected to emerge unscathed, we believe that the theory of the collaborative innovation bloc (CIB) can serve as a guide to help countries recover from or even navigate tumultuous times by harnessing their citizens' entrepreneurial potential. A CIB is an emergent system of innovation within which a host of individuals contribute a variety of complementary skills and resources while undertaking commercial activity. As such, it is a spontaneous order.

Spontaneous orders emerge under any politico-economic regime but will differ substantially depending on the characteristics of the regime, with the Soviet Union in the 1950s and contemporary North Korea at one extreme and Silicon Valley, Hong Kong, and Switzerland at the other. Why do orders vary so much across countries, industries, and over time, and why are some spontaneous orders more value-enhancing than others? The CIB perspective is well equipped to answer this question in a manner that puts it squarely in the fruitful intersection between institutional economics and evolutionary economics (Hodgson and Stoelhorst, 2014).

The CIB perspective places innovative entrepreneurship at the forefront of new business development and long-term wealth creation, a focus that is highly relevant, given that innovation has been estimated to account for more than nine-tenths of the increase in GDP per capita since 1870 (Baumol 2010). While the CIB theory's roots can be traced to the works of earlier Swedish economists (see, e.g., Eliasson 1996; Erixon 2011), it also shares features with the more recent literature on entrepreneurial ecosystems (Stam 2013) and the national system of entrepreneurship approach (Acs et al. 2014).¹ Our reintroduction and reformulation of the CIB perspective (Elert and Henrekson 2019a) ushered in a debate involving several entrepreneurship scholars (Lucas 2019; Foss et al. 2019; Bylund 2019; Elert and Henrekson 2019b).

Our book coauthored with Mark Sanders (Elert et al. 2019) used the CIB perspective to analyze how the European Union and its member states could best be reformed to move toward becoming an entrepreneurial society. In a recent contribution focusing on Sweden (Elert and Henrekson 2020), we show how the CIB perspective can help make institutional and evolutionary economics more concrete and relevant, especially regarding policy prescriptions,

¹ While these perspectives offer valuable insights, they rarely make a clear distinction between actors and institutions, and they conflate conditions with outcomes (Braunerhjelm and Henrekson 2016, p. 101).

which, in our view, should strive for antifragility against economic shocks and black swans, i.e., large events that are unexpected and highly consequential (Taleb 2007, 2012).

The way countries respond, adapt, and cope with the economic repercussions of the crisis caused by the 2020–21 Covid-19 pandemic will, in no small measure, depend on the degree to which their institutional systems give rise to well-functioning CIBs.² According to Taleb (2012, p. 54–55), innovation often “emerges from initial situations of necessity, in ways that go far beyond such necessity – the excess energy released from overreaction to setbacks is what innovates!”

The present article takes this insight to heart. It is an attempt to synthesize our previous work, to draw conclusions, and to look ahead. Putting the spotlight on actors’ interactions in innovation blocs improves our understanding of how and why entrepreneurial plans are formulated and revised over time. By highlighting in detail the functions necessary for an efficient CIB to emerge, we make institutional prescriptions considerably more concrete. Generally, we envision an institutional framework that improves the *antifragility* of CIBs and the economic system as a whole, thus enabling individual CIBs and the broader economic system to thrive when faced with adversity.

The remainder of this essay is organized as follows. In section 2, we discuss how and when collaborations occur in the market order and identify entrepreneurship as an inherently collaborative function. In section 3, we describe the collaborative innovation bloc and each of its skill components: entrepreneurs, inventors, early- and later-stage-financiers, key personnel, and customers. In section 4, we identify the most important critical areas affecting CIBs, thus demonstrating the usefulness of this perspective for understanding when innovation comes (and does not come) about. Founded on actors’ conditions on the ground, the analysis shows how the innovation bloc can be used systematically to identify the institutional framework that needs to be present and the institutional bottlenecks that stand in the way for innovative entrepreneurship and its subsequent scale-up. The last section discusses the key takeaways and limitations of the perspective before highlighting fruitful avenues for future research.

² To be sure, there is some debate on whether the Covid-19 pandemic is better described as a gray rhino – a “highly obvious, highly probable, but still neglected” danger (Wucker 2016); the creator of this term notes that most black swans occur when gray rhinos are neglected.

2. Collaboration as a force to be reckoned with

2.1 Collaboration and superadditivity

Historically, the importance of collaboration is difficult to overstate, with proponents of the synergism hypothesis arguing that cooperation is likely to be a more significant force than competition in explaining the evolution of complexity in nature and in human societies (Corning and Szathmary 2015; Corning 2018). All of evolution’s major turning points involved critical new forms of synergistic cooperation alongside novel ways of storing, transmitting and using information – from the emergence of the first replicating molecules to the origin of social groups culminating in highly integrated communicative species, such as humans, with a social division and combination of labor (Maynard Smith and Szathmary 1995, 1999). In the words of Nowak and Highfield (2011), humans are “supercooperators.”

The benefits, costs, and payoffs associated with various synergistic effects in a given context constitute the underlying cause of cooperative relationships. As Corning and Szathmary (2015, p. 49) state:

In economics, the archetypical example is the description of an eighteenth century pin factory in Smith (...) In biology, the archetypical example is, perhaps, the eukaryotic cell, and it is insufficient merely to say that the interactions among various organelles in a eukaryote are non-additive.

Rather, collaborations, notably human collaborations, are often superadditive, meaning that they have an “explosive upside, what is mathematically called a superadditive function” (Taleb 2012, p. 238). Baumol (2005, p. 3) notes much the same thing when discussing the revolutionary innovations of small, new firms and the incremental innovation of large firms, stating that “the contribution of the two together is superadditive, that is, the combined result is greater than the sum of their individual contributions.”

This collaborative effect characterizes many economic interactions, which likely helps explain why innovation and entrepreneurship are often localized phenomena today (Zucker et al. 1998). Indeed, a critical mass seems to be required for a dynamic innovation environment to emerge since there are many benefits for firms located close to other firms in dense, knowledge-intensive areas (Feldman 1994; Feldman and Audretsch 1999; Paci and Usai 1999; Chatterji et al. 2014; Delgado et al. 2014). The evidence also suggests that the presence of strong clusters enhances growth opportunities in other industries and clusters in the region (Delgado et al.

2014).³ The lens of the CIB perspective promises a greater understanding of such clusters and the institutional conditions that enable collaborations within them.

2.2 Institutional analysis must take collaborations into account

As an essential figure in most innovative accounts, the entrepreneur is commonly seen as the person responsible for creating and expanding businesses by identifying and exploiting new opportunities (Kirzner 1973). Unsurprisingly, the institutions governing the entrepreneur's behavior are highly relevant for economic prosperity, as argued by, e.g., Boettke and Coyne (2009, p. 158):

Only under a certain institutional environment will entrepreneurs have an incentive to discover new resources, substitutes for existing resources or trading partners to obtain resources. Further, only in certain institutional contexts will entrepreneurs have an incentive to discover new technological knowledge such as new production processes or new organization structures.

Notably, Scottish Enlightenment thinkers such as David Hume and Adam Smith stressed the relevance of well-defined and enforceable private property rights, the rule of law, and a moral code of behavior legitimizing these practices (Kasper et al. 2014, p. 26). While modern researchers concur with these assessments (cf. Hall and Jones 1999; Boettke 2014; Henrekson and Johansson 2009), exactly *how* such institutions affect the spontaneous market order and entrepreneurship remains somewhat of a mystery.

Some contributions make crucial distinctions, such as that between productive, unproductive, and destructive entrepreneurship (Baumol 1990) and how and when institutions constrain the actions of entrepreneurs (Lucas and Fuller 2017; Elert and Henrekson 2017). Nevertheless, most institutional economists identify well-functioning institutions only at a (prohibitively) high level of theoretical abstraction, without offering much concrete policy advice (Rodrik 2007). There is thus some truth to McCloskey's (2016, p. 137) quip that institutional economics essentially amounts to the idea that one should "add institutions and stir."

CIBs emerge spontaneously in modern economies, provided that the right institutional conditions are at hand. However, while ticking off the aforementioned items on the standard institutional laundry list may be necessary, it is seldom sufficient. Some institutional bottlenecks are far less obvious because they pertain to actors other than the entrepreneur. Identifying them requires better knowledge of the workings of innovation blocs and the

³ The CIB concept is aligned with Alfred Marshall's (1919) industrial district, which he defines as a place where workers and firms, specialized in a main industry and auxiliary industries, live and work.

functional roles played at different stages of collaboration. Such an emphasis makes institutional analysis grounded in CIB theory concrete.

2.3 Not all collaborations are equal

A starting point that the CIB theory shares with, e.g., Austrian theory, is that everything of importance that happens in the economy is shrouded in uncertainty and imperfect knowledge. Given the “unavoidable imperfection of man’s knowledge,” Hayek (1945, p. 530) speaks of the “need for a process by which knowledge is constantly communicated and acquired.” He is not alone in seeing knowledge coordination as the chief problem that economics should explain (cf. Knight 1951, p. 6; Leijonhufvud 1981, p. 321–322). Typically, the price mechanism is thought to guide this coordination in the market, with efficient resource allocation arising through human action without much in the way of human design (Mises 1981 [1922]; Hayek 1937).

Is it apt to describe such coordination as a matter of collaboration? To Smith (1976 [1776], p. 23, 26), the answer would have been yes: he is well known for pondering how his woolen coat came to him through “the assistance and cooperation of many thousands.” In the same vein, Rubin (2014) notes that core economic concepts, such as specialization and the division of labor, are about cooperation rather than competition:

Both the production of goods and the exchange of goods for other goods are cooperative acts. There is no competition in these actions. The motive for some acts may be competitive, but the actions themselves are cooperative (Rubin 2014, p. 880).

However, Hayek (1988, p. 19) maintains that

[c]ooperation, like solidarity, presupposes a large measure of agreement on ends as well as on methods employed in their pursuit. It makes sense in a small group whose members share particular habits, knowledge and beliefs about possibilities.

People do not share these features in most spontaneous order interactions. For this reason, Klein (2012) calls for a distinction between *mutual* and *concatenate* coordination.⁴ While mutual coordination occurs in small groups with similar knowledge and beliefs, concatenate coordination is the type of coordination that Hayek considers the primary economic problem: the type of coordination that brings about Smith’s woolen coat and any number of other items that no one knows how to create in their entirety (Read 1958).

The prices (and profits and losses) that enable this specialization and division of labor *are* a result of competition. Dollars and cents work as an (imperfect) common unit of account that

⁴ Klein (2012, p. 75) states that if people “wish to praise the free market system as a system of cooperation, [...] they had better be prepared to explain how two people who have no mutual consciousness, who know nothing of each other, can be said to be cooperating.”

gives people a measure of the relative scarcity of things they want or need, thus conveying the necessary minimum of required information (Hayek 1945; Boettke 1998). While this is one of the most important insights of economics, it obscures the fact that for innovation to take place and for entrepreneurs to be able to operate, they must *cooperate* extensively with others in the mutual coordination sense (cf. Mises 1998 [1949]). In fact, most entrepreneurial processes guiding spontaneous order evolution (Buchanan 1979) would not take place were it not for the presence of the CIB surrounding entrepreneurs. Most innovative activity *is* a collaborative effort, with the value of a successful innovation materializing when the entrepreneur's talents, insights, and effort are combined with the labor effort, human capital, and financial capital of other input providers. (This does not preclude that each entrepreneur's collaborative team competes against other collaborative teams, causing competitive pressures that create favorable macrolevel outcomes.)

When collaboration takes place, these factors form an *inseparable bundle* of necessary inputs for the emergence of a successful, innovative firm. Nevertheless, there are plenty of potential institutional impediments barring the spontaneous emergence of such terms that harmonize behavior across a wide array of skill bearers and resource owners. In fact, given the complexities involved, one may wonder how successful collaboration can come about at all. The creation of a firm is part of the answer to the problem; it is an (imperfect) way for the entrepreneur to mitigate the inherent uncertainty of an innovative project and compel others to commit to the same vision. However, it is not a complete answer.

3. The collaborative innovation bloc

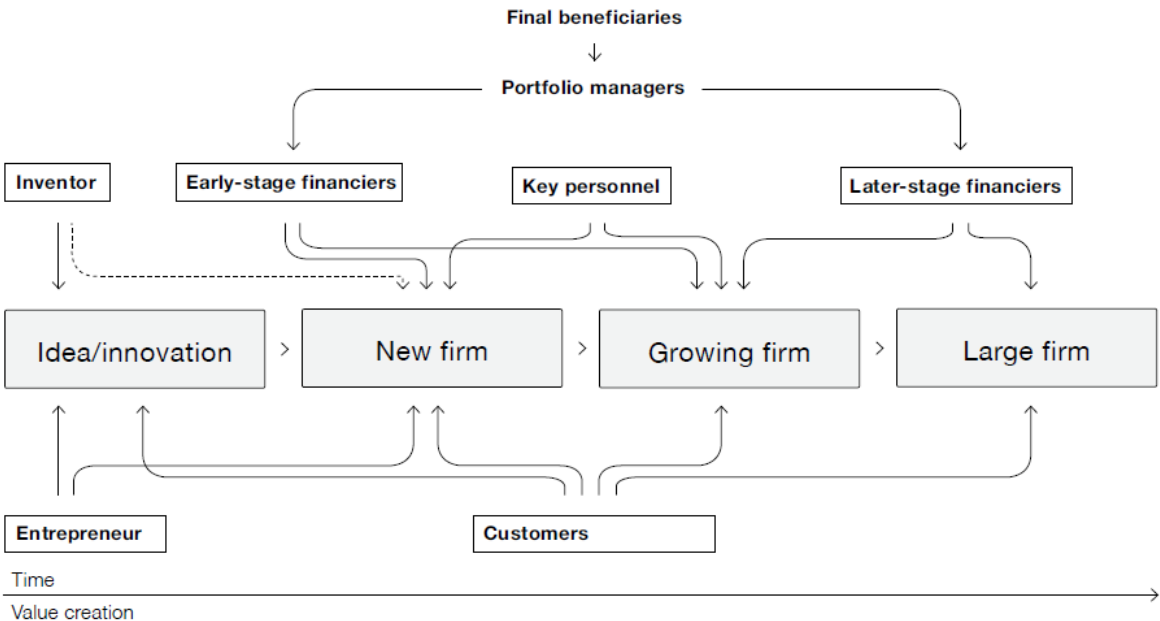
3.1 The outlined perspective

While commonly seen as the implementation of a new or significantly improved product or process, a new marketing method, or a new organizational method (Schumpeter 1934 [1911]; OECD 2010), innovations always begin as ideas. Any entrepreneur striving to generate, identify, select, and commercialize these ideas must overcome innumerable hurdles, ranging from technological complexity and uncertainty to high initial investment costs and fierce competition. It is not surprising, then, that successful innovative entrepreneurship is rare (Hall and Woodward 2010) and that most new business ideas fail quickly (Bartelsman et al. 2005; Delmar and Wennberg 2010). To increase the chances of success, the entrepreneur requires resources from a support structure possessing various kinds of skills and resources.

Figure 1 provides a schematic overview of the structure of skills and resources that, according to the CIB perspective, are required for innovation to take place. We consider innovation in a

familiar sense, namely that an entrepreneur finds a new firm around one or several core ideas and turns it into a growing firm that eventually reaches maturity (e.g., Fenn et al. 1995; Gompers and Lerner 2001). By necessity, the figure is a simplification: A CIB is, after all, a *complex* system characterized by ambiguity, uncertainty, and instability (cf. Dekker 2012). Moreover, while all systems consist of nodes and connections, the nodes in a human population system can imagine and create new patterns of action, which makes the system even more unpredictable (Shackle 1976). Nevertheless, some patterns are sufficiently common to make it meaningful to highlight them.

Figure 1. The collaborative innovation bloc – a simplified overview.



At every step of the innovative process, the entrepreneur has to gather and mobilize crucial skills or assets that others possess. The CIB perspective conveys this idea by conceptualizing six (stylized) pools of economic skills, encompassing entrepreneurs, inventors, key personnel, early-stage financiers, later-stage financiers, and customers. People are recruited from these pools to form part of an entrepreneur’s collaborative team. In general, a minimum critical mass and variety of each skill are needed before the entrepreneur can hope to find what he or she needs, i.e., before innovation-based venturing has a high probability of success.⁵ Moreover, the entrepreneurial meta-skill of gathering these skills makes it possible over time to turn an innovation into a good or a service that is produced and sold on an industrial scale, in

⁵ Eliasson (2000) refers to these features as “breadth” (all skills are in place) and “depth” (a critical mass of actors with the requisite skills to fulfill each function efficiently).

competition with innovations created by other collaborative teams. This process generates economic growth in an experimentally organized market economy.

Seen from a different perspective, a well-functioning CIB facilitates the joint mitigation of two errors (Eliasson 2000). The first error type relates to spurious discoveries that occur when an individual has partially or completely misread data and consists of allowing failed projects to survive for too long. Such errors tend to become systematically eliminated as “market experience reveals the unfeasibility of some (hitherto sought after) courses of action and the (hitherto unnoticed) profitability of other courses of action” (Kirzner 1997, p. 71). The second error type is that of rejecting winners. Such missed opportunities often result from excessive pessimism on the part of entrepreneurs or other actors. The two error types are linked and omnipresent. For example, accepting a project that one should reject makes it impossible for someone to use the resources that go into that project in an alternative project. Collaborations in CIBs are essential for identifying and correcting such errors early and at the lowest cost possible.

That said, errors in CIBs are inevitable. Everyone’s knowledge is limited and local: actors respond to information and knowledge presented to them in the moment, and they interact only with the small number of agents within their local neighborhood (Heylighen et al. 2006). Some actors may have a bird’s-eye view of their situation, but physical and social distance interferes with all efforts to know what events are happening and where (Vaughan 1996). Specialized knowledge further inhibits any pretense of omniscience. Each actor is thus largely ignorant of the extent to which his or her local actions have global consequences and affect the overall system (Heylighen et al. 2006). For this reason, system behavior cannot be reduced to the behavior of the constituent actors “but only characterized on the basis of the multitude of ever-changing relationships between them” (Dekker 2012, p. 138).

Another consequence is that both success and failure are emergent phenomena, and a thin line often separates these outcomes. The myriad of interactions by which new firms and innovations come to life in a CIB are usually nonlinear in the sense that the same action will have multiple effects in different parts of the network at different times. Some of those causal chains will close in on themselves, feeding back into the conditions that started the chain (Heylighen et al.

2006). Hence, small events may very well yield large effects (cf. McKelvey 2004b). Successful innovation is one example of such superadditivity, while spectacular failure is another.⁶

While a CIB's actors are guided in their coordination by a range of market prices helping them "to revise their actions in a direction likely to be less erroneous than before" (Kirzner 1979, p. 30), prices are more or less absent as a guide in other CIB interactions (for example, those between the entrepreneur and his or her employees). Actors must therefore resort to other guiding mechanisms to signal their intentions and anticipate the actions of others. One such source of coordination is what Lachmann (1971) calls informal "nodal points" of mutual orientation and plan coordination. By being subject to interpretation, these shared "meaning structures" (Pongracic 2009) are flexible and act to guide behavior by creating ranges of knowability about the possible future conduct and motivations of others (Ebeling 1999). As such, these meaning structures serve as indispensable and continuous sources of plan revision when prices are absent throughout the innovation process. Herein lies much of a CIB's propensity for error correction (cf. Alchian 1950).

Economies are generally home to a host of CIBs, which overlap and intersect in myriad ways. Like all complex systems, CIBs are influenced by their environment (e.g., the broader economic system) and influence that environment in return. The boundaries of any individual CIB are thus inherently fuzzy. Horizontally, there is usually overlap with other CIBs in that participants in a particular skill pool – say, venture capitalists or key employees – can be available to several CIBs. Vertically, the boundary to the political sphere is fuzzy – in some instances, political appointees and state-owned firms may even be large players in a CIB (though they exert influence rather than control) (Wagner 2016).

As mentioned, the preferred institutional framework should improve the *antifragility* of CIBs and the broader economic system (Elert and Henrekson 2020). Since Taleb (2012) coined this term, antifragility has been studied within such varied fields as physics (Naji et al., 2014), computer science (Lichtman, 2016), and economics (Markey-Towler 2018). The core distinction between antifragility and seemingly similar terms such as robustness or resilience is

⁶ Paradoxically, the competition-driven success of a firm or collaborative team in one period may spell its demise in future periods. Success can lead to a blindness to errors and risks and an unwillingness to consider dissenting viewpoints, which can cause a gradual, virtually unnoticed deterioration of performance (Dekker 2012). Optimization that gives an edge in the short term may also prove fatal in the long term because it couples factors too tightly; this absence of slack may be a liability when conditions change, especially if they change quickly and unexpectedly.

that an antifragile object, firm or economy not only endures a shock (robustness) or bounces back from it (resilience) but is *strengthened* by and thrives from the shock.

As an example, consider *hormesis*, which is a favorable biological response to low exposure to toxins and other stressors. Applied to an organization, hormesis describes its adaptation to the challenges brought about by a changing environment, making it fitter and better able to survive (Derbyshire and Wright, 2014; Pech and Oakley, 2005). Optionality, i.e., a payoff structure with large, open-ended upside and limited, known downside, appears crucial to any antifragile strategy. This trait characterizes innovation, which drives improvements in human material wellbeing. Antifragility is also a desirable property of an economic system.⁷

Just as macroeconomic antifragility implies microeconomic instability or turbulence in the sense that many firms are born, compete, and die (e.g., Brown et al. 2008; Taleb 2012), the competition between collaborative teams within a CIB is essential for the selection of successful innovations that can be produced and distributed on an industrial scale as rapidly as possible. Nevertheless, a desirable property for CIBs is to be less fragile than the individual firms and organizations that operate within them. While all healthy economies will see a blend of fragile, robust, and antifragile CIBs and a continuous movement across these three categories, the renewal of the CIB population should be less volatile and smoother than microlevel processes in a well-functioning institutional setting (Elert and Henrekson 2020).

3.2. The CIB's skill pools

Whereas the actors in the CIB are themselves less important than the myriad nonlinear interactions between them (Cilliers 2000; Heylighen et al. 2006), it is nevertheless important to describe each of the six skill pools and what they contribute to the innovative process in some detail.

3.2.1 Entrepreneurs

There are many conceptions of entrepreneurship (Hébert and Link 2006). Among the more commonly used is Kirzner's (1973) emphasis on entrepreneurial alertness and the discovery of opportunities and the Schumpeterian view of the entrepreneur as an innovator, i.e., a creator of new combinations of knowledge. It is possible to view these entrepreneurial functions as two sides of the same coin (Boettke 2014); in the words of Peter G. Klein (2008, p. 176),

⁷ Living organisms are generally (to a certain extent and within their life cycle) antifragile, as are many objects, technologies, institutions, social practices, and systems that last for a long time (Blečić and Cecchini, 2017). Antifragility has similarities to Ostrom's (2010) theory of resilient governance. Such resilience entails more than the mere ability to bounce back from shocks; resilience encompasses robustness and adaptability (Salter and Tarko, 2019).

“opportunities are neither discovered nor created, but imagined.” In line with Henrekson and Stenkula (2016; cf. Wennekers and Thurik 1999), we argue that the entrepreneur’s primary role is to perceive opportunities to innovate and to realize the potential of the innovation in the form of actual goods and services available in the marketplace.

As such, *entrepreneurs* are regularly a CIB’s prime movers in the sense that most ideas and inventions emanate from them or from inventors (Baumol 2005). To commercialize an idea, the entrepreneur usually creates a new collaborative team, searching for and attracting the skills perceived as necessary to realize the project. In this role, the entrepreneur not only benefits from the skill pools in existing CIBs but also creates new blocs and helps existing CIBs evolve when necessary (Stam and Lambooy 2012). Throughout this process, he or she is inevitably exposed to competition; innovation is an arms race that no one can escape (Baumol 2002, 2010). If an innovation is sufficiently disruptive, it may cause the demise of an entrepreneur’s competitors *and* of extant CIBs (Beltagui et al. 2020).

Treating the entrepreneur as a collaborator in this manner is, to be sure, not a new approach. Schumpeter (1989 [1949], p. 261) argues that the entrepreneurial function “may be and is often filled cooperatively,” and several perspectives on entrepreneurship acknowledge the same fact (e.g., Lachmann 1956; McCloskey and Klamer 1995; Cosgel and Klamer 1990; Lazear 2004). Notably, the perspective of the entrepreneur as a persuader (McCloskey and Klamer 1995; Cosgel and Klamer 1990) highlights the importance of the entrepreneur formulating and conveying a vision and building trust among collaborators as well as backers. Likewise, the idea that entrepreneurs are jacks-of-all-trades stipulates that entrepreneurs, rather than being specialized, require a breadth of skills to handle the variety of tasks they face (Lazear 2004; Åstebro and Thompson 2011; Eesley et al. 2014; Aldén et al. 2017). Also explicit about the collaborative aspects of entrepreneurship are Leyden and Link (2015, p. 45), who argue that an entrepreneur engages in a process of knowledge conversion through the “development of effective, experiential social relationships,” or social networks. “Over time, the heterogeneity of those relationships engenders a creative spirit as to how that new knowledge can be applied, that is, how it can be transformed into economic knowledge.” In the private sector, the outcome of this uncertain process manifests itself as innovation.

Importantly, entrepreneurs need a clear idea of what skills they lack and how to procure them, that is, who they need to collaborate with if they are to realize their projects. Unless they have a clear idea, they will have to develop it through a (costly) process of trial and error. In fact, in a Hayekian (1945) world of tacit and dispersed knowledge, the entrepreneurial firm can be said

to act as a knowledge-integrating institution. Production of any kind requires the complex integration of multiple types of knowledge, which cannot be accomplished by completely specified contracts or repeated market transactions. Hence, there is a need for organizations like the business firm (Lewin and Baetjer 2011), and we argue for the place of the entrepreneurial founder within a structure of complementary skills.

3.2.2 *Inventors*

The CIB perspective's chief focus is on implementation, but this does not imply that *inventors* are unimportant or that research cannot have superadditive properties or that a CIB will not benefit from a breadth of inventors with different skill sets and ideas. Schumpeter (1934 [1911]) distinguishes between inventors and entrepreneurs, but this nuance is lost in modern growth models (e.g., Romer 1990; Aghion and Howitt 1992) that collapse invention, innovation and commercialization into one decision (Acs and Sanders 2012, 2013).⁸ Entrepreneurs generally have an excellent overall understanding of how to exploit an opportunity but may lack specific knowledge regarding relevant technologies, indicating that inventors may play a key role in founding teams. Evidence suggests that close cooperation between inventors and entrepreneurs is crucial for the successful commercialization of patents (Darby and Zucker 2003; Braunerhjelm and Svensson 2010).

According to Taleb (2012, p. 234), payoffs from research have “big, near-unlimited upside but, because of optionality, limited downside. Consequently, payoff from research should necessarily be linear to number of trials, not total funds involved in the trials.” However, this does not imply that research can be routinized or that results will predictably emerge. To be successful, inventors need to be both visionary and singularly focused on solving the particular problem they are addressing. They also have to be both passionate and persistent, being able to endure the high failure rate of attempts to turn ideas into inventions and the subsequent frequent failure of properly turning inventions into viable products.

⁸ Like Schumpeter, we treat innovators and entrepreneurs as more or less synonymous, as they carry out the same function. This is not the case in the predecessor theory of the experimentally organized economy and competence blocs, which distinguishes innovators from both entrepreneurs and inventors. According to this theory, an entrepreneur is a person who creates things of value and thus is responsible for creating wealth for himself and others, whereas an innovator is a person who brings a new technology, process, or knowledge to life. Thus, the innovator fulfills a more advanced function in the competence bloc than does the Schumpeterian inventor, solving advanced technological problems and putting large-scale technologies together into technically advanced products (or systems of products) such as airplanes and cars. The function is more akin to that of an administrator of large-scale innovative activities than to that of an inventor of incremental technical changes. As with that of the other actors, the innovator's function can be carried out by one person or by a group of persons (Johansson 2010, p. 189–190).

In most cases, inventors will have a great deal of technical expertise. They strive to perform cutting-edge research to come up with previously unknown or unrealized processes or products. Thus, they are focused on creating and building a product, process, or service that can solve specific problems. Typically, they develop a minimum viable product based on an idea in order to provide customers with a notion of what the product will look like or how it will function. Thus, they will conduct numerous tests to determine if a feasible product or service is possible. While the product or service they (help) create is meant to solve an issue and should conceivably be able to pass the market test, inventors seldom pay attention to the assessment of the market viability of their inventions.

3.2.3 *Key personnel*

The literature on corporate entrepreneurship or intrapreneurship is another testament to the vital role employees play in innovative activities, especially in large firms in developed economies (see, e.g., Stam 2013).⁹ In times of rapid firm growth and development, *key personnel* such as professional managers, skilled specialists, production staff, and front-line personnel may contribute skills that are essential to an entrepreneurial venture (Sautet 2000). While Coase (1937) famously describes firms as islands of planning in a sea of market relationships, the reality is that the Hayekian knowledge problem is consistently present also *within* firms and increases with the size of the organization (Foss 1997). To survive, firms must successfully coordinate their internally dispersed (tacit) knowledge. They will be able to do so only if employees are allowed to act upon the knowledge that they alone possess to promote intrafirm learning and local discoveries (Foss 1997; Pongracic 2009). The sequence in which ventures typically draw on such resources suggests that founder teams and employees grow more rapidly when the firm is involved in radical product innovations rather than incremental service innovations (Held et al. 2018b).

Intrapreneurial key personnel are unlikely to flourish if they are surrounded by too much red tape or are forced to follow detailed commands from their superiors at every stage. Rather, they need to be propelled by trust (Rose 2012) and a feeling of common cause. When the market's price mechanism is absent, the entrepreneur can achieve greater coordination among hired personnel and other actors involved through structures of shared meaning (Hayek 1973, p. 49). Since people are not anonymous in firms, such structures can have a more powerful coordinating effect inside a firm than in society at large, especially when the corporate culture

⁹ First coined by Pinchot (1985), the term "intrapreneurship" generally refers to people with a paid job who assume an entrepreneurial role. Parker (2011, p. 19) defines it as "the practice of developing a new venture within an existing organization, to exploit a new opportunity and create economic value."

facilitates mutual comprehension (Pongracic 2009, p. 109–110).¹⁰ To a large extent, this phenomenon means that entrepreneurs and managers act as collaborators rather than as planners (Langlois 1992, p. 167). At the heart of the issue is to allow the most informed employees to act upon the knowledge that only they possess to promote intrafirm learning and local discoveries (Foss 1997). This, in turn, will give firms the greatest capability to react to change and encourage innovation (Minkler 1993, p. 569).

Pongracic (2009, p. 1) argues that decentralization of decision-making within a firm is the clearest manifestation of efforts to create a “thoroughly entrepreneurial firm, one where most or even all employees are encouraged to act in creative and innovative ways.” While decentralization risks yielding poorer incentives and efficiency compared to hierarchy, its benefits are greater flexibility and innovativeness (the creation of new knowledge), which, in times of rapid market change, may be too costly to ignore. Entrepreneurs and other firm actors must assess this trade-off themselves (Pongracic 2009, p. 69–70).

Regarding the skills that key personnel contribute, their relative importance is impossible to generalize. R&D teams and technical specialists are seen as key to innovation in much of the mainstream entrepreneurship and economics literature, where, as Audretsch et al. (2006) highlight, innovative activities are considered the result of systematic and purposeful efforts to create new knowledge by investing in R&D, followed by commercialization (Chandler 1990; Cohen and Levinthal 1989). From our perspective, the ancillary idea that more R&D spending is a tool that will promote innovation reveals an overly mechanical view of how the economic system works (Elert et al. 2017), and it constitutes an overemphasis on R&D relative to other means of innovation, such as learning-by-doing, networking and combinatorial insights (Braunerhjelm 2011). By contrast, the Austrian perspective, if anything, seems to underemphasize the role of R&D, mainly because of its focus on Kirznerian arbitrage.

The truth of the matter is likely to be found in between these extremes. As Bhidé (2008) argues, high-level ideas, once produced, are readily available to anyone. Hence, tacitness does not hinder such ideas from being picked up by outsiders. Turning them into a commercially viable product is another matter that does not involve much in the way of high-level R&D; therefore, although high R&D spending can be a necessary component of a thriving economy, it is far from sufficient. Bhidé (2008, p. 150–151) asserts that

¹⁰ As an example, booklets about shared aims and values written by founders or important managers are required reading for employees in large firms such as IKEA and ABB.

The commercial success of innovations turns not just on the attributes of the product or know-how, but on the effectiveness and efficiency of the innovator's sales and marketing process. This point is utterly obvious to those in the business world.

In addition, as an entrepreneurial venture grows, professional managers with the expertise to take the business into a mature stage characterized by large-scale production and distribution become essential. A core issue is mitigating the internal Hayekian knowledge problem confronting a large firm (Sautet 2000) and creating common rules and shared meanings that facilitate the discovery, exploitation, and sharing of local knowledge while also preventing misuse and conflict (Ghoshal et al. 1995). Of course, entrepreneurs can possess such skills themselves, but when they do not and are unable to perceive that these skills are lacking, venture capitalists and other financiers may have to take matters into their own hands and replace the current management, as discussed below.

3.2.4 Early-stage financiers

Austrian economists probably go too far in underemphasizing the importance of R&D for economic growth, but they are right to note that “while knowledge is a limit, capital (the available amount of savings) is a narrower limit” (Rothbard 2009 [1962], p. 542). High-level ideas can be employed in production only if there is sufficient (physical and financial) capital to put them to use. Therefore, financing is of crucial importance in the innovation bloc; we differentiate between early-stage and later-stage financiers since the need for and nature of financing differ substantially in different stages of the innovation process.

External equity financing is necessary for most entrepreneurial firms to develop and grow into significant industry players,¹¹ especially in industries characterized by rapid technological change. Furthermore, if network effects can benefit the industry and enhance the value of the innovation, rapid growth financed by external equity becomes paramount to obtaining a leading position. In the early stages, external equity financing serves more than just a financial purpose (Landström and Mason (2016). Business angels, as well as banks, play an instrumental role in providing tight screening and close monitoring of the firm's progress, markedly reducing moral hazard problems. Hence, the early involvement of an external, disciplining entity in the firm is as important as the financial resources per se. VC investors, who play a similar role somewhat

¹¹ IKEA founder Ingvar Kamrad was an atypical entrepreneur in this respect. When he died in early 2018 at age 91, he still controlled 100 percent of the company he founded in 1943. In comparison, Amazon founder Jeff Bezos owns a mere 17 percent of Amazon, and Google founders Sergey Brin and Larry Page own less than 10 percent each of Google's parent company Alphabet.

later in the life cycle, would have far fewer potentially successful candidates to choose from were it not for these earlier contributions.

VC firms are limited partnerships, raising their funds from institutional investors in an arrangement that provides them with high-powered incentives. Institutional investors enter into an agreement with a venture capital firm as limited partners, and the senior managers of the VC firm act as general partners. The lifetime of such partnerships is predetermined (typically to between eight and ten years), and while they supply some 99 percent of the capital, the limited partners play no active role in the management of their investments. In addition to an annual management fee, the general partners receive a sizable share of any future capital gains (typically 20 percent above the so-called hurdle rate; see, e.g., Gompers and Lerner (2001) for further details).

VC firms thereby convert high-risk opportunities to a more acceptable risk level through portfolio diversification. As a result, they can align the incentives of all three agents: investors, VC firms, and founders. The VC function is often performed by individuals with extensive experience in the industry in which they invest (Zacharakis and Meyer 1998; Busenitz et al. 2014). Many are former entrepreneurs who have sold their businesses to invest the profits in new firms without assuming day-to-day operational responsibility. As such, they identify entrepreneurs and their projects, determine whether and how much to invest and decide how this investment should be valued. Importantly, they also contribute critical skills to the entrepreneur, such as management expertise and market knowledge, and access to their business networks. If need be, they can also enforce change and appoint new management that is better equipped to lead the company.¹²

The importance of failing early in CIB theory has ramifications for what type of financing is required. As Mougayar (2015) describes, “[t]hat’s the whole *raison d’être* of the steps behind a venture-backed company that goes from seed, to angel, to Series A, B, C, D, etc. There is de-risking at every subsequent stage.” More generally, Taleb (2012, p. 235) views debt as fragile, equity as robust and VC as antifragile because it spreads “attempts in as large a number of trials as possible” (cf. Polzin et al. 2017). Firms also have reasons to be wary of excessive debt since small variations in performance can be enough to make them go bankrupt (Derbyshire and Wright 2014, p. 221).

¹² In practice, the founder’s superior information, specialist knowledge, and *de facto* control of the company, often mean that the value of the external investors’ equity would fall if they ousted the founder.

From the entrepreneur's perspective, it is crucial that equity financing is offered at a reasonable cost so that he or she retains a sizable ownership share despite raising external equity. Venture capitalists need to strike a balance between demanding as high an ownership share as possible and avoiding impairing the incentives of the founder and other key personnel whose skills and continued engagement are crucial for the future development of the firm. In practice, they often take on a mentorship role (MacMillan et al. 1989), where learning and the exchange of knowledge and skills lie at the heart of the collaboration between early-stage financiers and entrepreneurs. Thus, venture capitalists become crucial to the entrepreneur's formulation and revision of plans related to the entrepreneurial project. A relationship built on trust and reciprocity may provide a means through which each party obtains optimal access to the other's knowledge (De Clercq and Sapienza 2001). As such, the relationship itself becomes a specialized resource that generates new knowledge (Madhok and Tallman 1998), and ultimately, what Dyer and Singh (1998, p. 662) call supernormal profit, which the partners can create only through their joint contributions.

While a venture capitalist may benefit from an entrepreneur's alertness to unexploited opportunities or ability to combine new resources, the entrepreneur may benefit from a venture capitalist's reputation or access to valuable networks. As De Clercq and Sapienza (2001, p. 112) note, "the availability of venture capitalists who hold sufficient industry-specific knowledge at a particular point in time, or entrepreneurs who have a unique experience in developing a particular technology may indeed be limited." A varied and competent VC industry is therefore a crucial aspect of the early-stage selection machinery of the innovation bloc. Its absence in many industrial countries is illustrated by the lack of entrepreneurship outside of existing industries and established organizations, which may explain the high reliance on intrapreneurship in these countries.¹³

All *early-stage financiers* contribute critical skills to the entrepreneurial venture, such as management expertise, market knowledge, and access to their business networks. Thus, they provide a crucial component of the early-stage selection machinery of the collaborative innovation bloc.

3.2.5 *Later-stage financiers*

Later-stage financiers are a *sine qua non* for early-stage financiers, notably because they enable VC firms to unload their investments when their operations have run their course (Eliasson

¹³ See Elert, Stam and Stenkula (2019).

2000; Norbäck and Persson 2009). Later-stage financiers also provide entrepreneurs with the large equity infusions typically required to turn a nascent venture into a sizable firm. In the case of sustained inferior performance, later-stage financiers also assess whether there are potential profits from assuming control and replacing the entrepreneur and the firm's top management.¹⁴ However, whether later-stage financiers such as buyout firms or buyers in a trade sale will be able to act in a forceful manner depends on the extent to which they can expect capital infusions from passive investors (such as pension funds and open-ended stock market funds) if the firm develops well. Thus, the functioning of exit markets depends on the prevailing institutions that shape incentives and payoffs for venture owners and acquirers alike.

Today, the most common exit strategy is a trade sale – selling the firm to another firm, usually a firm in the same industry (Norbäck et al. 2009). A trade sale is likely an indication that some crucial skill is lacking in the firm in its existing form, making an independent scale-up of its operations unfeasible or too risky. Full control of the firm is then handed over to the buyer, and the entrepreneur/founder leaves the business with substantial financial assets. These assets make it possible for the entrepreneur to start a new firm or to switch roles in a CIB and act, e.g., as a business angel or venture capitalist.

Traditionally, wealthy industrial families such as Italy's Agnelli family and Sweden's Wallenberg family have controlled large firms with the help of mechanisms such as dual-class shares and pyramiding, which give them control that often greatly exceeds their actual equity share (Morck 2005). Sometimes, such control is exercised through a listed closed-end investment fund, which acts as a blockholder specialist of large listed firms. Owner-activists are another type of agent who, by means of a sizable ownership block in public firms, prompt value-enhancing strategic changes in mature firms (e.g., Carl Icahn and Cevian Capital). Owner-activists raise money from pension funds and other institutional investors on terms similar to those used by venture capitalists.

Buyout firms serve a similar function as VC firms, but in later funding stages, such as when the firm does not go public through an IPO or becomes delisted because the buyout actors believe that they would be able to create more value if the firm becomes private again. However, these firms are structured like VC firms, and the relevant agents are incentivized in the same way, although funds and investments are generally much larger. Evidence suggests that buyouts lead

¹⁴ This approach is not an uncommon type of plan correction. After all, if the person who errs is unable to perceive this error and is not removed from a controlling position, a more alert or creative competitor may bid resources away from the firm and correct the error (cf. Mises 1981 [1922]).

to a reallocation of resources to more productive use (Tåg 2012). As expressed by Davis et al. (2008), private equity firms are catalysts of creative destruction. Part of the explanation for this phenomenon is that buyouts bring in better knowledge of management practices, as shown by Bloom et al. (2009).

In addition to these investors who take an active part in or wholly control the governance of the firm in which they invest, the secondary market would be incomplete without passive investors, such as pension funds and open-ended stock market funds, as well as persons who own listed shares directly. Such “gray” capital is usually invested with the premise that a company should follow the market trend; this is sound behavior for actors wishing to minimize their risk, but it is doubtful that it will engender radical innovation. In the words of Erixon and Weigel (2016, p. 63), “if the funding of corporate capitalism increasingly follows the playbook of modern portfolio theory, it basically means that funding for the unknown is drained.” That said, each owner category has a role to play in a CIB. For example, whether active owners in secondary markets will act forcefully largely depends on whether they can expect infusions of passive capital if the firm develops well.

3.2.6 Consumers

Entrepreneurs govern the temporal allocation of a modern economy’s resources. However, when they decide whether to engage in an intertemporal reallocation of resources away from the production of consumer goods now and towards the more roundabout production of capital goods (cf. Böhm-Bawerk 2010 [1891]), entrepreneurs are governed not by their own time preferences but by those of consumers (Manish and Powell 2014). While only the sellers of consumer goods and services are in direct contact with consumers, they transmit the orders received from consumers to all parties engaged in higher-order production (Mises 1998 [1949], p. 270).

The CIB perspective helps us see that the role of consumption is richer than commonly described; early-stage, demanding collaborators may be crucial not only for financing but also for altering the entrepreneurs’ awareness of what is possible, thereby helping them to detect and correct previously unforeseen errors. Individual consumption can, in fact, often be quite entrepreneurial as well; an emphasis on this “venturesomeness” of consumption helps elucidate the many harms to innovation blocs caused by product and service regulations that impede consumers from taking on this role to the best of their ability.

Even though *consumers* are the ultimate arbiters of an innovation’s success, they hardly ever appear in the cast of most accounts of innovation. This omission is regrettable, according to

Bhidé (2008), who asserts that the benefits of lower-level venturesome consumption often remain in the country in which it occurs. He defines venturesome consumption as the willingness and ability of intermediate producers and individual consumers to take a chance on and effectively use new know-how and products, arguing that it may be as crucial as a country's capacity to undertake high-level research.

It is impossible to know the demand for a new good or service in advance, and frequently, entrepreneurs have a daunting task in persuading potential buyers that what they are offering is worthwhile (this was, for example, the case with photocopying; see Mueller 1996). The role of alert and interested customers is therefore essential to the supply of innovative products; a sophisticated, active demand is a *sine qua non* for industrial success and the emergence of a well-functioning CIB (Porter 1990; Eliasson 2000). This is not surprising since modern markets for industrial goods and services are typified by open-ended relational contracts and long-term demand-supply relationships between business partners who know each other (Kasper et al. 2014).

Even in an entrepreneurial venture's early stages, demanding collaborators can function as particularly important sources of information on consumer needs and preferences. Sometimes, they even act as strategic partners who take an active part in the development and commercialization of products (Bhidé 2008; von Hippel et al. 2011). In the extreme, when qualified venture capitalists are absent, large enterprises rich in capital often step in to play this role, albeit imperfectly (Eliasson 2000; von Hippel et al. 2011). However, this function is imperfect as a substitute for qualified venture capitalists because it restricts financing to technologies similar to those of the existing industry (Eliasson 2000). Radical innovations are unlikely to emerge in this manner.

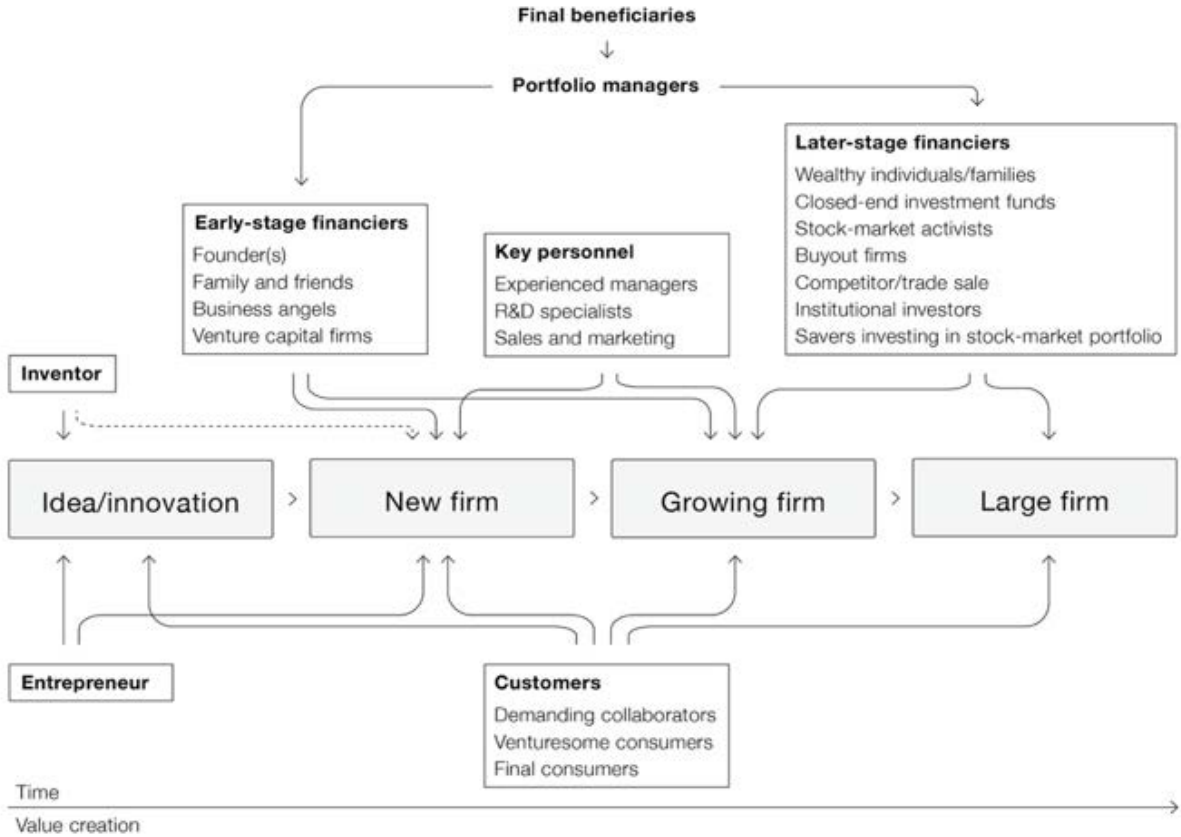
3.3 The collaborative innovation bloc – a detailed summary

Figure 2 offers a more detailed description of the collaborative innovation bloc, summarizing the insights gained from this section. We now observe the vital interplay between final beneficiaries and the actors in the primary/early-stage and secondary/late-stage markets of financing, as well as the main categories of inventors, key personnel, and customers. For innovation to have a high probability of reaching its full potential, the CIB must acquire sufficient size and depth to attain a critical mass, i.e., have sufficiently large pools of each skill from which actors can be recruited to fulfill each function in the collaborative team. As Leyden and Link (2015) argue, the heterogeneity of a firm's experiential ties is the essence of its social

network. A lack of requisite skills or the absence of an important actor category is likely to significantly impede or even prevent the necessary collaborations from taking place.

Of course, as we have stated, part of what it means to be an entrepreneur is to be able to gather these other skills and productively combine them. However, this task is arcane for any one individual without the necessary breadth and depth of the collaborative innovation bloc. This is where economic policy and the institutional framework underpinning the innovation bloc come into play. We will turn to this issue in the following section.

Figure 2. The collaborative innovation bloc – a detailed overview.



3.4 The CIB as a diagnostic tool

While a CIB’s boundary against other CIBs is usually fuzzy, so is its boundary against institutions. Surely, the institutional framework determines the incentives for people to acquire and utilize their skills, but it can be difficult to distinguish between choosing the rules of the game and playing the game according to those rules (Burfield and Harrison 2018). In some instances, political appointees and state-owned firms are big players in a CIB (although they exert influence rather than control; Wagner 2016), e.g., as important customers or financiers. The political sphere also has an indirect yet crucial effect on CIBs, in that politically instituted rules and regulations affect the strength of interactions between the different actor categories,

their incentives to acquire and use skills and, ultimately, the quality of the collaborations that result. Differences in so-called meso-institutions (public bureaus, regulatory agencies, and other subsidiaries in charge of implementing the general rules of the game and of framing and delineating the domain of activities that actors can engage in) may also explain why conditions for innovation-based venturing differ across sectors, countries, and regions (Ménard 2014). Nevertheless, even though CIBs are subject to an entanglement between the economic and political realms, the perspective offers a concrete way of thinking about the institutional underpinnings that are best suited to facilitate and strengthen coordination and economic change, increasing the likelihood that CIBs and the broader economic system become antifragile (Elert and Henrekson 2020).

Of course, most ideas that are attempted will not see the full involvement of all CIB skill categories, simply because most business ideas and businesses fail (Hall and Woodward 2010). When successful, however, the innovative process frequently begins when an entrepreneur identifies and attempts to develop a potential opportunity into a successfully commercialized innovation together with an inventor and a small number of key personnel. Financing is critical in this uncertain, experimental stage. Early-stage financiers usually propel the project into a scale-up phase, during which the conjectured entrepreneurial profits can be realized (assuming that the project reaches this point). VC firms can, at least partly, transform noncalculable uncertainty into risk-taking by concurrently investing in a large number of young firms. By contrast, entrepreneurs typically invest all their human capital and the major portion of, if not all, their financial assets in their venture, thus being unable to mitigate any uncertainty through diversification (Knight 1921).

To scale up the business to a full-grown firm, the entrepreneur also requires more key personnel who are permitted to act upon the knowledge that only they possess to promote intrafirm discoveries (Foss 1997), allowing the firm to adapt to challenges in a hormesis-like manner, react quickly to change, and encourage innovation. Eventually, later-stage financiers assume responsibility for financing, which may be substantial. At this point, innovation may have resulted in adaptive tensions (creative destruction) that drive the emergence of new firms (McKelvey 2004a) as perceptive competitors begin to imitate innovation. The market grows through the operational scaling-up of activities resulting from differential growth and selection (Metcalf 1998). Ultimately, this phenomenon may result in the emergence of a new industry (Chiles et al. 2004).

Understanding the contours of this process and how it is “supposed” to play out makes it possible for researchers and other analysts to identify institutional bottlenecks that hamper a CIB’s innovative prospects. For example, if entrepreneurs in general have a hard time finding early-stage financing, it may be because the pool of early-stage financiers is too small. This observation, in turn, can prompt a search for the features of an institutional system that creates this unfortunate situation. While the list of potential suspects is rarely short, the CIB theory offers an analytical clarity that is helpful when offering institutional prescriptions.

4. Institutional areas affecting CIBs

The current literature suggests that entrepreneurship and innovation take different forms between countries or regions because of institutional differences (see, e.g., Case and Harris 2012; WEF 2013). The (formal) institutions thought to be particularly important in this respect include the protection of private property, the rule of law, intellectual property rights, tax codes, social insurance systems, employment protection legislation, and competition policy (Hall and Jones 1999; Henrekson and Johansson 2009; Bjørnskov and Foss 2013). The reasoning suggests that entrepreneurship-friendly institutions in these areas should guarantee productive entrepreneurial venturing just about anywhere.

This reasoning is correct, subject to some caveats. For example, while the European Union has seen top-down and bottom-up convergence over the years, even member states with similar levels of per capita income continue to differ substantially in their institutional organization (Elert et al. 2019a). This diversity is not surprising, given the documented importance of historical values and norms, lock-in effects, and path dependency in institutional evolution (Arthur 1989; Reher 1998; Acemoglu et al. 2001; Nunn 2009; Alesina et al. 2015).

Indeed, these cross-country differences are a starting point in the various incarnations of the varieties of capitalism (VoC) literature, which is closely associated with the seminal work of Hall and Soskice (2001). Research in this tradition considers the existence of institutional complementarities as the main driver of the persistence of institutional differences across VoCs, with institutions being complementary “if the presence (or efficiency) of one [institution] increases the returns from (or efficiency of) the other” (Hall and Soskice 2001, p. 17).¹⁵

¹⁵ One salient example is the sizeable cross-country variation in corporate governance models of large listed firms: It ranges from the archetypical Anglo-American model based on management control and dispersed ownership to various models of concentrated family control by means of dual-class shares, pyramiding, and cross ownership, which are common in Europe and Asia (Bebchuk and Roe 2004). The complementarity of elements in these specific corporate governance models is crucial. Reforms limited to a particular element risk giving rise to inconsistencies that make the overall model less efficient (Schmidt and Spindler 2002).

Specifically, it makes little sense for European member states to try and emulate U.S.-style alumni donations to universities or Chinese-style infrastructure investments when the supporting cultural and deeply embedded, historically evolved complementary institutions are absent. It is better to look at the best of your closest peers, e.g., German-style apprenticeships or Finnish educational policies, and adopt them.

To date, however, the VoC literature has largely neglected entrepreneurial venturing, evolving instead through studies of incumbent firms and the institutions that channel their behavior. Dilli et al. (2018) fill this research gap by illustrating how distinct institutional constellations relate to specific types of entrepreneurship in a study focusing on the United States and 20 European economies: countries fall into four distinct families or clusters with a similar set of institutions governing finance, labor markets, education and training, and interfirm relationships. According to Dilli et al. (2018), these constellations facilitate the development of different types of entrepreneurship, ranging from risk-loving, growth-aspiring ventures based on radical innovations to risk-avoiding, growth-averse ventures based on imitation.

These findings are both discouraging and revealing. If distinct institutional constellations govern the emergence of distinct forms of entrepreneurship, then merely enacting some regulatory policy in isolation is unlikely to yield the desired results. Such an action might even make matters worse if it removes or weakens an institution whose presence is essential for the functioning of other institutions in the complex web that comprises the entrepreneurial ecosystem. For example, implementing an isolated fiscal reform to strengthen incentives for VC providers would hardly be effective in facilitating more Schumpeterian entrepreneurship in Continental, Southern, and Eastern Europe. To achieve this goal, policymakers more likely need to deregulate both labor and financial markets in a sensible manner so that VC-funded ventures can hire and fire employees more freely, strong incentive contracts for founders can be implemented, and a viable exit market is allowed to emerge. Only under those conditions can the classical VC model evolve and function efficiently. Reform failure is likely if policymakers do not take these important institutional complementarities into account.

However, the steps required for an appropriate and effective reform strategy are similar across VoCs at a sufficiently high level of abstraction. In all regions and countries, one must begin by assessing the most salient features of the institutional framework in place and tracing its historical roots. This phenomenon makes it possible to assess strengths and weaknesses and identify bottlenecks in the entrepreneurial ecosystem by resorting to a structured analysis of primary and secondary data. These insights should then be applied to a menu of evidence-based

policy interventions, allowing appropriate interventions to be selected and tailored to fit the specific country or region by heeding the relevant local, regional and national institutional complexities. In the following subsections of this essay, we present such a menu of evidence-based policy interventions for six institutional areas that we identify as particularly critical to the creation of flourishing collaborative innovation blocs and, ultimately, an entrepreneurial society. In this section, we illustrate the usefulness of the EOE perspective by directly linking a set of institutions to CIBs and the actors who operate within these blocs. Before presenting our examples, some overall observations are in order.

First, Silicon Valley stands out as an example of a geographical area that is dense with CIBs, where all the necessary actors are present and actively contribute to the activation and commercialization of scientific discovery (Eliasson 2000). An important question is whether such an innovation bloc can only emerge spontaneously as a result of the actions of entrepreneurs and other actors or whether it can be designed by policymakers, at least to some degree. The short answer is that it depends on the initial conditions faced by the actors that could potentially comprise the collaborative innovation bloc. These initial conditions are seldom close to what can be labeled optimal; a central role of policy is therefore to remove bottlenecks that hinder the emergence of a sufficient mass and variety of one or several skills in the structure. However, such a process is always shrouded in uncertainty for both policymakers and CIB actors.

As a case in point: When William Shockley founded his firm in Mountain View, California instead of in New Jersey, where his former employer Bell Labs was located, he did so not because he aimed to create something like Silicon Valley but because he was nostalgic about his boyhood and wanted to move closer to his mother. Furthermore, his failures as a boss were not intended to usher in a host of spinouts by “the treacherous eight” and the founding of the broader web of CIBs that we currently know as Silicon Valley (Klepper 2016, p. 114–120). Likewise, spinoffs and spinouts prompted by disagreements between management and employees were key to creating Detroit’s agglomerated automobile industry (Klepper 2007).

That said, Silicon Valley’s success was far from immediate, in large part because the development of the VC industry was hindered by high capital gains taxes, whereas pension funds were barred from investing in securities issued by small firms, new firms, or VC funds. Absent the set of reforms that removed these obstacles in the 1980s, it would be difficult to imagine the American VC industry’s impressive growth or the emergence of the kind of contractual forms that are fundamental to how Silicon Valley operates today (Fenn et al. 1995;

Gompers and Lerner 2001; Gilson and Schizer 2003). That said, the reforms were not intended to directly promote Silicon Valley, and it was impossible to fully foresee their repercussions for CIBs across the United States.

The CIB perspective inevitably implies regional knowledge concentration, especially given the importance of networks in academic research and economies of agglomeration. This concentration should be considered normal and acceptable. Likewise, successful entrepreneurial ecosystems and industrial clusters follow an economic logic that is not necessarily politically convenient. There is little doubt that geographic proximity facilitates knowledge spillover and knowledge transfer among networks and collaborations (Jaffe et al. 1993; Sorenson and Stuart 2001; Ponds et al. 2007; Arzaghi and Henderson 2008; Rosenthal and Strange 2008). These findings hint at a potential role for governments, national and local, in promoting urbanization, local networks, and clusters (Andersson and Henrekson 2015).

Strong, dynamic clusters are bottom-up phenomena that can emerge anywhere (Klepper 2016) and should be allowed to form endogenously. However, policy and institutional reforms can improve initial conditions. First, they can reform real estate markets so that housing prices reflect scarcity and preferences; where appropriate, they should also liberalize zoning laws and remove any red tape that could curb cluster development (Glaeser and Tobio 2008; Glaeser 2011). Local policymakers should also provide an infrastructure that allows smooth transportation and commuting.

Put differently, to the extent that policymakers undertake initiatives, they should address the source of the problem and not treat the symptoms. Again, the VC example is a case in point. A lack of venture financing is often seen as a reason for the government to step in as a substitute. However, a forceful objection to this option is that with few exceptions, research evaluations of soft loans and similar support for startups from government agencies find them to be ineffective (Lerner 2009; Sandström et al. 2016). The know-how to raise such capital is part of the skill set of a successful, productive entrepreneur (Shand 1984; Evans 2016). Instead of lowering the risk that winners are rejected, injections of financial resources on noncommercial terms will impede the selection process of the innovation bloc, thereby increasing the risk that ineffectual collaborations survive longer than necessary. By going to the source of the problem, the VC reforms described below avoid this error.

The fact that policymakers often end up treating the symptoms can be appreciated by drawing on a public choice perspective, which highlights that to understand policy formation, one has to look at the incentives of politicians, regulators and experts and how they interact. Lucas

(2019) argues that an identification of institutional bottlenecks in CIBs will suffer unless all the implications of human self-interest are taken into account. Lucas brings up “black holes” – what one may perhaps label a mirror image of institutional bottlenecks – where government subsidies for innovation projects induce entrepreneurs to pursue value-destroying projects for too long in order to receive more subsidies. Such schemes essentially contribute to rather than mitigate Type I errors, although they tend to be introduced as a second-best response to alleviate problems caused by other innovation-hindering policies. Once such subsidies have been put in place, there is a great risk that a new group of unproductive “subsidy entrepreneurs” emerges (Gustafsson et al. 2019).

In general, a change in policy in a democratic society needs to be preceded by an informed discussion of the detrimental effects of the current policy. Welfare-enhancing policy reform becomes more likely if the electorate’s view of the world, particularly its view of how the market system works, is well informed. Thorough analysis of the likely effects of a reform proposal will increase the likelihood that it wins the approval of the electorate. Currently, such ex ante evaluations are almost always based on neoclassical models and methods, although one could argue in line with Holcombe (2009, p. 301) that “[f]or purposes of policy analysis, the Austrian approach provides better insights because of its more realistic behavioral foundations.” Elert and Henrekson (2019a) argue that the Austrian approach will be better suited to provide such insights if it incorporates a CIB framework. Of course, CIB actors need not be passive in this process. This is an important theme in the public sector entrepreneurship literature, which focuses on innovative public policy initiatives aimed at increasing economic prosperity by creating an economic environment conducive to value-enhancing activities in the face of uncertainty. The economic agents in the CIB may serve as an important source of ideas that policymakers can use to determine how public policies could be improved to foster a more innovative environment (Link and Link 2009; Leyden and Link 2015).

More generally, when the absence of a skill is detected, the first question economic actors, researchers, and policymakers should ask is: Why did this skill not emerge spontaneously? Here, the CIB perspective is highly valuable since it helps us identify which institutions matter the most for the emergence and expedient collaboration of the principal actors in the innovation bloc. Successful collaborative innovation blocs and entrepreneurial ecosystems cannot be planned top-down, but deliberate economic policy is not irrelevant: Bad policy can effectively bar the emergence of collaborative innovation blocs, and good policy can increase the likelihood that they will emerge and flourish. That said, the CIB perspective makes clear that

the quest to develop an optimal set of legal rules ignores the continuous change, innovation, and adaptation of organizations in a competitive environment, which calls for a never-ending search for efficiency-enhancing adjustments and modifications of the institutional framework within which the various agents in the innovation bloc develop their collaborations.

Below, we illustrate how the innovation bloc can be used systematically as a reliable foundation to identify the institutional framework that needs to be present and, importantly, the institutional bottlenecks that need to be removed for more innovative entrepreneurship to take place and to increase its payoff by facilitating its subsequent scale-up. The primary strength of the approach is that it is founded on the conditions of the actors on the ground.

4.1 The rule of law and protection of property rights

The protection of private property rights, as well as the rule of law and a high level of trust, are relevant for all actors in the innovation bloc and the market process more broadly. Deficiencies in these factors negatively impact all agents in the innovation bloc and induce people to conduct activities and keep their assets in the shadow economy and to be wary of entering into business relationships with strangers (Johnson et al. 2002). The division and specialization of labor are also hampered in such instances, to the detriment of collaborative innovation blocs and their actors, whether financiers, personnel, or customers. When they are well functioning, by contrast, these fundamental rules of the game strengthen and complement each other by preventing undue uncertainty and ensuring that entrepreneurs can engage in productive activities.

That said, the rule of law is not enshrined in any particular legal rule; what happens in practice matters more than what the law says. Likewise, formal property rights that do not offer control rights in practice are useless, while the absence of formal property rights need not be prohibitive if control rights are sufficiently strong (Rodrik 2007). Therefore, when assessing the impact of the rule of law and protection of property rights on the workings of CIBs, one should consider *de facto* rather than *de jure* institutions (Feld and Voigt 2003; Acemoglu et al. 2005; Woodruff 2006; Hodgson 2016). For example, legal titles are meaningless if they are not enforced in practice.

Economic actors can (and do) compensate to some extent for weaknesses in the rule of law and property rights protection by undertaking more off-the-books activity; as a result, countries that perform poorly in these respects usually have larger underground economies (Schneider 2015). However, shadow economy activity is generally a poor substitute for formal sector activity,

partly because it creates unfair competition for firms that adhere to rules and regulations. More importantly, firms in the shadow economy cannot benefit from the division of labor and specialization of collaborative innovation blocs to the same extent as formal firms and are therefore unlikely to grow into large firms. Imperfections in these institutions hurt all actors in the economy, especially cash-constrained small and young ventures. Addressing such fundamental issues would go a long way towards supporting a more entrepreneurial and innovative economy.

This approach requires nuance, however. Economic history shows that private property is a function of technology and norms in many ways (Christiansen and Gothberg 2001; Pagano 2011). As Wagner (2016, p. 48) puts it, property rights are just settled quarrels, “settled for now anyway.” There is even value to property rights continually being challenged and renegotiated – such stressors can improve the property system as a whole. It has been said that civilizations flourish only when attaining a balance between protecting expectations and allowing adaptation to new conditions (Kuran 1988, p. 145), and this is certainly true for collaborative innovation blocs. On the one hand, we want to protect private property to incentivize productive investment through the accumulation of private wealth; on the other hand, it is necessary to maintain an open and contestable market for new entrants to keep unproductive rent seeking (e.g., lobbying for closed and complex standards) and destructive entrepreneurship (e.g., ventures that disregard public health, exploit natural resources or appropriate other nonmarket goods) at bay.

Intellectual property rights (IPR) illustrate the pitfalls of this balancing act and the difficulties in properly weighing the interests of inventors against the positive spillover effects of knowledge diffusion. Knowledge is unique in the sense that it is often tedious and expensive to create. However, once discovered, it is nonrival in use and can be shared freely without being diminished. On the one hand, if IPR protection is too weak or too easily circumvented, creators will need alternative ways to recover the costs of knowledge generation and early diffusion (Merrill et al. 2004; Acs and Szerb 2007; Baumol et al. 2007; Kauffman Foundation 2007). On the other hand, if protection is overly strong, the inventor or his delegate will extract excessive rents from entrepreneurs *ex post*. Such rents come about if the IPR time frame is too long or if it is too easy to obtain protection, even for bits and pieces of potentially useful knowledge and inventions that have yet to be developed into useful innovations. Such features of IPR protection inhibit the free flow of knowledge and reduce incentives to commercialize, consequently leaving the economy less competitive and less innovative (Jaffe and Lerner 2004; Acs and Sanders 2012). Strong(er) IPR protection then becomes the problem rather than the solution,

making it necessary to consider more fundamental reforms to the system itself to promote the diffusion and use of knowledge.

4.2 Taxation

When pondering the determinants of the supply of entrepreneurship, it is important to reckon with Baumol's (1990) notion that core entrepreneurial talents are used to maximize individual utility, not social welfare. Hence, the rules of the game or the institutional setup give rise to a "social structure of payoffs", which in turn determines whether entrepreneurship is allocated to productive, unproductive or destructive purposes (cf. Elert and Henrekson 2016, 2017). While the distinction between the supply and allocation of entrepreneurial effort is theoretically and empirically relevant, available data seldom allow for a complete empirical distinction (Bjørnskov and Foss 2008). When social value creation is determined relative to the individual's next best alternative in view of existing institutions, many actions that appear unproductive are in fact productive (Lucas and Fuller 2017); what seem to be nonproductive forms of entrepreneurship are best considered as second-best *productive* responses to suboptimal institutions (Douhan and Henrekson 2010).

Taxes are of immense importance for entrepreneurship, but the fact that no specific tax on income from entrepreneurial effort exists in practice complicates matters. Entrepreneurial income is taxed in several different forms, notably as labor income, business income, current capital income (dividends and interest), or capital gains. These taxes may affect entrepreneurial activities differently. In Elert et al. (2019a), we systematically cover all areas of taxation that we deem relevant to an entrepreneurial society. Such an exercise is important because taxes shape and bias the incentives for corporations, individuals, and organizations. Biases in favor of entrepreneurship can sometimes be justified in the case of strong positive external effects, but more often, we argue for the importance of a level playing field and moderate taxation to restore or maintain market incentives. Below, we list a number of key features that institutions surrounding tax policies should adhere to in order to nurture well-functioning CIBs.

4.2.1 Labor taxation

While some entrepreneurs (such as owner-managers in incorporated businesses) are employees in their own companies, they seldom pay themselves a high salary, especially in early phases, when liquidity tends to be constrained. Nevertheless, the emphasis on key personnel in the collaborative innovation bloc underscores the central role of labor taxation in successful entrepreneurial venturing. To offset the negative impacts of high marginal and average labor taxes on labor supply, policymakers tie many of the valuable transfers and welfare state services

that these taxes finance (e.g., childcare and pension rights) to employment (Lindbeck 1982). However, if systems are poorly designed, they push people away from small, risky and innovative ventures into secure, salaried employment in the public sector or in incumbent firms. More often than not, these high-taxation–high-conditionality systems lack moderation, neutrality, and transparency. To ensure the supply of entrepreneurs and key personnel in CIBs, tax burdens on labor should thus be low, with subsidies, pension rights and social benefits being universal rather than conditional on employment status (for more on this issue, see subsection 4.4.2 on social security).

4.2.2 Corporate taxation

Corporate taxation has significant ramifications for the interplay between entrepreneurs and financiers in the collaborative innovation bloc; specifically, a high tax rate on business profits discourages equity financing and encourages debt financing if interest payments are tax-deductible (Desai et al. 2003; Huizinga et al. 2008). Because debt financing is less costly and more readily available to larger firms, high corporate tax rates coupled with tax-deductible interest payments put smaller firms and potential entrepreneurs at a disadvantage (Davis and Henrekson 1999) while also reducing the amount of retained earnings that can be used to expand ventures after start-up. Consequently, taxing profits can be expected to negatively affect growth, especially in small firms (Michaelas et al. 1999). As such, a tax system with small or no discrepancies between statutory and effective corporate income tax rates will incentivize firm growth and facilitate all-important collaborations between entrepreneurs and financiers in CIBs.

4.2.3 Dividends and capital gains taxation

The returns to entrepreneurship accrue to investors and entrepreneurs mainly in the form of dividends and capital gains on their firm ownership stake. A high dividend tax rate encourages entrepreneurs to rely on retained earnings to finance expansion but can also trap capital in incumbent firms, thereby obstructing the flow of capital to the most promising projects in a collaborative innovation bloc (Chetty and Saez 2005). This imbalance is likely part of the reason why owners receive most of their economic return from successful entrepreneurship in the form of increased share values. Consequently, the taxation of capital gains on stock holdings typically has a substantial effect on the financial incentives of potential high-impact entrepreneurs and their (equity) financiers (Cumming 2005; Da Rin et al. 2006). When tax schemes for dividends and capital gains are complex, as is often the case, they feed a thriving but macroeconomically unproductive tax advice business. In contrast, dividend and capital

gains tax rates with few exceptions, and few (opaque) concessionary schemes will benefit the workings of CIBs by ensuring that the tax system is not biased against highly relevant sources of finance for entrepreneurial venturing.

4.2.4 Wealth taxation

“Triple-F” finance – from friends, family and fools – plays an important role in the early stages of many ventures in a collaborative innovation bloc. Entrepreneurs distribute ownership rights to informal investors early in the start-up process, negating the idea that triple-F financiers act out of charity (Kotha and George 2012; Ford and Nelsen 2014). In fact, the supply of such finance typically follows demand closely, and the amounts invested are of the same order of magnitude as the amounts committed by angel investors in later stages of development (Burke et al. 2014). In other words, entrepreneurs mobilize significant funds from their personal and informal networks that aid in the development of their nascent ventures. It is possible, therefore, that more private wealth would increase the supply of informal finance in CIBs, ultimately enabling more entrepreneurial venturing. Low taxes on private wealth, private wealth transfers and productively invested inheritance will therefore be highly beneficial for entrepreneurial ventures in the early stages. When the taxation of private wealth is low and transparent, more savings for productive investment in entrepreneurial ventures will be available.

4.2.5 Equity and debt tax treatment

Innovative entrepreneurs face large disadvantages in attracting more formal forms of debt finance due to high uncertainty and the lack of a robust track record and readily collateralizable assets. Therefore, tax structures that favor debt over equity investments will, often unintentionally, bias the flow of financial resources away from innovative entrepreneurial venturing and impede the functioning of the collaborative innovation bloc. Moreover, the tax deductibility of interest payments has provided large firms with ample room for artificially shifting profits to low- or zero-tax locations (OECD 2017). In CIBs, it is (primarily) equity investments that enable innovative entrepreneurial venturing and thereby generate useful knowledge about the products, services and business models that work or fail. This knowledge constitutes a positive externality, which may even justify the preferential tax treatment of equity investments over debt. Thus, fiscal parity between debt finance and equity finance goes a long way towards strengthening CIBs.

4.2.6 Stock option taxation

The role played by key personnel in collaborative innovation blocs is substantially affected by the fiscal treatment of stock options. As promises of a future ownership stake, employee stock

options are used to encourage and reward individuals who supply key competencies to a young firm that is typically cash constrained. However, their value and effectiveness as an incentive mechanism greatly depend on the option tax code, particularly on whether employees can defer tax liability until they sell stocks and whether they are taxed at a low capital gains tax rate at this point (Gilson and Schizer 2003). Empirically, the effective tax treatment of option contracts is a major determinant of the size of the VC-funded entrepreneurial sector (Henrekson and Sanandaji 2018). The VC sector remains small in most countries where the tax rate on stock options is high, while low-tax countries such as Hong Kong and the United States have large and highly dynamic VC sectors (Armour and Cumming 2006). The supply and effective employment of key personnel in CIBs is thus strengthened when taxes on capital gains on stock options and the underlying stock in start-ups are low and taxed only when gains are realized.

4.3 Savings, finance, and capital

Few developed economies suffer from any actual shortage of financial savings (OECD 2019). However, as we have already mentioned, the nature of entrepreneurial venturing makes some forms of finance more suitable than others. In other words, the problem is not quantitative but qualitative: The allocation, rather than the volume, of savings matters for entrepreneurial activity. Although plentiful, financial resources in the EU are mainly intermediated through universal banks and institutional investors who prefer large, low-risk, debt-based assets and blue-chip stocks over small, risky equity-based investments (Westerhuis 2016). This phenomenon produces largely bank-based and highly regulated systems of financial markets in which wealth and savings are predominantly “locked-up” in professionally managed funds and assets. Investees without collateral, strong balance sheets and long track records fight an uphill battle to gain access to credit and financial resources in such systems. The ramifications for collaborative innovation blocs are considerable; one can only speculate as to the number of fundamentally sound entrepreneurial projects that never left the ground because the financial playing field was tilted against them.

To benefit collaborative innovation blocs to the greatest extent possible, institutions governing savings and finance should safeguard a large flow of financial resources to small and new firms with a high potential for entrepreneurial venturing. A sufficient quantity of existing resources should become available to new ventures at the right time and in the appropriate form. In many countries, the realization of this goal in practice entails enabling vested institutions, promoting proven alternatives, and experimenting with new technologies to allocate more of the available capital to innovative entrepreneurs. Since adequate capitalization in the early stages of

development is a major driver of venture survival and success, this section outlines how the financial sector should be balanced to promote CIBs. This happens when resources are prevented from being “institutionalized” in the first place or freed up once they are and when the evolution of alternative channels of finance is facilitated.

4.3.1 Private wealth

The flow of finance into entrepreneurial venturing will likely be higher in many countries if less wealth is tied up in compartmentalized institutional investment funds. Institutions that encourage private wealth accumulation and the free flow of that wealth into entrepreneurial ventures are thus likely to ensure that there is a proper supply of entrepreneurial financing (Pelikan 1988). As already noted, a lack of equity capital in smaller ticket sizes constrains (potential) high-growth firms more than others because such firms require regular infusions of external equity to sustain growth (Baumol et al. 2007, p. 205). This reliance increases (relative to debt) with the degree of risk and opacity, both of which are greater among younger and more innovative firms than among older and less innovative firms. Therefore, entrepreneurial start-ups usually struggle to raise funds, especially from large financial institutions (van Tilburg 2009). Part of the problem is that wealth-constrained would-be entrepreneurs who do not have a track record cannot put up collateral or make sizable equity infusions of their own to credibly signal their project’s worth to outside investors.

High levels of private wealth accumulation would remedy this asymmetric information problem (Nykqvist 2008; Parker 2018) and may even enable the entrepreneur to make equity infusions that are large enough to capitalize the firm at inception. Such capitalization is essential for later venture success and performance (Henrekson and Sanandaji 2016) and thus matters greatly for the selection that takes place in collaborative innovation blocs. Moreover, a high level of private or family-based savings could increase the pool of potential business angels and other informal investors who can help entrepreneurs overcome early-stage liquidity constraints (Ho and Wong 2007). CIBs will be better off when much wealth is allowed to accumulate and remain in private hands, provided that it is possible, easy and attractive to invest such wealth in entrepreneurial ventures.

4.3.2 Pension savings

Unfortunately, financial markets show a growing tendency towards institutionalization with funds managed on behalf of individual investors (e.g., Pilbeam 2018). To strengthen access to early-stage finance for CIBs, it is therefore important to consider other initiatives to make more savings available to start-ups. Crucially, pension fund participants should have a high degree

of discretion over their pension savings, be allowed to buy unlisted stock and invest part of their pension savings in start-ups should they want to do so. When people are allowed to individually choose how and where to invest part of their pension savings, the likelihood increases that some of that money will flow into CIBs and reach entrepreneurs in the nascent stages of venture creation.

4.3.3 The venture capital sector

Beyond the nascent stage, business angels and venture capital (VC) firms play a crucial role in high-performing entrepreneurial firms with growth ambitions (Cumming 2012); however, more private wealth is only a first step towards developing a VC industry. Because the current trend of a progressively larger share of savings going into pension funds is unlikely to reverse anytime soon (OECD 2018), CIBs will benefit greatly if at least part of these assets can be invested in entrepreneurial firms and not just in real estate, public stocks and high-rated bonds. However, since large financial institutions do not have the competence to invest directly in small and new firms, such a measure would create a demand for a professional VC sector. Hence, if pension funds and other institutional investors are allowed to invest considerable amounts in equity in general and in venture capital specifically, this is likely to strengthen early-stage financiers and improve the flow of financial resources to entrepreneurial start-ups. Crucially, such a scheme should be combined with cuts in capital gains taxes and the effective tax treatment of stock options in young entrepreneurial firms, as discussed in sections 4.2.3 and 4.2.6.

Moreover, the problem with venture capital is not a lack of money or skills per se. Rather, a substantial degree of “skin in the game” needs to be retained to avoid moral hazard, as returns and the risk of failure are likely to depend on entrepreneurial effort and investors’ commitment to the venture. Too much “easy” public funding may actually reduce an entrepreneurial venture’s chances of success. Even professional fund managers will make expensive mistakes and invest in projects with high risks and low returns if allowed to play with “other people’s money” (Kay 2015). CIBs will see a stable demand and supply of private VC funds when incentives to invest are strong and the potential to offload losses onto taxpayers is kept to a minimum. Low barriers to the sale, acquisition and IPO of VC-funded start-ups to facilitate profitable exits are therefore highly desirable. After all, a VC fund is involved in a venture’s lifespan for a relatively short but crucial period. Strong, reliable exit opportunities will therefore be a valuable complement to the aforementioned tax scheme. Good access to later-stage financiers and exit markets will intensify competition among potential buyers, which will then increase the value of innovative entrepreneurial ventures.

4.3.4 New financing technologies

Alternative modes of financing are on the rise as sources of entrepreneurial funding (Bruton et al. 2015; Vulkan et al. 2016; Block et al. 2018). Today, small firms can access large pools of financial resources through crowdfunding and peer-to-business platforms, in which many small investments add up to a large and growing total. Unsurprisingly, these systems benefit entrepreneurial start-ups more than they do large, incumbent firms and corporate groups (Polzin et al. 2017). Currently, it is perhaps particularly relevant that peer-to-business lending has proven to be an important buffer against the impact of the financial crisis in relevant countries (Mills and McCarthy 2014). However, for these benefits to materialize, it is essential that regulators and supervisors resist their instinct to protect small-scale investors. Taking on risk is simply an essential part of equity crowdfunding and peer-to-business lending, which is why CIB activity is best served when alternative finance modes are governed by a light-touch regulatory regime.

4.4 Labor markets and social security

A necessary condition for the long-term success of a new venture is that the entrepreneur can recruit key personnel at the opportune time to scale up the business to a full-grown firm (Eliasson 1996; Elert and Henrekson 2019a). Hence, if the labor market does not work like a market, one can expect little radically new industry formation or innovation (Eliasson 2000). Labor market and social security institutions in mature industrialized economies are systems that are deeply embedded culturally and that typically favor large, stable incumbent firms. As a result, experimental, innovative ventures tend to be at a disadvantage in regard to obtaining human resources. While new ventures are usually free to offer jobs and recruit workers as they see fit, they do not compete for the talent they need on a level playing field with established firms. Employing labor typically comes with responsibilities that go beyond paying a competitive wage – responsibilities that are particularly hard for new ventures to shoulder. Such issues make access to key personnel more constrained than it needs to be, to the detriment of the functioning of collaborative innovation blocs.

The situation for entrepreneurs and key personnel is improved when rights are portable and social security is universal and unconditional. The incentives that encourage activation, mobility and risk-taking in CIBs are best served by universal insurance systems that disregard labor market status, history or attachment. Therefore, these institutions should ensure the portability of tenure rights and pension plans as well as a full decoupling of health insurance from current employers. Such a framework would avoid punishing individuals who leave secure, tenured employment positions and pursue entrepreneurial projects, whether as

entrepreneurs or as employees in entrepreneurial start-ups. Finally, the extent to which these risks are collectively insured should be moderate, and systems should be kept simple to achieve the salience necessary for people to act rationally and avoid costs from spiraling out of control.

4.4.1 Employment protection legislation

Virtually all industrialized countries have some sort of legal protection pertaining to the employer-employee relationship. These rules come in many shapes, such as dismissal procedures, severance pay, and legitimate causes for dismissal. Undoubtedly, rules protecting employees from erratic and arbitrary behavior by employers reduce insecurity, which may increase employees' commitment to employers and strengthen incentives for workers and firms to engage in training in firm-specific skills (Pissarides 2001). However, the evidence clearly shows that stringent employment protection legislation leads to lower labor turnover and thus increases the opportunity cost of seeking employment in new innovative firms where the risk of failure is high (Skedinger 2010).

To mitigate the adverse effects of overly stringent employment protection legislation, policymakers in many countries have instituted firm-size thresholds below which regulations are more relaxed. In practice, however, the threshold is the equivalent of a tax on firm growth and has been shown to incentivize firms to remain small in, e.g., Germany (Autio et al. 2007), France (Garicano et al. 2016), Portugal (Braguinsky et al. 2011), and Italy (Schivardi and Torrini 2008). Discouraged by such thresholds, many entrepreneurs never discover whether they could have become high-impact entrepreneurs. More generally, there is a negative relationship between the overall strictness of employment protection legislation and the rate of early-stage entrepreneurship with high growth expectations (Henrekson 2020; Elert et al. 2019a).

Moreover, many countries exhibit considerable gaps in strictness for regulating temporary and permanent employment in many countries. Such discrepancies may have some logic to them: policymakers may see tight labor protection for permanent employees as necessary to maintain high levels of firm-specific human capital (Adnett et al. 2004) yet prefer temporary work over unemployment when it serves as a stepping stone to permanent contracts (Scherer 2004; Gash 2008). In addition to concerns about the emergence of dual labor markets (Gebel 2010; Hirsch 2016; Dolado 2016), this disparity also implies that government-enforced regulation tilts the playing field against entrepreneurial ventures: the greater the disparity between temporary and permanent contracts, the greater the opportunity cost for an employee on a permanent contract of accepting a job in a high-risk firm.

For the supply of key personnel to be high and flexible, employment protection legislation should be uniformly moderate, with small discrepancies between permanent and temporary contracts. Under such an institutional regime, job security will be low, but employment security will be high because it will increase labor demand and result in the creation of more labor market opportunities. This does not deny that the impact and strictness of employment protection legislation depend on a complex combination of components, such as grounds for individual dismissal, redundancy procedures, mandated periods of advanced notice, severance payments, special requirements for collective dismissals, and rules favoring disadvantaged groups. These components should be taken into account when undertaking efforts to strengthen CIBs in this manner.

Labor supply will be more flexible and responsive to the needs of entrepreneurs when workers and employers have greater freedom to contract on working hours. In addition, high worker mobility across jobs, industries, and regions will benefit the broader CIB population. Notably, confidentiality agreements and noncompete clauses often prevent knowledge from flowing freely across firms and sectors. The fact that noncompete clauses are not allowed in California (in contrast to, say, Texas) is seen as an important element in the development of the Golden State's highly successful ecosystem of CIBs (Gilson 1999). Finally, tenure-related wage scales and severance pay should be low because these insider benefits tend to lock people into jobs and shift bargaining power in the labor market toward large, incumbent employers (Lindbeck and Snower 2001; Eichhorst et al. 2017). However, this move requires that (all) workers are empowered vis-à-vis their employers through a robust fallback option, which is why we turn to social insurance systems.

4.4.2 Social insurance systems

In principle, providing insurance for the usual social risks (loss of income due to unemployment, illness, disability or old age and high medical costs, child care or educational expenses) should enable individuals to consider and pursue entrepreneurial endeavors by mitigating the burden of uncertainty. However, the design features of social insurance systems matter a lot for whether this is the case or not. As Sinn (1996) argues, when insurance is closely linked to tenure in a specific job, it does not promote an entrepreneurial spirit.

What matters for an employee considering whether to transfer to self-employment or a risky job in an entrepreneurial firm is the opportunity cost, i.e., how much income or security this individual has to sacrifice. Absent public or collective insurance schemes, these costs can be prohibitive. Company-specific health insurance plans, which are common in the United States,

are an obvious example; another is accumulated pension assets that are difficult to transfer when switching employers, industries, or countries of residence. Labor mobility is greatly improved when these and other benefits are decoupled from the current employer-employee relationship. One way to achieve this is by guaranteeing equal access to welfare state arrangements for all, regardless of tenure in a specific job or labor market status. An added benefit is that such a system eliminates the competitive advantage held by large mature companies in attracting and retaining talent, given that young, innovative firms can seldom offer a long and secure tenure. The full portability of entitlements and flexible employment contracts would thus create a more level playing field in the competition for labor.

4.5 Contestability in entry and exit

Contestability refers to openness to innovation and challengers, which is not only crucial to collaborative innovation blocs but also relevant for the well-being of individual firms, bureaucratic organizations, and a host of other contexts. A CIB will progress only if it allows better ideas to drive out inferior ones, which occurs when there is a limit on the resources wasted on losing and flawed projects (Type 1 error) while also avoiding the imposition of undue constraints on winners and successful projects (Type 2 error) in CIBs. These two error types are interlinked, which is why we treat both entry and exit restrictions in this section. Failed ventures must end so that their resources can be turned to more productive uses, but “fear of failure” should not prevent new entrants from challenging the status quo. Learning by failure is of paramount importance for entrepreneurs, collaborative innovation blocs, and society.

Unfortunately, the “fear of failure” cannot be eliminated by efficient and effective insolvency regulation alone. Such attitudes depend, in no small measure, on a cultural dimension that differs markedly across countries. To the extent that formal institutions affect citizens’ attitudes about entrepreneurial venturing, such effects will only materialize in the long run. Nevertheless, if society’s institutions signal that business failure is acceptable, cultural attitudes can gradually become more supportive (Sanders et al. 2020b).

4.5.1 Regulations of goods and service markets

Even when they are well intended, environmental, health, safety, and quality regulations can be abused by incumbents to limit entry and competition. Excessive reliance on rules and procedures discourages potential entrepreneurs and hampers the process of creative destruction, in large measure because a detailed and complex system works in incumbents’ favor vis-à-vis potential challengers. It is therefore vital that such regulations are clear, transparent and

neutrally formulated to ensure that new, alternative ways of doing old and new things are permitted in collaborative innovation blocs.

As a case in point, cross-country evidence reveals that restrictive product market regulations slow the diffusion of best practice production techniques across borders and the incorporation of new technologies into the production process. One channel through which this occurs is in the adoption of information and communications technology, where anticompetitive product market regulation appears to have a negative and significant effect (Conway et al. 2006). As such, product market regulations can be said to hamper the ability of customers to behave in a competent and venturesome manner.¹⁶ However, recent decades have seen governments of many developed countries deregulate product markets in order to increase market contestability and provide more opportunities for private entrepreneurship within sectors such as telecommunications, energy production, transportation, and financial services (Elert et al. 2017). The scope for new high-impact entrepreneurship in many CIBs has thus increased dramatically.

As a first precondition for contestability, it should be easy and cheap to formally start a venture. An institutional system conducive to CIBs will thus have low barriers to new business formation and new entry. An entry barrier warranting special attention is occupational licensing, which was originally intended to ensure the quality of services that consumers are unable to determine themselves. In theory, the license indicates that the provider is capable and abides by the rules, ensuring a minimum quality level of the service. In practice, however, occupational licensing often results in unjustified profit opportunities for license holders and the abuse of market power rather than consumer protection. Evidence from the United States and the EU shows that such regulation has a significant impact on prices and labor mobility, while little to no evidence supports the claim that quality is higher (Kleiner 2000; Kleiner and Krueger 2010, 2013; Barrios 2018).

Furthermore, a central segment of many advanced economies is heavily regulated or even monopolized by the public sector, namely, the provision of private good social services such as

¹⁶ The presence of competent customers, especially of the venturesome type proposed by Bhidé (2008), in CIBs is largely a result of a society's broader cultural attitudes. This view attributes the innovative success of the United States to Americans' great willingness to employ and implement novelties in their role as customers, even when both costs and benefits are uncertain. Formal institutions can help determine whether individuals willing to engage in this type of behavior can do so. Bhidé (2017, p. 23) highlights this as a problem in the field of medicine, where the Food and Drug Administration (FDA) "has been mandated to make choices about the safety and effectiveness of drugs and new devices on everyone's behalf."

health care, care of children and the elderly, and education (Andersen 2008; Henrekson and Johansson 2009). The extent and nature of government involvement can differ substantially, but if the government monopolizes both production and financing, the room for any CIB actors or skills to play a role will be severely curtailed. As a result, CIBs with the requisite breadth and depth to become antifragile cannot emerge. The same is effectively the case when the government “only” monopolizes production.

A noteworthy trend, therefore, is the increasing recognition by welfare states that ensuring access to health care and other social goods and services does not require the government to produce them. Of course, one challenge to the implementation of such frameworks is the fact that consumers can rarely assess the quality of the service provided or discipline producers directly. Policymakers thus have the unenviable task of ensuring quality and access to health care and other social services without resorting to full bureaucratic regulation and public production. The case of the Netherlands shows that it may even be possible to eschew public financing: Dutch health care insurance is fully privatized in the sense that all private suppliers are forced to offer a standardized policy at a (competitive) price, while all citizens are obligated to buy such a policy (Schäfer et al. 2010). Such measures may increase the scope for citizens to act as venturesome customers to a considerable degree. Deregulated health and public services promise to open entirely new arenas for private innovation and entrepreneurial venturing, even if direct public financing is likely to remain the default option in most countries.

4.5.2 Bankruptcy law and insolvency regulation

Collaborative innovation blocs are experimental at their core, which makes frequent failure inevitable and, to some extent, desirable. Business failures can stimulate firm founding by opening new opportunities, enabling knowledge spillovers, and making additional resources available (Hoetker and Agarwal 2007; Hiatt et al. 2009). Failed projects should not be considered a waste of resources, and bankruptcies are neither unproductive nor destructive; instead, firm failure provides valuable information to economic agents about whether a business model is viable. The restriction or delay of the process of restructuring by too stringent bankruptcy regulation harms knowledge generation and development (e.g., Holbrook et al. 2000; Armour and Cumming 2008) and discourages potential entrepreneurs by adding to the expected cost of starting a business.

Moreover, a restructured venture with new management or a different firm can often recycle and improve upon the knowledge and ideas from failed projects, making past failure the foundation for future success. Indeed, more lenient bankruptcy laws are associated with higher

rates of venture formation (Fan and White 2003; Peng et al. 2009). In a longitudinal study of the connectedness of barriers to failure, venture growth, and elite entrepreneurs, Eberhart et al. (2017, p. 93) even find that “lowering barriers to failure via lenient bankruptcy laws encourages more capable – and not just more – entrepreneurs to start firms.”

Of course, failure also implies that people suffer, psychologically and financially, and such damage should be minimized. Thus, relatively generous bankruptcy laws and insolvency regulations are preferable, with provisions for discharge clauses, the postponement of debt service and repayment, and the possibility of restructuring. Insolvency regulation should protect inherently healthy and promising ventures while smoothly putting bad ventures to rest. If firms are too hastily shut down, with their remaining assets shifted out to creditors, the result could be excessive value destruction. It is often sufficient that the current owners lose their equity, that the debt is restructured and that the consortium of debtors finds a new controlling owner after restructuring (Becker and Josephson 2016).

4.6 Mobilizing human capital for entrepreneurship

The human brain’s creative potential has led researchers to label it the ultimate resource (Simon and Kahn 1981; Simon 1996; Naam 2013). As measured in internationally comparable tests of pupils’ abilities and skills, human capital is of crucial importance for economic growth (Hanushek and Woessmann 2015; Lucas 1988; Mankiw et al. 1992; Barro 2001). Because collaborative innovation blocs require a broad variety of skills and knowledge, society’s institutions should enable the accumulation of sufficient human capital to be matched to sophisticated demand. This accumulation begins in school but continues throughout an individual’s working life, whether on production floors or in dedicated R&D labs.

While the aforementioned factors, such as labor market rigidities, help explain why the supply of key personnel is often limited in practice, the quality, efficiency and relevance of education emerge as core institutional factors, making this limited supply more than an issue of spending. For example, while high educational spending accompanies good results in Finland, it is associated with weak results in Sweden. In addition, whereas pupils in Poland and Estonia achieve excellent results despite relatively low educational spending, Romania and Bulgaria spend little and do poorly (Elert et al. 2019a). An implication is that high educational budgets in and of themselves are unlikely to benefit collaborative innovation very much.

Moreover, the link between national performance in international tests and economic growth may be positive, but strong causality is difficult to establish. The link to successful entrepreneurial venturing is even less evident. The CIB perspective illustrates that most

innovation emanates from team efforts that bring together skills and knowledge from different sources. A new idea is only the first step in a knowledge-intensive innovation and commercialization process, and if new knowledge is to translate into economic growth, entrepreneurs must exploit it by introducing new methods of production or new products into the marketplace (Schumpeter 1934 [1911]; Michelacci 2003; Bhidé 2008). Nevertheless, in all likelihood, an excellent educational system from kindergarten through university would provide entrepreneurial ventures with a rich and diverse pool of human capital.

4.6.1 Education

Combining a carefully sequenced curriculum organized around subject disciplines with external exit exams (Hirsch 2016; Woessmann 2016) is likely a good way to standardize a body of knowledge from which every student, including the wildest freethinker, can benefit without becoming too neutered. Beyond this framework, however, the radical uncertainty of the future means that we cannot predict what skills and knowledge future generations will require to thrive. As a case in point, while the performance of American pupils on internationally comparable tests is inferior to that of many European and Asian countries, the United States is universally considered the superior place for Ph.D. training. This ostensible paradox may arise because “the educational approaches that are most effective in providing mastery of the already extant body of intellectual materials actually tend to handicap a student’s ability to ‘think outside the box’ and thus discourage unorthodox ideas and breakthrough approaches and results” (Baumol 2005, p. 7). Fortunato (2017, p. 184) raises the point that standardized practices at every educational level risk yielding fragility. In his view, value differences and knowledge diversity are desirable in education precisely because they introduce instability; this helps the educational system become increasingly antifragile and able to cope with systemic shocks. While he considers imposing standards to elevate the lowest level of students “a noble goal,” he is wary of isolating and eschewing “those productive rebels who might simply see the world differently, question the current paradigm, and create situations that are, let’s face it, very hard to measure indeed.”

Nonetheless, Swedish empirical evidence suggests that it is possible to educate and train successful entrepreneurs with education and training that are practically oriented and centered on experiencing every stage of the entrepreneurial process, from birth to death (see, e.g., Elert et al. 2015). This accords well with Lerner’s (2009, p. 12) assessment that “ensuring that business and technology students are exposed to entrepreneurship classes will allow them to

make more informed decisions; and creating training opportunities in entrepreneurship for midcareer professionals is also likely to pay dividends.”

The essence of entrepreneurship is trial and error and learning from failure, hinting at the importance of education in fostering pupils’ positive attitude towards learning. To achieve this goal, it is important that the early stages of an educational career are characterized by positive learning experiences (Illeris 2006; Sanders et al. 2015) and that they instill a tolerance for failure and an appreciation of trial and error (Clifford 1984; Clifford et al. 1988; Metcalfe 2017). Primary and secondary education should therefore provide pupils with a solid and coherent knowledge base and promote initiative, creativity and a willingness to experiment.

Moreover, pupils and students should be challenged, not pleased; human capital of a mathematical and natural science orientation, for example, has been shown to be important for science-based entrepreneurship (Shavinina 2013; Dilli and Westerhuis 2018). Indeed, this type of entrepreneurship typically delivers the most scalable and growth-enhancing innovations, and the most successful entrepreneurs in the world tend to have advanced technical degrees from the most highly ranked universities (Henrekson and Sanandaji 2014).

While students should be infused with an entrepreneurial spirit early in life (Jayawarna et al. 2014), a great deal can still be done to make even students in tertiary education more entrepreneurial. Students typically make a crucial human capital decision at the end of secondary school when they decide whether to work or to pursue tertiary education. If their earlier education has been deficient, fewer students will be willing or able to choose more demanding lines of study, notably science and engineering. The demonstrated importance of engineering skills for entrepreneurship notwithstanding, more technically proficient graduates do not necessarily become more successful entrepreneurs. Nevertheless, universities can teach students entrepreneurial skills even when they are learning about other topics by making academic research and teaching more action-oriented and aimed at real-world experience; a mindset of trial and error and learning from failure is, after all, something all pupils should embrace (Sanders et al. 2020c). Moreover, to the extent that there are specific courses in entrepreneurship, they should be taught by people who have been involved in entrepreneurial venturing (rather than by tenured university lecturers and professors lacking hands-on experience, as is all too often the case; see, e.g., Sanders et al. 2020a).

4.6.2 University campuses

When discussing tertiary education, it is necessary to emphasize the importance of university campuses. Evidence shows that campuses can be hotbeds of entrepreneurial venturing

(Audretsch 2014), and some of Europe's campuses have already realized that potential, forming collaborative innovation blocs in their own right (e.g., Chalmers University of Technology in Gothenburg, Sweden: Jacob et al. 2003; Lindholm Dahlstrand 2007; Lundqvist 2014). Usually, creating such an environment requires that several university-level links function efficiently. Notably, for knowledge-based entrepreneurship to flourish, universities must have incentives to align subject areas with business sector demand and to facilitate knowledge transfer from academia to the entrepreneurial sector. The United States may serve as an important role model in this respect.

Universities should have the flexibility to respond to the needs of regional collaborative innovation blocs, where demanding customers serve as crucial sources of information regarding consumer needs and preferences (von Hippel et al. 2011). Here, academic entrepreneurs can demonstrate how to commercialize new knowledge and research. Furthermore, it is important to actively engage with societal partners outside of academia, such as corporations, governments, NGOs, and civil society organizations. Reaching out to such external stakeholders will expose students and staff to many opportunities for the useful application of new knowledge in social or commercial ventures.

There should be strong links between universities and external stakeholders that make it easy for universities to stimulate entrepreneurial initiatives and university spinoffs. The private sector perspective is often different from that of the university scientist, and with that divergence comes the creative synergies and dynamics that can result in the creation of new knowledge that benefits all parties (Leyden and Link 2015). There are already successful examples of such collaborations, bringing business to science and science to business (Jacob et al. 2003; Hommen et al. 2006; Castillo and Meyer 2018). Such joint efforts may be especially crucial in high-technology fields; for example, universities and their faculties have encouraged local economic development by improving the ability of new and incumbent firms to use biotech research (Okubo and Sjöberg 2000; Link and Swann 2016; Amoroso et al. 2018). Such examples hint at the potential to stimulate academic entrepreneurship and accelerate the commercialization of university-developed inventions of great potential value (Goldfarb and Henrekson 2003; Kauffman Foundation 2007; Link and Swann 2016; Amoroso et al. 2018).

4.6.3 R&D

Returning to the role that knowledge plays in an entrepreneurial society, we should note that scientific knowledge is a purely public good (Nelson 1959; Romer 1990; Salter and Martin 2001; Pavitt 1991) – channeling more money to basic research that provides positive knowledge

spillovers would therefore seem like a no-regrets policy. Nevertheless, it does not immediately follow that a policy of increased government spending on or subsidies to R&D will result in more economically valuable knowledge. Da Rin et al. (2006) examine 14 European countries between 1988 and 2001. They do not find any positive relationship between public R&D spending and the rate of innovation (defined as the share of high-tech and early-stage venture capital investments). In fact, public R&D may crowd out private R&D; the share of R&D in the business sector that is directly or indirectly funded by the government tends to be lower in countries with high R&D spending by business enterprises and higher in countries with low R&D spending by businesses (Elert et al. 2019a). Furthermore, R&D is an input in the production process; the desired output – higher value creation – depends on many more steps.

An institutional framework conducive to innovative entrepreneurial venturing will likely spontaneously increase R&D spending and, as a side effect, allocate it efficiently. Conversely, if a well-functioning ecosystem of collaborative innovation blocs is not already in place, a government pushes to increase R&D risks becoming a waste of resources, directing focus and resources towards factors that would have found better use elsewhere in the economy. Spontaneous, demand-driven increases in R&D expenditures should be preferred over any top-down designed alternatives, as it is next to impossible for a bureaucracy to “pick the winners.” Instead, society’s institutions should mobilize and incentivize the available resources to flow to their most productive use, including R&D.

5. Conclusion

A common perspective on how innovation comes about in modern economies is the R&D-centered story, which sees innovative activities as the result of systematic and purposeful efforts to create new knowledge by investing in R&D, followed by commercialization (Schot and Steinmueller 2018). The CIB perspective differs greatly from this linear, mechanical view. It takes note of a core distinction of Schumpeter’s, namely, the distinction between the creation and/or discovery of new knowledge, often in the form of an invention, and the *implementation* of that new knowledge in the economy. While basic science may be crucial for arriving at an invention – a new synthesis of existing or new technological components or a refinement of a previous combination of technologies (Fleming 2001) – the later innovative stage is what ultimately produces economic value for consumers. That stage has as much to do with R&D as with other innovative practices, such as learning by doing, networking, branding, and combinatorial insights (Bhidé 2008). Importantly, the innovation stage requires that the entrepreneur acts as a collaborator.

The CIB perspective helps elucidate this fact. We have demonstrated how successful entrepreneurship depends on an innovation bloc of this kind, a system of innovation that consists of six (stylized) pools of economic skills from which people are drawn or recruited to form part of a collaborative team, which is necessary if innovation-based venturing is to flourish. The six skill categories are entrepreneurs, inventors, early- and later-stage financiers, key personnel, and customers. We have demonstrated how the application of the CIB perspective helps make institutional analysis more concrete and relevant. Notably, the perspective facilitates the understanding of an innovation system and its weak points, thereby offering guidance for what kind of institutional framework can increase the economy's innovation potential.

Sometimes, the fragility of a phenomenon – say, an egg – is readily apparent. Fragility is even intended in the case of an electric fuse. “In contrast, hidden vulnerability is insidious and entails surprise” (Ansar et al. 2016, p. 66). Moreover, there are several dimensions of antifragility. (A system of) CIBs can be well positioned to deal with, say, a financial crisis but fragile to other shocks (Alderson and Doyle 2010), such as a global pandemic. A recent case in point is the 2020–21 Covid-19 pandemic. Obviously, this event had short-term negative economic repercussions for virtually all nodes in the global economic system, but the quality of countries' CIBs will largely determine whether they will continue to suffer or whether they will experience what Taleb (2012, p. 54–55) labels “posttraumatic growth,” a situation in which individuals or cities or countries harmed by past events surpass themselves.

Whereas a robust economy would simply be able to endure macroeconomic shocks, an antifragile economy should become stronger when exposed to macroeconomic fluctuations. If the economy is home to a multitude of CIBs, many of which are robust or antifragile, this supersystem will likely be antifragile. Some CIBs will inevitably suffer or fail when an economic shock occurs, but the overall system of CIBs should emerge chastened and stronger. Conversely, macroeconomic developments and regimes can impact an economy's overall antifragility indirectly through their effects at the meso level. Collaborations within a CIB can be more or less antifragile, and there is an inherent unpredictability to them. This is why the top-down steering of a CIB is likely to be doomed from the start.

CIB theory chiefly applies to the realm of mesoeconomics, i.e., an intermediate level between microeconomics and the fully aggregated level of macroeconomics (Dopfer et al. 2004). At this level, it is useful to describe a number of heuristics that, when taken together, make it possible to assess whether a CIB is well functioning or even antifragile. First, a core diagnostic to

determine whether a CIB or a sector is fragile is the way it is financed; equity trumps debt, in large part because skin in the game creates proper incentives. Diversity is also a necessary (though by no means sufficient) condition for the antifragility of CIBs, as it increases the likelihood that each skill pool contains enough competent actors with different experiences, backgrounds, and points of view. In fact, the public sector entrepreneurship literature argues that an efficient way for policy to further the transformation toward a more entrepreneurial environment is by increasing the effectiveness of social networks, that is, “the heterogeneity of experiential ties among economic units and the ability of those same economic units to exploit (i.e., to learn from) such diversity” (Leyden and Link 2015, p. 18). Closely tied to this issue is a CIB’s degree of centralization. A CIB with sufficient depth and breadth and a skill pool that encompasses a host of competent actors will be decentralized by necessity. This phenomenon adds antifragility because individual failures become less likely to propagate through the system. Instead, errors that spell disaster for the individual entrepreneur or collaborative team may convey valuable lessons to other actors that survive – volatility may thus provide answers regarding the viability of ideas and plans.

Another vital characteristic for the antifragility of a CIB is its scalability, i.e., the ability “to *effortlessly* transition back *and* forth from the very micro to the very macro *spatial, temporal, and relational* scales” (Ansar et al. 2016, p. 70). Faced with increasing demand, a CIB (and all its skill pools) must be able to scale up; conversely, the CIB must be able to scale down if demand falls so that critical skills and resources can be used elsewhere. Obviously, this is also crucial to the broader economy’s ability to weather a crisis.

To be sure, complete and pervasive antifragility on all societal levels is neither possible nor desirable. At the micro level, most business ideas will likely continue to fail, but the institutional structure should (i) ensure that the costs of such failures are not overly dire for the individual, (ii) ensure that the knowledge generated from failures is accessible to others, and (iii) help cultivate antifragile personalities and antifragile business strategies. This should help usher in more antifragile CIBs at the meso level. However, there will always be movement along the fragile–antifragile continuum, with new CIBs emerging and failing or emerging and becoming antifragile, whereas others will go from being antifragile to becoming robust or fragile. This continuous process produces antifragility at the macro level and the ability to withstand, or at least bounce back from, crises such as the one caused by the 2020 Covid-19 pandemic.

5.1 Limitations of the CIB perspective

For several reasons, evaluating and improving the workings of a collaborative innovation bloc are not easy. First, we should note that more collaboration is not a panacea. Whether positive superadditive effects will materialize in a CIB depends on who is collaborating and to what degree. It has been shown theoretically that when the concentration of interaction is too low, a system will not generate novelty (McKelvey 1999). Conversely, too much interdependency pushes a system into a complexity catastrophe characterized by little adaptation. Instead, truly novel behavior occurs on the verge of order and disorder, that is, on “the edge of chaos”, to use a term popularized by Lewin (1999).

Moreover, we should note that the CIB perspective harbors (as well as that of the spontaneous market order more generally) a tension between the nonteleological nature of such an order (the order has no purpose, only its participants do) and the act of evaluating a collaborative innovation bloc according to some criterion.¹⁷ When we consider the spontaneous market order’s ability to achieve innovation and prosperity, we are not exempt from the in-depth critique of such attempts made by Buchanan and Vanberg (1991).

Second, it is not apparent which evaluation criterion to choose or how to adequately measure it. That this issue exists for a system whose primary problem is one of knowledge coordination should come as no surprise: By its very nature, tacit knowledge is impossible to write down or measure with anything remotely akin to a quantifiable statistic. As Bhidé (2008, p. 25) notes, the core technical contribution of VC-backed businesses is often not “patentable” because what was not “obvious” about the combinatorial know-how was difficult to codify.

Third, and importantly, while identifying institutional bottlenecks is useful, removing them is a very different matter. In the case of the Silicon Valley VC reforms discussed in section 4, politicians did not undertake the changes to promote a skill cluster such as Silicon Valley; that no one foresaw the serendipitous consequences is not surprising, given the complexities of the collaborations taking place in an innovation bloc. An actor with in-depth knowledge of the workings of an innovation bloc may, of course, engage in institutional entrepreneurship, e.g., by lobbying for regulatory changes. However, such activity is often costly and thereby

¹⁷ The cost of foregone innovations due to regulatory obstacles is often high but is always shrouded in uncertainty because it concerns something that, in Frédéric Bastiat’s (2007 [1850]) words, is “not seen.” Calculating the commercial potential of innovations in light of the existing uncertainty has never been an easy task (Verspagen 2007, p. 487). Thierer (2016, p. 13) provides a striking example: until the early 1990s, commercial use of the Internet was *de facto* prohibited: “[T]hose who imposed restrictions on commercial use of the Internet probably were simply unable to imagine the enormous benefits that would be generated by allowing it to become an open platform for social and commercial innovation. Regardless, the opportunity costs of those prohibitions were enormous.”

effectively unavailable to new and small firms. Hence, it is often undertaken by large corporations attempting to shape government regulations to be favorable to themselves and detrimental to current and prospective competitors, not to create a flourishing CIB.

Certainly, some forms of “top-down” change may emanate from public policy initiatives that use private-sector entrepreneurship as a source of ideas on how to create an economic environment conducive to value-enhancing activities in the face of uncertainty (Link and Link 2009; Leyden and Link 2015). However, the CIB perspective teaches us that no specific agent inside or outside of the innovation bloc is in charge; no one “owns it” or understands more than a fraction of its inner workings. While the entrepreneur is the main actor who creates and expands the business by identifying and exploiting new ideas, the success of these ideas depends crucially on an array of other actors/functions whose complementary skills and inputs are necessary to create and use productive knowledge.

The broader discussion of entrepreneurial ecosystems emphasizes the same point (Autio 2016), with the implication that no actor necessarily feels responsible for ascertaining the efficient functioning of the ecosystem. The very lack of ownership of collaborative blocs means that no chain of command can be applied, which is a central reason why top-down “command-and-control” approaches should be undertaken with restraint.¹⁸

5.2 Future research

Future studies could move in several directions. Importantly, while it is informative to examine thriving CIB ecologies such as Silicon Valley, much can be learned by also identifying CIBs that had the potential to become antifragile but never did so. Why was that? Which actors were missing? What facets of the institutional setup were most important in preventing the emergence of an antifragile CIB? Additionally, in instances when a CIB went from being antifragile to fragile, what were the reasons for this development? Such questions are probably best answered by conducting case studies or comparative studies focusing on different industries within a country or similar industries in different countries. As a next step, researchers should ask whether and to what extent the findings related to successful CIBs embedded in a specific context (e.g., Silicon Valley in California) can be used to guide policy in other contexts. Taking institutional arguments seriously means acknowledging that

¹⁸ This phenomenon was observed by Adam Smith (1966 [1759], p. 342–343), who warns against succumbing to the temptation of thinking like a “man of the system” who believes he can “arrange the different members of a great society with as much ease as the hand arranges the different pieces upon a chess-board.”

institutional complementarities exist and that more than one institutional constellation can enable entrepreneurship and antifragility (Hall and Soskice 2001).

Moreover, microlevel fragility is not necessarily harmful for a system, but individuals and firms in a CIB can behave in more or less antifragile ways. Markey-Towler (2018) develops the idea of antifragile knowledge and the psychological attributes necessary to benefit from radical uncertainty. In sum, a person's knowledge of the world is antifragile if it grows when black swan events occur (Taleb 2007). People with antifragile personalities thus use their imagination to adapt to changing environments and to be agents of change. Other researchers have developed an antifragile approach for firms, described as "a step-by-step, non-deterministic methodology that can be used as a replacement for, or as a complement to, the causally focused approach of scenario planning" (Derbyshire and Wright 2014; cf. Barnett and Dunbar 2008; Sarasvathy 2008). Arguably, the likelihood that a collaborative team will be antifragile depends to some extent on the antifragility of the skill pools from which actors are drawn.

Examining the six actor categories in more detail, how their behavior relates to antifragility and whether this behavior differs across regions would be a useful exercise. For example, while managers are a crucial type of key personnel for a firm to reach a mature stage, they are sometimes cut from a different mold than entrepreneurs; in large firms, managers often overprotect their organizations, essentially shielding them from volatility, thereby risking both longer-term development and adaptation for the sake of short-term stability (Pech and Oakley 2005). This fact may explain why many large firms struggle and eventually fail (Gans 2016). Resisting such impulses by ensuring that managers also behave as entrepreneurially as possible could lead to antifragility.

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