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The Institutional Environment for U.S. Economic Innovation

by

Charles Eesley
Lijie Zhou

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Stanford University
John A. and Cynthia Fry Gunn Building
366 Galvez Street | Stanford, CA | 94305-6015

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Abstract

The institutional environment allows innovators and entrepreneurs to take calculated economic risks. In the U.S, innovation originates from education and research, while competition is made possible by a cluster of laws and financial regulatory institutions. Creative education, innovative research, legal institutions and financial regulations function together to enable a highly dynamic and innovative economy. We first give a brief introduction of the relationship between innovation, entrepreneurship and institutions. We examine the entrepreneurial environment, including barriers to entry, to growth and to failure. Next, we discuss educational institutions that nurture innovation and entrepreneurship. Education innovation (collaborative knowledge building, flexibility, improvisation and action-learning) and innovative research (government funding for R&D, the tenure system and technology transfer) play an important role in encouraging entrepreneurship. Third, we discuss the legal environment for the U.S innovation system, including patent law, an independent judiciary and contract enforcement, financial regulation and antitrust law. Finally, we review related research on national innovation systems and draw a comparison observing the differences between Chinese and U.S. institutions related to innovation and entrepreneurship.

Keywords: US Economic Innovation, entrepreneurial environment, growth, financial regulation, Chinese and U.S. institutions

JEL Classification No.: L26, N20, M13, N25

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*Charles Eesley, Assistant Professor Department of Management Science & Engineering, Stanford University Lijie Zhou, Master's student in Instructional Technology, San Francisco State University

What analogy best encapsulates the most effective role of government in fostering a highly innovative economy? For policymakers seeking to create the environment for innovation and entrepreneurship, the analogy they should have at the front of their minds is that they are essentially hoping for a good dinner party. Yet, with so many elements in a good dinner party, which should the hosts focus on? The food? The music?

The key role for the host (the government policymakers in this case) is to set the table, but then to step back and let the guests enjoy the meal. Setting the table is equivalent to setting up the rules of the game. In order for the party of innovation and entrepreneurship to flourish, the government needs to set up a variety of policies that allow the chefs and guests to come and have an entertaining and innovative dinner party. You can think of the raw food as the basic science and fundamental university R&D that the government (in part) funds. University scientists and engineers are the chefs that invent and create the dishes. The government's other role is to invite and educate the guests in terms of what behavior is expected and permitted at this type of dinner party. This is equivalent to the university funding (in part) the education system. You can think of the dishes, plates, silverware and cups as the various policies that ensure healthy market competition. Cups might be financial regulations (keeping everyone liquid and hydrated). Napkins might be the bankruptcy laws. Silverware might be the patent system, antitrust laws, an independent judiciary and so on. These elements keep the competition fair and on a level playing field for all participants.

This chapter focuses on the mechanism for innovation and the regulatory environment in the U.S. for innovation and entrepreneurship. The main message is that innovation in the U.S. economy is driven by market competition and the threat of competition from new startup entrants. Innovation originates from education and research while competition is made possible by a cluster of laws and financial regulatory institutions. Thus, creative education, innovative research, legal institution and financial regulations function together to enable a highly dynamic and innovative economy.

The flow of this chapter is as follows. First, we give a brief introduction of institutions, innovation and entrepreneurship. Then we take a closer look at entrepreneurial environment, including the barriers to entry, to growth and to failure. Second, we discuss institutional support of innovative education and research. More specifically, we analyze that collaborative knowledge building, flexibility, improvisation and action-learning play a key role in education innovation. Whereas government funding for R&D, tenure system and technology transfer are vital for innovative research. Third, we draw on financial and legal institutions including patent law, antitrust law, an independent judiciary and contract enforcement that work towards a competitive environment for entrepreneurship and innovation. Finally, we briefly review related research of American national innovation system and draw a comparison between China and U.S. institutions supportive of innovation and entrepreneurship.

1 Introduction: Innovation, Entrepreneurship and Institution

1-1 Innovation and Entrepreneurship

Most scholars accept that entrepreneurial firms are more likely to introduce radical innovations (products and processes) than are large incumbents, and there is a large literature that reports on the innovation capacity of small compared with large firms. One research line focuses on the relationship between the company's size or age and its innovation capacity. The "incumbent's curse" (Chandy and Tellis) is a common perception in the field of innovation. Huergo and Jaumandreu (2003) examine the impact of firm age on innovation (as reflected in productivity growth). Using plant level productivity data, they find that "newborn firms tend to show higher rates of productivity growth which tend to converge to common growth rates". Balasubramanian and Lee (2008) draw similar conclusion based on the data on patents of public firms: their findings show that firm age is negatively related to technical quality; each additional year reduces the impact of a 10% increase in R&D intensity on the firms' market value by over 3%.

Another research line focuses on the interplay between entry by new, more productive firms, on the one hand, and innovations and productivity improvements by existing firms, on the other. Evidence suggests that this interplay is important for productivity growth. Bartelsman and Doms (2000) document that the entry of new establishments/plants accounts for about 25% of average total factor productivity (TFP) growth (which is thought to be mainly due to innovation) at the industry level, with the remaining productivity improvements accounted for by incumbent establishments. Aghion, Redding, Burgess and Zilibotti (2005) examine how firms respond to the threat of competition from new entrants. Their findings show that technologically advanced firms and those located in regions with pro-business institutions are more likely to respond to the threat of entry by investing in new technologies and production processes. This further leads to improved productivity within the whole industry.

Based on past research, we can conclude that entrepreneurial firms are important both because they tend to create radical new innovations themselves, and also because the competitive pressure they introduce forces incumbents to innovate. That is why we cannot talk about innovation without talking about policies to encourage the emergence of innovative entrepreneurial firms.

Chandy and Tellis (2000) point out that U.S. innovators are expected to differ from the non-US, radical innovators found in Japan and Western Europe. Specifically, small firms or non-incumbents are more likely to promote radical innovations that emerge in the United States. There are several factors that contribute to this phenomenon; for example, US popular culture celebrates the risk-taker; succeeding after a series of failures tend to enhance the glory of the U.S. entrepreneur. But Chandy and Tellis argue that the role of financial institutions is important in encouraging radical innovations among less-well-established firms in the US compared to similar firms in Japan and Western Europe. Saxenian (1994) also argues that the United States has a more

active venture capital market, which makes financing for less-established firms easier to obtain in the US than in many other countries.

Acemoglu, Akcigit, Bloom, and Kerr (2013) determine that industrial policy that subsidizes either the R&D or the continued operation of incumbents reduces growth and welfare. For example, a subsidy to incumbent firms' R&D equivalent to 5% of GDP reduces welfare by about 1.5% because it deters the entry of new and more innovative startups. By contrast, substantial improvements are possible if the continued operation of incumbents is taxed while, simultaneously; R&D by incumbents and new entrants is subsidized. They further argue that subsidies to incumbents encourage the survival and expansion of these firms at the expense of potential high-tech entrants and suggest that optimal policy should encourage the exit of low-tech firms and support R&D by high-tech incumbents and new entrants.

State and corporate-driven innovation is rarely the case in U.S. and thus not the focus of this chapter. Yet, it has been attempted in Japan and Western Europe in the past. Fitzroy and Kraft (1991) find that government policies in Japan and Western Europe have traditionally favored technological innovation by large, established firms over small firms. Large incumbents in these countries enjoy financial and technological support that is unavailable to similar firms in the United States (Magaziner and Patinkin 1989). Similarly, Chandy and Tellis (2000) reexamine the "incumbent's curse" using a historical analysis of a relatively large number of radical innovations. Their findings suggest that the "incumbent's curse" is less prevalent in recent times and, increasingly, incumbents are introducing more radical new products. One important reason may be that such firms have organizational climates that resemble those of small firms. The implication of their studies is that policymakers may encourage the dynamic organizational structure and strong technological capability required to keep large, incumbent organizations nimble and innovative. A state and corporate-driven model may fit more closely with the current institutional context in China. Nonetheless, it still requires a strong, market-based institutional environment that allows entry of entrepreneurial firms, protection of intellectual property, an independent judicial system and contract enforcement. The state and corporate-driven model has a poor track record of success historically relative to the U.S. Silicon Valley model.

1-2 Innovation and Institutions

The fundamental mechanism driving innovation in the U.S. is competition in the market. Over time, competition drives prices down and excess profits towards zero, causing firms to need to innovate to differentiate their products from competitors and to offer new products and services that do not suffer (initially) from competition from other firms. The overarching model of the process of innovation is referred to as the linear model. Vannevar Bush, after the conclusion of World War II, is known for bringing the language of the linear model to the forefront of America's science and technology policy. The linear model states that innovation begins with basic research, often in universities and government labs designed to create fundamental inventions and breakthroughs. This knowledge gained from basic R&D is then developed further via applied

R&D (typically within companies) and once sufficiently developed is commercialized as products and services in the market. A relatively recent new model of the innovation process is known as user innovation. User innovation highlights the fact that many innovations are actually first developed by users before being picked up by companies who then improve on the users' designs and manufacture the product. The US has a long history of independent inventors and entrepreneurs (Dahlin, Taylor and Fichman, 2004). The legal environment that supports innovation must foster these processes – market competition, the linear model of basic to applied R&D, and user innovation by independent inventors and entrepreneurs.

Institutions matter for innovation, but which institutions matter more? It is clear from work in institutional economics that the level of innovative activity is affected by the surrounding institutions (Licht, Siegel 2006, Busenitz, Gomez, Spencer 2000). Institutions can help alter the structure of incentives in a society to direct self-interested behavior towards more or less economically productive activities (Baumol 1990, Nee 1996). New opportunities open up as emerging economies undertake the shift from redistributive bureaucracy to open markets (Nee 1996). The environment for entrepreneurship along with differences in technological opportunities, the characteristics of economic spillovers between universities and private firms, along with cultural factors can impact the level of entrepreneurial activity.

1-3 Entrepreneurship and Institutions

Only relatively recently has entrepreneurship come to the attention of policymakers and become a topic of policy debate. Much of this shift in emphasis can be attributed to the Internet boom in the Silicon Valley of the late 1990s. Before this, U.S. entrepreneurs were seen as needing neither official financial support nor specially designed regulation. Subsequently, opinions changed. Entrepreneurs needed to be regulated and restrained since they might disturb competitive equilibrium or harm consumers through low quality products; and they needed to be offered financial support through such programs as those administered by the Small Business Administration since they were often capital constrained (Audretsch & Thurik, 2001). Yet, with the technology boom in Silicon Valley and elsewhere, entrepreneurship came to be seen as closely linked to economic growth and as a driver of innovation and productivity improvements (Hwang & Powell, 2005; Acs & Audretsch, 1988; David, 1990; Oliner & Sichel, 2000).

The replacement of old firms by new, more efficient and productive ones was found to be more important for the dynamism of the economy and for growth than were the improvement and upgrading of existing firms (Foster, Haltiwanger, & Syverson, 2005; Carree & Thurik, 2005). In particular, policymakers became more interested in entrepreneurship due to its impact on increasing employment (Haltiwanger, Jarmin, & Miranda, 2010). Yet, it is important to note that most of this increase in employment comes through *young* firms (startups) rather than through *small* firms (small and medium enterprises) and government policy often confuses this important distinction.

The conventional wisdom now is that entrepreneurship is highly important; it is tightly linked to innovation, yet the risks involved lead to lower levels of entrepreneurship than are

socially optimal and therefore it merits encouragement from policies. Around the world, policymakers now seek to reduce the barriers, costs and steps necessary to start new firms. Examples are easy to find and include Startup Chile, Startup America, the Jobs Act in the US, Skolkovo in Russia, Gründerland Deutschland in Germany, and Vinova in Sweden. Many of these programs have two assumptions in common: first, that more entrepreneurship is better; and second, that subsidizing and simplifying the start-up of firms is the best way to foster entrepreneurship. Recent research casts serious doubt, however, on these driving assumptions of many globally observed policies for entrepreneurship. Furthermore, my own work and that of others suggests that there may be alternative policy measures that are more effective.

Recent scholarship casts doubt on the effectiveness of many government efforts to foster entrepreneurship in the US (Haltiwanger, Jarmin, & Miranda, 2012; Reedy & Strom, 2012) and in Europe (Fritsch, Kritikos, & Rusakova, 2012). Even more disheartening, some evidence suggests that efforts to support entrepreneurship may actually result in poorly performing ventures (Shane, 2009; Nanda, 2010).

2 Entrepreneurial Environment

2-1 Barriers to Entry

What many of these government efforts have in common is the (misguided) notion that the only way to spur more entrepreneurship is to lower the barriers to entry. Two notable barriers to entry are the (plethora of) steps necessary to register a business and the initial capital requirements. The World Bank evaluates the potential for entrepreneurship in countries around the world by the number of steps necessary to establish and register a firm. A study of the procedures required for firms to obtain licenses and permits before operating across European countries found that the greater the number of steps to officially register the business, the lower the rate of entrepreneurship (Klapper, Laevena, & Rajan, 2006).

There are also good reasons to expect that entrepreneurs are capital constrained and that raising sufficient funding to get started is an important barrier to entry as well. For example, wealthy individuals are consistently found to be more likely to found firms (Holtz-Eakin, Joulfaian, & Rosen, 1994). This expectation has led many governments to attempt to spur entrepreneurship by providing funding to entrepreneurs directly or by subsidizing venture capital. Many of these programs have failed for various reasons (Lerner, 2010). Recent work that more carefully evaluates the influence of financial constraints on founding rates (using a policy reform in Denmark), determined that lowering the financial burden of starting a firm does increase entrepreneurship rates. However, individuals who were encouraged to found firms as a result of lowering this entry barrier were also significantly more likely to shut down their firms soon after getting started. Moreover, wealthy individuals who were most likely to found firms because they lack constraints on initial capital, were also more likely to found businesses that fail to survive and grow. Thus, lowering barriers to entry may increase the "churn" of new business creation, but it

often increases failure and the exit of these new businesses as well.

2-2 Barriers to Growth

In this section, I outline some of my own research on entrepreneurship and innovation, where I (the lead author) focus on the influence of the external environment on entrepreneurship. Specifically, I investigate the types of environments that encourage the founding of high growth, technology-based firms. In the past few years, I have repeatedly studied entrepreneurship in China and the U.S., from which I see two incompatible innovation models - the Silicon Valley style of entrepreneurial innovation, which is supported by the policies outlined above, and the state and corporate-led innovation model, which might conform more to the current institutional environment in China. My findings demonstrate that institutions matter and effective institutional change influences who starts firms, not just how many firms are started. My own work suggests a new framework in which, as well as barriers to entry, we should also consider barriers to growth for new firms. In addition, my research calls into question the dogma that more entrepreneurship is always better. Using data from a survey of Tsinghua alumni, I find that lowering barriers to entry appears to increase entrepreneurship, but among less talented, "lower-human-capital" individuals, resulting in lower quality and low growth firms. However, lowering barriers to growth increases entrepreneurship among more highly talented, and more highly educated individuals who are more likely to innovate and to create high growth firms. Thus, policymakers must be attentive to which type of entrepreneurship their policies are stimulating – more small businesses versus more high growth, innovative startups. This is an important distinction and one that merits further investigation.

What are barriers to growth? Barriers to growth are elements in the formal, regulatory policies or in the culture of a society that inhibit entrepreneurs from expanding their businesses into quickly growing, profitable, successful large firms. Many people mistakenly believe that the creation of a startup is the goal. A startup is meant to be a temporary organization. Once the startup firm has demonstrated a profitable, scalable new business model, the goal of the organization is to scale up as rapidly as possible and to become a large, established firm. In our enthusiasm over startups and entrepreneurship, we often focus on the first part, neglecting the vitally important role of the latter phases of the complete process. A plethora of barriers get in the way of successfully turning a startup into a successful large, established firm. Let's examine a few examples.

The first barrier to growth is an un-level playing field for competition between established incumbents and startups. Anti-trust laws were established in the US several decades ago in order to limit the power of large monopolistic firms to obstruct competition from new entrants. In many economies, large incumbents capture the regulatory process through campaign contributions or outright corruption and bribery. They use their influence with regulators and policymakers to erect regulations that either amount to barriers to entry or barriers to growth for startups. During the beginning stages of the commercial Internet in the US, the Federal Communications Commission (FCC) was at the heart of one such battle. Large telecommunications companies owned the phone lines and other infrastructure behind the nascent Internet. These incumbents wanted to profit from

the emerging Internet industry by charging internet service providers (ISPs) and other fledgling startups to use their phone lines to transmit data. However, at the time, the FCC wisely recognized that such charges would effectively tax the nascent Internet startups and resisted pressure to allow incumbent telecommunications companies to charge fees that would have been a barrier to growth for the startup companies that drove the Internet boom. Even today, we see similar battles playing out where the incumbent hotel industry seeks regulation to limit the competitive threat from startups like Airbnb. Similarly, in many developing economies business groups and state-owned enterprises represent powerful economic actors who may be able to stake out advantaged competitive positions and inhibit the growth of startup firms and their emergence as a competitive threat, even if they cannot prevent their entry in the first place.

For most startup firms, success is defined as being acquired by a larger company or completing an initial public offering (IPO). Thus, some of the most important barriers to growth may be the laws regulating mergers and acquisitions and IPOs. If these regulations create undue burdens or constrain such liquidity events for entrepreneurs and their investors, the effect is to inhibit the growth of startups and creating a chilling effect on the entire entrepreneurship ecosystem.

But the effects of IPO reforms can be subtle and complex so caution is warranted. In a recent analysis of IPO reform in Japan, a student and I analyzed over 16,000 startup firms over a ten-year period both before and after the reform. We found that reducing the requirements to make IPOs easier had an unanticipated effect of concentrating investment in the technology sector and reducing overall returns and growth in that sector due to overinvestment (Eberhart, Eesley and Eisenhardt, 2014). This occurred despite the larger number of IPOs that were enabled after the reform. Nonetheless, we must recognize that IPOs are important opportunities for entrepreneurs and investors to turn their private stock holdings into tradable public securities. IPOs also represent an important source of growth capital for young firms. Indeed, prior work finds that regions where there was greater IPO activity for biotechnology ventures in the US, subsequently saw greater startup activity due to the resources and funding available after the IPO to investors and new entrepreneurs.

To the extent that lack of skills or skilled labor represents a barrier to growth for firms, universities have an important role to play in fostering firm growth as well. One of the growth strategies for startups is to pursue innovation via research and development to produce new products or to manufacture existing products more cheaply, enabling growth. Thus, science and technology policies play a role in supporting high growth startups. In Silicon Valley, many firms have difficulties growing due to the challenges in finding and recruiting engineers and technical talent to expand the firm. The situation is even worse, and often extends to managerial talent, in other parts of the country.

In China, a doctoral student working with me has been examining the impact of Project 985, a university reform meant to increase the innovation capacity and quality of technological research and education in Chinese universities. We expected that students attending the Project 985 universities would be exposed to new technologies and would be more likely to create high-tech startups. The results bore out this result and we found graduates from 985 universities

were more likely to start innovative firms and to express a belief in the importance of innovation and intellectual property (IP). However, unexpectedly, we found that the financial performance of these firms was significantly lower when compared with less innovative startups and to firms started by non-985 university graduates. We believe part of the explanation is that there are other institutional barriers to growth in the environment (lack of IP protection, lack of entrepreneurship education, lack of early-stage capital, and competition from state-owned enterprises) that create difficulties for the commercialization of innovations. A final role for universities in lowering barriers to growth may be in educating future entrepreneurs and providing them with the human capital that has been shown to be integrally associated with higher growth firms.

2-3 Barriers to Failure

Bankruptcy laws and other "barriers to failure" represent a third pillar of policies that are important for high growth, innovative entrepreneurship. Bankruptcy law is important because the most likely outcome for a new entrepreneur is that his or her firm will go out of business. Countries vary in the protection offered to investors compared with entrepreneurs during the bankruptcy process. Many creditors (investors) argue that they need a greater ability to recover their resources in the event of a bankruptcy. Without such protections, they would need to raise interest rates (investment returns), which could inhibit entrepreneurship due to the higher cost of capital. Yet, a talented (and wealthy) individual who is contemplating founding a risky, but potentially high growth, venture is likely to be deterred if a bankruptcy event could result in the loss of a significant share of his or her personal wealth.

Personal liability protection was introduced in a bankruptcy reform that coauthors and I studied in Japan. We found that a reform to the bankruptcy laws to make them more "entrepreneur friendly" had the effect of increasing bankruptcies in the country. However, it also resulted in more entrepreneurship among more highly educated individuals. Due to the entry of this higher quality group of entrepreneurs, startup growth rates increased as a result of the reform, meaning that the performance of the average startup firm was better (Eberhart, Eesley and Eisenhardt, 2014b). Thus, lowering the barriers to failure is important in order to allow under-performing firms to fail and to enable highly talented individuals to take the risk of entrepreneurship because such individuals tend to start more innovative and higher growth firms.

In conclusion, potential entrepreneurs, especially highly talented individuals with many career options look carefully at the outcomes of friends and former colleagues who chose to go down the entrepreneurial path. When those efforts fail or when those entrepreneurs struggle to grow their firms, this can create a deterrent in the minds of these potential entrepreneurs, and cause them to choose the safer path of working in established companies or in the government and academia. Yet, when barriers to entry, growth and failure are low, then potential entrepreneurs are more likely to see their friends and former colleagues enjoying success as entrepreneurs and growing wealthy in the process. This creates confidence and optimism in the minds of potential entrepreneurs, often leading them to try entrepreneurship since they also might succeed beyond their wildest dreams.

3 Education Innovation

The entrepreneurial environment is shaped by a variety of institutions, among which educational institution plays a key role in the formation of innovative ideas. It has been widely acknowledge that a core input to innovation is knowledge and accordingly the key task for education is to prepare learners for innovative thinking (OECD, 2000). In recent years, the burgeoning entrepreneurial centers, courses and programs in universities attach greater importance to entrepreneurial education. Thus, we start with a discussion of educational institutions that nurture innovation and entrepreneurship.

3-1 Collaborative Knowledge building

Innovation is not a result of individual inventions but more often of collaborative creation by teams of people working together. Scholars have discovered that the most important innovative insights typically come from collaborative teams (Farrell, 2001; John-Steiner, 2000; Sawyer, 2003). That is partly a result of the complexity in society, where the most pressing problems (e.g., poverty, pollution etc.) and unmet user needs are often out of the capacity of any individual. Empirical study shows that even single firms frequently innovate with some form of outside help (OECD, 2000). For example, innovative ideas occur during teamwork or brainstorming. Companies often collaboratively create ideas and coordinate them into a single product. Customers and suppliers interact with companies to support such innovation.

Educational institutions that facilitate collaborative knowledge building may take on various forms. They can be implemented through certain centers, programs, workshops classes and clubs. For example, at the Massachusetts Institute of Technology (MIT), the MIT Entrepreneurship Center is headed by faculty in the MIT Sloan School of Management, yet works to establish collaboration with four other schools of MIT. Such interdisciplinary collaboration is especially essential to connect those business students who have market innovations with the science and technology students who have advanced technical ideas.

3-2 Flexibility and Improvisation

Institutional flexibility in education promotes individual interests, independent thinking and entrepreneurial intentions, which are crucial for innovation. Flexibility is defined as the characteristics of institutions to permit choices. Universities provide a wide range of resources and permit various course selections to promote institutional flexibility. Besides, the emerging online courses implement the traditional education system and promote flexibility by providing more course choices. NovoEd, Coursera and Udacity are examples of massive open online course (MOOC) platforms that provide various courses for people around the world.

Flexibility in course selection promotes innovation and entrepreneurship for three main reasons. First, this flexibility helps students explore their interests in multidisciplinary studies and recombine knowledge to form innovative ideas. Second, exposure to a variety of courses fosters

the habit of questioning underlying assumptions, which is crucial for unfolding alternative possibilities. Finally, giving choices to students implies confidence in their decision-making, which builds self-efficacy in students and further inspires them to pursue their entrepreneurial intentions and action (Chen et al., 1998; Yang et al., 2014).

Flexibility in the education system may also be extended from course selection to course design, in which improvisation plays a key role for innovation. Research has demonstrated that unstructured group discussion or improvisation tends to promote group creativity and better understanding (Sawyer & Berson, 2004). Unstructured improvisation leads to constructive learning for understanding, rather than memorization for facts (Bransford et al., 2000). Constructive learning lays the foundation for innovation and entrepreneurship. The U.S. has implemented improvisational exercises with teachers on several professional development programs (Sawyer, 2006).

3-3 Action-learning

Action learning is a combination of collaboration and improvisation. More specifically, action learning is "continued process of learning and reflection with the support of a group of colleagues working on real issues" (McGill and Brockband 2003). By that definition, action learning shares similarities with "learning by doing", but differs from the later in that action learning is a social process characterized by recognized ignorance. In other words, team members recognize that no one knows the answer but are all obliged to find it, therefore starting to learn with each other (Pedler 2011). Action learning may also be regarded as a special form of learning by doing, or "learning by posing fresh questions" (Pedler 2011) rather than copying existing knowledge. That is often the case in entrepreneurship, where the surrounding situation is unknown and uncertain to all members.

Education systems promote mastery of received knowledge, but also support exploration of the unknown (Baumol, 2004). Action-learning methods have been popular in U.S business schools. For example, MIT implemented a "Mixed-Team Project" class, where students from all departments ranging from management to science and engineering organize in teams to deal with real-world problems in entrepreneurial organizations (Roberts and Eesley 2011). "Entrepreneurship Laboratory", or E-Lab is the earliest mixed-team "action-learning" project in MIT. Students select from the problems presented by early-stage companies and work on "a problem that keeps the CEO up late at night" (Roberts and Eesley 2011). For a whole semester, the team is devoted to working on the selected issue. While in class, students communicate with the management team, work on project analysis, client relationships, market research, and share reports of ongoing progress with each other. In the process of action learning, the problems are new to everyone and solutions come out as co-construction of all team members.

4 Innovative Research

4-1 Government Funding for R&D

David and Hall (2000) divide up the mechanisms flowing from public to private R&D according to three dimensions. First, they note that there are direct and indirect effects of public R&D. Direct effects include shifts in the demand and supply of tangible inputs used in the R&D process (scientists, engineers, and research tools). Indirect effects involve the intangible results of the R&D process. The indirect effects stem from the knowledge generated as a result of public R&D and the effects that knowledge has on the expected costs of privately funded R&D. Broadly, these are the "knowledge spillovers" that have spawned a large literature. To avoid crowding out private R&D funding, government funds should focus on basic science and fundamental R&D. Basic science is the type of R&D in which companies are most likely to under-invest.[1]

The second dimension is the mechanism through which public R&D expenditures are disbursed. When grant R&D is given, at least in the U.S. practice, it is typically for more exploratory research to university labs or national institutes. At the other end of the spectrum is contract R&D that is often given to private firms or government labs and is typically for a more defined mission of one of the public agencies (Department of Energy, Department of Defense, etc.). Contract R&D, in the sense that it transfers funds from the government to private firms, relaxes financial constraints on firms, however, the government may not act in the same way or with the same expertise that profit-seeking financial intermediaries might be expected to operate. Thus, contract-based R&D, unlike grant-based R&D is more likely to result in wasting funds on bad projects and in crowding out private investment.

Third, the effects of public R&D expenditures may be felt in different ways according to different lags. For example, contemporaneous effects of increased public R&D funding may be to increase the demand for scientists (or other research inputs) in a certain specialty, increasing their salaries and labor costs to private firms (Goolsbee 1998). The short-term effect could be for private firms to react to higher labor costs by decreasing the number of scientists hired. However, with a longer lag, supply will catch up with the increased demand and salaries may fall, particularly if public demand subsequently decreases or shifts to new areas. In addition, the knowledge generated by these scientists may (with a lag) increase the productivity of more applied private R&D, resulting in private R&D funding increases. David and Hall (2000) walk through several examples of the complex interactions between short-run and more dynamic effects along the three dimensions. For instance, public R&D could also be interpreted by firms as a signal of future demand, resulting in contemporaneous increases in private R&D to build absorptive

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[1] The direct and indirect effects are not mutually exclusive. For instance, knowledge spillovers will have an influence on the prices of inputs into the research process and new knowledge can become embedded in research tools.

capacity and to take advantage of future demand (Cohen and Levinthal, 1990). The overall message is a cautionary one on the net impacts and whether public R&D is likely to stimulate or crowd out private R&D funding. Nonetheless, the analysis supports the idea that if complementary effects are to be found, they would be more likely in grant-based R&D and with a considerable lag. Contract-based public R&D funding for specific technologies or industries (i.e. "picking winners") is often a very poor choice, should be reserved for use only when it is clearly in the national interest and is more likely to result in overcapacity, wasted funds and to crowd-out private R&D investment.

4-2 Tenure System

Created by contract and implemented by institutional regulations (Byrne 1989), the tenure system defends academic freedom (Brown and Kurland 1990) and therefore propels innovative research. Brewster (1972) describes tenure as "a guarantee of appointment until retirement age". Van Alstyne (1971) proposes that tenure only prevents "dismissal without adequate cause" after a specified lengthy period of probationary service. During six years as a junior faculty member, an assistant professor usually works to meet the criteria for the granting of tenure. Among the key criteria are success in publishing research findings in journals judged by academic peers and ability to teach undergraduate and graduate students. In top research universities, the criteria are heavily weighted towards research publications and teaching loads are typically light, with junior faculty teaching 2-3 courses and permitted to "stack" these courses into a single semester to enable greater time to focus on research the rest of the year. Committee work is also kept to a minimum.

Although the efficiency remains disputable in some aspects, the tenure system promotes academic freedom and independent thinking. The 1940 Statement of Association of American Colleges (AAUP 1984) proclaim that tenure is a "means to certain ends" (AAUP 1984), which specifically promotes (1) a sufficient degree of economic security and (2) the freedom of teaching and research. First, as a social contract (Bowen and Schuster 1986), tenure provides lifelong employment so that faculty can get on with their work without much interference. Secondly, the tenure system is essential to innovative. Carmichael (1988) argues, "without tenure, incumbents would never be willing to hire people who might turn out to be better than themselves". Thirdly, even after getting tenure, the academic training in the previous years and intrinsic interest in research will keep motivating an associate or full professor. In sum, the assurance of economic stability, the mechanism of dynamic renewal and long-term incentives result in academic freedom. Freedom of thinking is the foundation of innovative research.

4-3 Technology Transfer

Technology transfer helps describe the bond between innovative research and high-tech startups. It also partly explains the success of some companies (e.g., Google) that build close ties with research universities. The mechanism of technology transfer is based on the interaction of research and industry. On one hand, university research is sometimes, though not always, motivated by a practical or scientifically challenging problem of industry. Chemical engineering,

for example, originated from the problems that puzzle early petroleum industry. On the other hand, industry benefits from the achievement of scientific research. Through faculty consulting or industrial affiliate programs, research results find their way to commercial application.

Institutions that promote technology transfer play a key role in bridging the gap between scientific research and commercial products. For example, the current MIT Technology Licensing Office website describes its mission as "to benefit the public by moving results of MIT research into societal use via technology licensing, through a process which is consistent with academic principles, demonstrates a concern for the welfare of students and faculty, and conforms to the highest ethical standards". Similarly, Stanford's Office of Technology Licensing (OTL) outlines several proposals of best practices related to technology transfer as follows (Eesley and Miller, 2012):

- Keep the technology transfer process close to the faculty.
- Transfer new technology to as many companies as possible.
- Negotiate agreements with long-term relationships in mind.
- Improve access to information for staff and inventors to expedite technology transfer.
- Encourage collaboration with other institutions by minimizing use of material transfer agreements (MTAs).
- Manage the licensing process to lessen potential conflicts of interest.
- Facilitate the licensing of Stanford engineering inventions to high-tech companies.
- Assist other nonprofit organizations with licensing

Institutions that facilitate technology transfer create an entrepreneurial ecosystem, which enables the flow of knowledge from research to industry. Technology transfer begins with an invention that may have commercial impact and an invention disclosure with Technology Licensing Office. For the inventions that are both patentable and commercial potential, the office will judge the optimal route to commercialization. Basically, the decision between licensing to an existing firm and a startup is grounded in both the characteristics of technology and inclination of inventors. In the case of licensing, information is circulated and personal interaction is involved during the process. This can take the form of a corporate lab visit, faculty consulting or hiring graduate candidates. In the case of a startup, initial funding and mentoring is crucial for success. Universities may support these startups with equity investment and faculty or alumni entrepreneurs may provide assistance in mentoring.

5 Financial Regulations

This section focuses on financial regulations and entrepreneurship. Specifically, it examines: first, the venture capital industry in the U.S. and how it affects innovation and entrepreneurship in a positive way; and second, reform of the U.S. banking sector and its impact on entrepreneurship and innovation.

The earliest use of venture capital dates back to the formation of American Research and Development in 1946. Venture capital is considered as equity or equity-linked investments in

young, privately held companies, where the investors are financial intermediaries that are typically active as directors, advisors, or even as managers of the firms. During 1946 to 1977, more venture funds were established but the flow of money into new venture funds during that period never exceeded a few hundred million dollars annually and usually was much less (Lerner, 2000). A large flow of funds entered the venture capital industry during the late 1970s and early 1980s due to the 1979 pension reform. In 1979, an amendment to the "prudent man" rule by the Department of Labor allowed pension managers to invest in high-risk assets, including venture capital, which sparked a rise in the venture capital industry.

Both empirical and theoretical literature shows that venture capital relates positively to innovation. Lerner and Kortum (2000) examine the influence of venture capital relative to corporate R&D on patented inventions in the United States across twenty industries over three decades. They find that increases in venture capital activity in an industry are associated with significantly higher patenting rates. They further argue that their estimates suggest that venture capital may have accounted for 8 percent of industry innovation during 1983 to 1992 despite accounting for only 3 percent of R&D funding.

If the relationship between venture capital and innovation is positive and significant, then it is a natural to ask: what are the sources of venture capitalists' advantages in funding these innovations? Is it the ex ante strategy prior to financing; or is it mainly due to the subsequent monitoring and control? Hellmann and Puri (2000) use the dataset of Silicon Valley startup companies to explore the role of venture capital financing. They examine two major questions: 1) the interrelationship of the ex ante strategy and the type of financing; 2) the interrelationship of the type of financing and the subsequent product market outcome. Their findings show that venture capitalists are more likely to invest in firms that pursue the strategy of innovator rather than imitator; their findings also show that obtaining venture capital is associated with faster time to market, especially for innovators.

Chemmanur, Krishnan and Nandy (2011) also study the efficiency gains generated by venture capital investment in private companies. Their findings show that the efficiency of VC-backed companies is higher than that of non-VC-backed companies; this efficiency advantage of VC-backed firms arises from both screening and monitoring. Also, the efficiency gains generated by VC backing arise primarily from improvement in product market performance (sales); however, for high reputation VCs the additional efficiency gains arise from both an additional improvement in product market performance as well as from reductions in various input costs. Finally, both the level of efficiency of VC-backed firms prior to receiving financing and the growth in efficiency subsequent to VC financing positively affect the probability of a successful exit (IPO or acquisition).

Many countries and policy makers are trying to boost the venture capital industry in their countries, but these efforts frequently disappoint, as they tend to focus on features that international investors, rather than local entrepreneurs or domestic sources of capital, regard as the most important. A body of academic work has established that there is a home bias for investors, i.e. investors are more comfortable investing in their home country than around the world. But Lerner (2009) also points to two factors that should persuade policy makers to avoid relying only

on domestic investors: 1) the relative size of the market; 2) the greater sophistication of global investors. He then suggests two ways for policy makers to attract foreign investors: limited liability and tax flow-through. First, the "limited" in "limited partnership" refers to the fact that outside investors can lose no more money than the amount they contribute to a fund, a protection that gives investors much more comfort in making high-risk investments. Second, tax flow-through is of great importance to tax-exempt institutions, which make up much of the pool of venture investors.

Besides the positive correlation between venture capital and entrepreneurship, a large literature also finds a positive relation between financial development and entrepreneurship. A well-established belief is that more efficient financial sectors facilitate better allocation of capital across investment opportunities (Pang and Wu, 2008).

Do changes in financing constraints for startups impact their entry size, rates and growth? Evans and Jovanovic (1989) predict that financing constraints should impact both the intensive margin of entry (i.e., the initial sizes of startups) and the extensive margin (i.e., the number of new firms); Cabral and Mata (2003) argue that the evolution of the firm size distribution is driven more by startup financing constraints that by subsequent competition and selection among entrants. Kerr and Nanda (2009) use data from the U.S. Census Bureau to examine entry sizes before and after U.S. branch banking deregulations. Their findings show that entrepreneurship grew substantially after the deregulation of inter-state banking. They argue that entrepreneurship requires many failures on the path to great success, which makes democratizing entry so important for the well-functioning financial market. Cetorellia and Strahan (2003)'s finding is based on the banking deregulation in European Union (EU). European Union (EU) countries have experienced significant deregulation affecting the banking industry since 1993. By removing substantial barriers to entry (cross-border expansions were heavily constrained prior to 1993), the new legislation aimed at generating significant improvements in the competitive conditions of financial markets. Their findings suggest that market power gives banks an implicit equity stake in those firms that they have long relationship with. This evidence is consistent with the idea that banks with market power erect an important financial barrier to entry to the detriment of the entrepreneurial firms in the economy, probably to protect the profitability of their existing clients. Thus, a more competitive banking sector that is open to market forces, results in a healthier financing environment and relaxes financial constraints on startup firms.

Jayaratne and Strahan (1996) provide evidence that the financial market can affect economic growth in other markets by studying the relaxation of the bank-branch restriction in the United States starting from the 1970s. They find that the rates of real, per-capita growth in income and output increased significantly following instate branch reform. The authors further argue that the observed faster growth reflects causality flowing from financial sector reform to improved growth performance.

6 Legal Institutions

6-1 Patent Law

The patent system is at the heart of the policies of the United States toward technological innovation. The United States patent law states that: *The Congress shall have power… To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.* In the U.S., a patent is a right to exclude others from making, using, selling, or offering for sale in exchange for disclosure of the invention.

The patent system promotes innovation through the granting of limited monopolies in selling new products and processes. In research-intensive industries that require long-term and continuous investment on innovation, firms generally do not prefer to rely on trade secret protection when patent protection is possible. The effects of the patent system were reported to be very substantial in certain research-intensive industries. Mansfield (1986) points out that over 80 percent of the patentable inventions are patented in the pharmaceutical and chemical industries. Yet, Mansfield's study, based on data obtained from a random sample of one hundred U.S. manufacturing firms, indicates that the effect of the patent system seems to be very small in such industries as electrical equipment, instruments, motor vehicle, rubber, and the like. Even though 60 percent of the patentable inventions seemed to be patented based on the data from these industries, those patents are frequently said to be relatively unimportant.

Although competition may suffer when we grant a monopoly right to an inventor, more recent research shows that it will benefit if this right facilitates entry into the industry by new and innovative firms. Cockburn and MacGarvie (2006) find evidence that firms holding patents are more likely to enter software markets. Evidence on exit and survival is consistent with these findings - holding patents appears to enhance the survival prospects of firms after entering a market (Cockburn, MacGavie, 2006).

The patent system may promote knowledge sharing by requiring the detail of an invention to be put in the public domain in return for granting the inventor exclusive right to exploit. Without the patent system, inventors need to keep the research a secret, which may cause a waste of time and money due to repeated work. Cohen, Nelson and Walsh (2000) also find that for the protection of product and process innovations, secrecy now appears to be much more heavily employed across most industries than previously.

Current research focuses on ideas for how to adjust the details of the implementation of the patent system. Besides economic benefits, the patent system helps to generate significant social profits by maximizing the possibility of recouping investments in research. Ridley, Grabowski and Moe (2006) proposed a "priority-review voucher" as an incentive to drug companies to develop therapies for neglected diseases. As a financial incentive, the awarded transferable voucher would entitle the bearer to priority Food and Drug Administration (FDA) review for another drug (or possibly multiple drugs) and orphan drug tax credits. Their study finds that the voucher would

speed access to highly valued treatments and thus benefits consumers in both developing and developed countries at relatively low cost to the taxpayer.

Although innovation will benefit from the incentive created by a patent, it may suffer if patents discourage the combining and recombining of inventions to make new products and processes (Scotchmer 1991; Heller and Eisenberg 1998). Scotchmer (1991) examines the effect of patent law on cumulative innovations (those that build on prior inventions). She argues that the challenge is for policy makers to figure out how to reward early inventors fully for the technical foundation they provide to later inventors, and how to reward the later inventors adequately for their improvements and new products as well. Merges and Nelson (1990) attempt to draw lessons regarding appropriate patent scope. They argue that in many industries the efficiency gains from the pioneer's ability to coordinate are likely to be outweighed by the loss of competition for improvements to the basic invention. They call, in particular, for policy makers to pay attention to two serious problems involving patent scope: pioneer patents, and the doctrines of enablement and equivalents. The potentially harmful effects of a pioneer patent on subsequent cumulative innovation could be mitigated if the Patent Office paid closer attention to what the inventor actually disclosed in his specification as an indicator of what the inventor actually achieved.

Recent studies show that the patent system may have more negative effects on small/medium-sized enterprises. Lerner (1995) suggests that patent litigation is especially burdensome for small firms with less access to finance, conceivably undermining their contributions to technical innovation. The potential risks, such as infringement lawsuits, may be very expensive for startups if claim needs to be pursued. This may also cause the inventors to apply for the patent before the invention is well developed, which may inhibit research by discouraging knowledge sharing.

6-2 Antitrust Law

Theories of industrial organization typically predict that competition increases innovation to some extent; however, when competition becomes extremely intense, it limits the cash firms have available to invest in R&D and starts to diminish innovation. Recent research finds evidence to support this conjecture. Aghion, Bloom, Griffith and Howitt (2005) investigate the relationship between product market competition and innovation. Their findings show that the competition-innovation relationship takes the form of an inverted-U shape. In their model, competition may increase the incremental profit from innovating, but it can also reduce innovation incentives for laggards; the balance between these two effects changes between low and high levels of competition, generating an inverted-U relationship. If competition is too low, then firms lack the incentive to innovate, yet if competition is extremely high, the cash flows needed to invest in future R&D are not available. In the U.S railroad industry, three policy regimes--public capitalization, pro-cartel, and antitrust law -- have considered A good example to examine how policy shapes competition is the early railroad foundings in Massachusetts in the U.S. Dobbin and Dowd (1997) examined the effects of three policy options on markets and competition and argue that analyses of Massachusetts railroad foundings between 1825 and 1922 establish that: 1) public

capitalization raises the number of foundings by increasing available resources; 2) pro-cartel policies raised the number of foundings by dampening price competition between incumbents; and 3) anti-trust depressed foundings by stimulating price competition.

These results demonstrate the important and nuanced effects of public policy on competition. They also demonstrate that simply looking for higher founding rates should not be the goal of public policy. While pro-cartel policies and an absence of anti-trust policies clearly improved founding rates, the result was higher prices for consumers, lower social welfare, less competition, and likely less innovation. Although competition can enhance innovation, in such high fixed cost, low marginal cost industries as railroads, it can also discourage further entry. Another example that demonstrates the effects of public policy on competition is the role of incumbents in the market. When incumbent firms are too heavily shielded from competition by a close relationship with the state, this is likely to depress entrepreneurial foundings or, at least, make them more likely to fail once they enter the market. In the case of China, where state-owned enterprises are so dominant and backed by the state-owned banks, this finding should remind policy makers to reconsider the question: Is the competition between entrepreneurial firms and state-owned enterprises balanced? If not, how could innovation flourish without competitive pressure? Is the competition mainly dominated by the market or by the government? Competition among small companies and the incumbent, which is backed up by the government, is not real competition, even though the market may appear to be competitive.

The close relationship between market incumbents and local government officials is in part, a problem rooted in poor political governance. As a result, Yasheng Huang (2008) argues that the single biggest obstacle to sustainable growth and financial stability in China today is its poor political governance. In order to distance government officials from incumbent firms and generate true competition in the market, China faces some of its toughest economic challenges and substantial vulnerabilities that require fundamental institutional and political reforms to encourage the development of entrepreneurial firms. China requires fundamental institutional reforms to encourage the development of entrepreneurial firms. The pressure generated by competition in the entrepreneurial economy will cause market participants to innovate.

6-3 Independent judiciary and contract enforcement

In the U.S., there are complex legal contracts between firms and its employees, stakeholders, partners and others. These deals enable entrepreneurs and their startups to enter into potentially lucrative markets at the early stage when they have very limited resources. Many nations are trying to duplicate the key parts of the American system, but skeptics might argue that the legal system, including those aspects that enforce contracts that are important to the U.S. may be less important in other nations. In fact, the importance of the legal system and contract enforcement has been shown to be the foundation for the financing and growth of entrepreneurial ventures, in both developed and developing countries.

There is a large literature on the relationship between a country's legal system and the development and liquidity of its financial market. In one study, La Porta, Lopez-de-Silanes,

Shleifer and Vishny (1997) collect data from 49 countries and find evidence that countries with poorer investor protections, measured by both the character of legal rules and the quality of law enforcement, have smaller and narrower capital markets. More specifically, the effects are felt in both the debt and equity markets. The authors further point out that French civil law countries have both the weakest investor protections and the least developed capital markets, especially as compared to common law countries.

Glaeser, Johnson and Shleifer (2001) compare the regulation of financial markets in Poland and the Czech Republic in the 1990s. They find that in Poland strict enforcement of the securities law by a highly motivated regulator was associated with a rapidly developing stock market. By contrast, the hands-off regulation in the Czech Republic was associated with a stagnant stock market.

Djankov, La Porta, Lopez-de-Silanes and Shleifer (2003) use data from 109 countries to measure and describe the exact procedures used by litigants and courts to evict a tenant for non-payment of rent and to collect a bounced check. They use these data to construct an index of "procedural formalism" of dispute resolution for each country. They find that such formalism is greater in civil law countries than common law countries. They further argue that "procedural formalism" is associated with a higher expected duration of judicial proceedings; more corruption; less consistency, honesty and fairness in judicial decisions; and inferior access to justice.

We also see repeated evidence showing that entrepreneurs and investors in countries with well-defined legal rules and effective court enforcement rely on these complex contracts. A good example would be convertible preferred stock, where the investor can choose either to get back the amount of that he or she invested, or alternatively to convert into common stock. After analyzing 210 developing country private equity investments, Lerner and Schoar (2003) find that transactions vary with the nation's enforcement. Investors in high enforcement and common law nations often use convertible preferred stock with covenants. However, in low enforcement and civil law nations, private equity groups tend to use common stock and debt, and rely on equity and board control. Their findings also show that transactions in high enforcement countries have higher valuations and returns. Lerner and Scholar (2003) further argue for the importance of the ability of entrepreneurs and investors to enter into complex contracts, where different outcomes can result if the company's progress varies.

Lerner (2009) also finds that private equity funds that were active in nations with well-operating legal systems had an average return multiple (the ratio of the amount out of their returns to the amount they invest) 19 percent better than the typical fund established in that subclass and that year, while those in other countries had a multiple 49 percent worse than the benchmark.

In another study of the private equity context, Kaplan and Strömberg (2003) identify a number of benefits to investors and entrepreneurs from being able to separate cash flow and control rights, typically through the use of convertible preferred stock. They study 213 VC investments in 119 portfolio companies by 14 VC firms and find that VC financing allows VCs to separately allocate cash flow rights, board rights, voting rights, liquidation rights, and other control rights. In general, board rights, voting right and liquidation rights are allocated so that if the

company performs poorly the VC obtains full control. As performance improves, the entrepreneur retains more control. If the firm performs very well, the VCs retain their cash flow rights, but relinquish most of their control and liquidation rights.

In general, there is enough evidence to believe that the legal structure and contract enforcement are important: this is a structure used not only in the U.S.; we see supporting evidence from both developing countries and developed countries. Also, the evidence suggests that these structures matter both to entrepreneurs and the groups that fund them.

7 National Innovation System

7-1 Framework

The essential framework for a system that promotes national innovation draws on three distinct areas of prior research: ideas-driven endogenous growth theory (Romer, 1990), the cluster-based theory of national industrial competitive advantage (Porter, 1990), and the theory of national innovation systems (Nelson, 1993). Research on national innovation systems focuses on describing the organizations and patterns of activity that contribute to innovative behavior in specific countries. As this research seems likely to be of most relevance to readers of this book, this section mainly concerns itself with results from such research.

The literature on national innovation systems emphasizes the active role played by government policy and specific institutions. Mowery compares the development of industrial research in Great Britain and United States during 1900 to 1950. His findings show that firm structure was not the sole factor influencing the low level of industrial research in Britain. Several other factors contributed to the delay of the managerial revolution in British industry: a weak antitrust policy, government rationalization policies, a lack of involvement of financial institutions and operatives in the internal management and reorganization of British firms, and persistent family control of British firms. He further emphasized the importance of policy factors by indicating the fact that from 1940 to 1960, as the structure of the British firm and manufacturing sector changed, the level of industrial research activity rose, but remained below the American level. Mowery's findings in the changing structure of the US national innovation system indicates that the innovation system that emerged in the postwar US economy now is undergoing change, which is characterized by:

- lower levels of overall federal R&D funding;
- proportionately lower levels of investment in 'R', as opposed to 'D';
- greater internationalization, in terms of both US R&D investment in foreign economies and non-US R&D investment within the domestic US economy.

Recent studies shows that over the final two decades of the 20th century, a number of formerly industrializing economies and historical imitator countries achieved levels of innovative capacity commensurate with or greater than those of some economies that were historically more innovative. Furman and Hayes (2004) investigate the factors that enabled those emerging

innovator economies to achieve successful catch-up in innovative productivity. Their finding suggests that continuously increasing investments in innovation is, ultimately, essential for achieving innovative leadership.

Different countries have systems that work in different ways, and they also face different challenges. There is no single standard applicable to all countries. What policy makers need to know is that continuously increasing investments in innovation is, ultimately, essential for achieving innovative leadership. Furthermore, the interaction between universities, large firms, entrepreneurial firms, the market and governments as a system for innovation is the key factor that determines the specific pattern for leadership innovation in their economies.

7-2 Implementation

Policies for innovation and entrepreneurship will be unsuccessful unless they are implemented properly. Like the elements of a good dinner party (a well prepared table, food, music and guests), these policies often work better together, in concert, than they do alone. Even the best-intentioned policies can fail if the details of how the policy is to be implemented and executed are neglected.

Silicon Valley style, high-tech entrepreneurship exists within a very special policy and cultural environment that fosters the belief that the small startup, through innovation and hustle can outcompete the large incumbent and win the market. In other societies, due to entrenched interests, business groups and/or state-owned enterprises, nascent entrepreneurs often confront almost insurmountable obstacles as they endeavor to grow and win the market. In these cases, the typical prescription offered by academics and others is a set of reforms (similar to those suggested above) to level the playing field and lower the barriers for entrepreneurs. The advice is to try to make the legal and policy environment more similar to that of the US and Silicon Valley in particular. However, implementation of these wide-ranging reforms may be infeasible in some societies or may take many years in others. Entrenched incumbents and well-connected special interests may block such attempts at reform because that is easier than competing in the market against startup entrepreneurs. Many emerging economies, China included, have challenges with passing laws that then go unenforced. Reforms such as anti-trust laws, contract enforcement, intellectual property protection and others require a well-functioning, independent judicial system.

An alternative may be to develop a different model or national system of innovation that focuses more on corporate entrepreneurship and innovation within the large, established incumbent company. Note, however, that this is not the Silicon Valley model of innovation in which the competitive threat from innovative startup firms spurs innovation by large and small companies. However, corporate entrepreneurship models that may be viewed as a viable alternative when the implementation of reforms to level the playing field between incumbents and startups is infeasible are relatively unproven and where they have been attempted, there is little evidence of their success in generating innovation.

Innovation and entrepreneurship within established firms is a more challenging model for generating economy-wide innovation. Not only must the innovators and internal entrepreneurs

within the company fight the typical startup battle to develop technology, recruit a team and to find paying customers, usually they must also fight a second war within the company. The second front is the battle against the bureaucracy and politics in the established company itself. Internal entrepreneurs and innovators must navigate complex company internal politics to acquire the resources and approvals necessary. Typical compensation arrangements and metrics for tracking execution against plans in established divisions within the company often apply less well in the context of a nascent innovation or new venture. Thus, the corporate entrepreneurship and innovation model requires a high level of skill and training on the part of managers within the company. In this model there is still a role for independent entrepreneurs, but they must be trained to look for opportunities in brand new industries, where breakthrough technologies allow them to develop new markets where there are no established incumbents. Such is the situation that occurred in China with the early Internet firms such as Sohu.com and Alibaba. In the model developed by Gompers and Scharfstein (2005) this is the low external entrepreneurship equilibrium, where most innovation projects take place within the company via internal hires and "intrapreneurship". When the government is heavily involved as well, then the innovators and entrepreneurs must fight a battle across three fronts, in the market, internal to the firm, and then a third front with government bureaucracy. This model is far less proven, it is not the Silicon Valley model of innovation, and thus is not recommended as a path to a more innovative economy.

8 Comparison and Conclusion

8-1 Comparison

The U.S. institutional environment promotes innovation and entrepreneurship by reducing undesirable risks or "demand uncertainties" (Wu and Knott, 2006). Entrepreneurs are risk-averse when it comes to uncertainty in market demand but risk-taking with respect to uncertainty around their abilities (Wu et al., 2006). Thus, it is important for the institutions to set up a level playing field, where the outcome of entrepreneurship is more of a meritocracy up to entrepreneurial abilities and less of an arbitrary decision of government officials that is difficult to anticipate. Particularly, institutions should remove the "undesirable uncertainties" so that entrepreneurs can focus more on the technological uncertainties, which promote innovation, rather than on the political uncertainties, which might lead to corruption and bribery. However, reducing risks by no means indicates that government should take all the risks. If entrepreneurship comes with no risk of failure, companies have no incentive to find creative and efficient approaches for survival.

The major role of institutions is to set the rules to reduce political risks rather than protect companies from risks of entrepreneurship. The "rules of the game" that are explicitly stated and rigidly implemented result in a predictable risk-reward tradeoff and therefore incentivize entrepreneurship. On one hand, a high value potential payoff is the incentive for entrepreneurship (Lippman and Rumelt, 1982). On the other hand, "entrepreneur friendly" bankruptcy laws lower the barriers to exist and the loss of failure is shared with all stakeholders in the market.

China's context for innovation and entrepreneurship appears familiar and yet still foreign from a Western perspective. On one hand, the burgeoning grassroots entrepreneurship in China shares surprising similarity with Silicon Valley entrepreneurship (Niu, 2013; Zhang, 2013). On the other hand, regulatory institutions and effective enforcement is not fully developed to allow unhindered innovation and entrepreneurship. The current business environment in China makes it extremely difficult for firms to innovate because they must simultaneously contend with market competition as well as navigating the political uncertainties created by the excessive interference in the market by government officials. In this sense, China's institutional environment enables entrepreneurship to flourish but also prevents entrepreneurship from reaching its full potential.

As depicted in the second section, barriers to growth and barriers to failure are lowered in a competitive market in the US. Whereas in China, unsteady expectation of a level playing field for competition in entrepreneurship and poorly functioning exist mechanism hinder potential innovation and entrepreneurship. According to our discussions in this chapter, the differences can be drawn from four aspects, namely education, research, finance and law.

Education and research produce internal sources of innovation. In the U.S, great emphasis has been put on collaborative knowledge building, flexibility and action-learning. While in China, exam-oriented education still imposes restrictions on innovation. Similarly, in the U.S., innovative research is supported by government funding in R&D, the tenure system and the technology transfer mechanism. Whereas in China, research suffers from a lack of attraction to overseas talent, an uncertain tenure system and high teaching loads at many universities. Financial and legal institutions provide external support of innovation. Contrary to the boost in venture capital, financial institutions in China exert excessive access control of private capital. And legal institutions in China fail to provide adequate intellectual property protection, incentivizing imitation rather than innovation.

8-2 Conclusion

China is at a crossroads. Great progress has been made towards innovation and entrepreneurship, yet moving up the value chain from a manufacturing and export driven economy to a science and technology driven economy is still challenging. First, institutional regulations and supports remain to be strengthened for further development of innovation and entrepreneurship. First, institutional regulations must be restructured to reduce the high uncertainty stemming from political risks. Creating and enforcing the institutions outlined in this chapter can accomplish this and provide the level playing field and predictable "rules of the game" that enable individuals to engage in entrepreneurship. If this is allowed to occur then all types of firms will feel the competitive pressure to innovate and become more secure in the rewards from taking such market-based risks.

Second, industrial policy balance between private entrepreneurs, state-owned enterprises and foreign-invested firms needs to be taken into consideration for a level playing field. Third, emphasis on domestic consumption growth must be balanced with attention to the less-developed regions. Since the Open Door policy in 1978, the overall trend of economic reform that has driven

impressive economic growth has been to decentralize economic decision-making. Will the same trend continue in the coming years with the institutional environment that supports entrepreneurial innovation?

Huang (2009) discusses capitalism with Chinese characteristics and points out the differences and policy reversals between entrepreneurial, market-driven rural China and the state-investment led urban China. As I mentioned in the beginning of this section, the market-driven model and the state and corporate-led model are two incompatible innovation models and policymakers must decide which direction they will promote in the years ahead. Examples of successful corporate or state-investment-led innovation model are extremely rare in historical experience. They lack the market competition and incentive to take calculated economic risks to spur innovation. The Silicon Valley model of driving innovation via entrepreneurship remains the "gold-standard" that is the envy of the world.

Finally, the Chinese growth path has reached a point at which the road forks. The existing economic system is an awkward merger of the corporate-innovation or state-led innovation model with a few elements of the Silicon-Valley-style model based on innovative technology and individual entrepreneurship; the latter option is encouraged through rhetoric, science parks, and other policies. However, to nurture innovation going forward, policymakers must choose between these two conflicting models of innovation. Silicon Valley style high-tech, high growth entrepreneurship could be fostered via the reforms outlined above. In contrast, a more state and corporate-driven internal entrepreneurship and innovation model might also have appeal for China's leaders.

In conclusion, the emergence of Silicon Valley-style entrepreneurial innovation requires a specific set of institutional reforms outlined in this chapter. The institutions we have discussed here are based not only on the extensive research literature that we have summarized, but also form the basis of the success of the Silicon Valley ecosystem in practice. The good news is that once implemented, this institutional environment fosters innovation without the need for heavy involvement of the government. Policymakers need only to set the table in the right ways, creating a level playing field that supports risk-taking by entrepreneurs and innovation will follow.

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