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Institutions and Innovation

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Abstract

Technological innovation is critical to a country's economic development and a firm's long-term success. This article reviews the recent literature that links institutions and innovation. Specifically, we focus on five aspects of the linkage. First, we discuss the literature that explores how the culture of a society or a corporation influences the process, features, and outcomes of innovation activities. Second, we review papers that focus on the role of demographic characteristics in innovation. Third, we describe studies examining the relation between market development and firms' incentives as well as their ability to engage in innovative investments. Fourth, we discuss the literature on how innovation is shaped by a nation's laws and policies. Finally, we review the academic papers regarding the effects of government regulations and policies on innovation activities. Overall, this article aims to provide a synthetic and evaluative review of recent academic research that links various aspects of institutions and innovation. We also provide our views on potential directions for future research in this area.

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1. INTRODUCTION

In this article, we attempt to review the recent literature on institutions and technological innovation. It is well understood by academics, regulators, and practitioners that innovation is critical to a country's economic development (Schumpeter 1911, Solow 1957, Romer 1986) and a firm's long-term success (Porter 1992). Due to the recent availability of high-quality patent and citation data that capture a country's and/or a firm's innovation output, there has been a fast-growing strand of literature in finance that explores various determinants and consequences of corporate innovation. For example, Ederer & Manso (2011) review academic studies that explore the motivation of innovation from an optimal contracting point of view; Hall & Lerner (2010) and Kerr & Nanda (2015) review the literature on the financing of research and development (R&D) investment and innovation outcomes; and He & Tian (2018) provide a comprehensive survey of the literature that links finance and innovation.¹ Unlike these review articles, ours focuses on a specific determinant of innovation activities, namely institutions, which have been the central subject of study in a wide spectrum of disciplines, such as economics, finance, management, law, and public policy. Specifically, we examine whether and how social and corporate culture, demographic characteristics, market development, laws, and regulations and policies encourage or discourage innovation activities.

To get a better idea of the development of the literature on institutions and innovation, we reviewed all of the relevant academic papers published in the top five economics journals [i.e., *American Economic Review* (*AER*), *Econometrica* (*ECTA*), *Journal of Political Economy*, *Quarterly Journal of Economics*, and *Review of Economic Studies*], top three finance journals [i.e., *Journal of Finance*, *Journal of Financial Economics* (*JFE*), and *Review of Financial Studies* (*RFS*)], top three accounting journals [i.e., *Accounting Review* (*TAR*), *Journal of Accounting and Economics* (*JAE*), and *Journal of Accounting Research* (*JAR*)], and a top general management journal [i.e., *Management Science* (*MS*)] in the past 20 years (i.e., 2000–2019). We first read all of the papers to ensure that they study technological innovation. Then we removed the papers that are unrelated to institutions.² We ended up with a total of 72 such publications between 2000 and 2019.³

Figure 1 shows a fast-growing trend in the number of published papers on institutions and innovation in the above set of journals. For example, 12 such papers were published in these journals between 2000 and 2009. This number, however, soars to 60 (about five times as many) in the second half of the sample period, between 2010 and 2019. This dramatic increase in publication volume could be due to the fact that high-quality patent and citation databases became available to researchers during the last decade.

Figure 2 depicts the distribution of such publications across the journals. It appears that *AER* is the leading journal, publishing the most such papers in this area (17 papers), followed by *JFE* (16 papers), *MS* (13 papers), and *RFS* (10 papers). Only two such papers were published in an accounting journal (*JAE*), and several journals, such as *ECTA*, *JAR*, and *TAR*, published none at all. These observations suggest that economics and finance journals (as opposed to accounting ones) are the main outlets for publications on institutions and innovation.

¹The *Review of Financial Studies* published a special issue on entrepreneurial finance and innovation in 2014. In its leading article, Chemmanur & Fulghieri (2014) discuss the importance of research on entrepreneurial finance and innovation and point out a few new research questions in this area.

²We define institutions along the following five dimensions: culture, demographic characteristics, market development, laws, and regulations and policies.

³This searching process is simply meant to illustrate the development of the literature. This review, however, describes important papers on institutions and innovation that have been published in other academic journals and other time periods as well as those that are still unpublished.

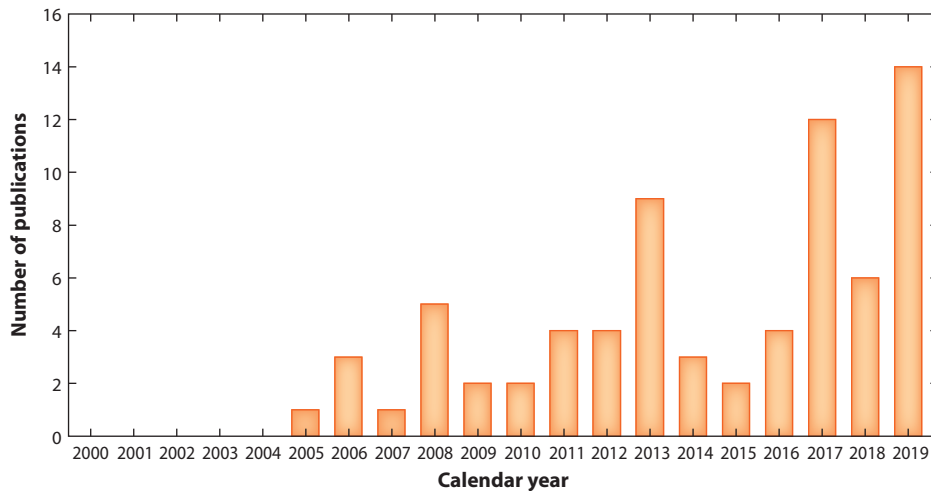


Figure 1

Time-series distribution of publications on institutions and innovation between 2000 and 2019.

Given the increasing importance and popularity of academic research on institutions and innovation, we survey both published papers in top journals and unpublished working papers that have been presented at high-quality academic conferences in this area over the past decade. The remainder of this review consists of six sections. Section 2 discusses the literature that explores how the culture of a society or a corporation influences the process, features, and outcomes of innovation activities. Section 3 reviews papers that focus on the role of a geographical area’s or a firm’s demographic characteristics in innovation. Section 4 covers studies examining the relation between market development and firms’ incentives as well as their abilities to engage in innovative investments. Sections 5 and 6 analyze the literature on how innovation is shaped by a nation’s laws and government policies, respectively. Section 7 discusses potential directions for future research and concludes.

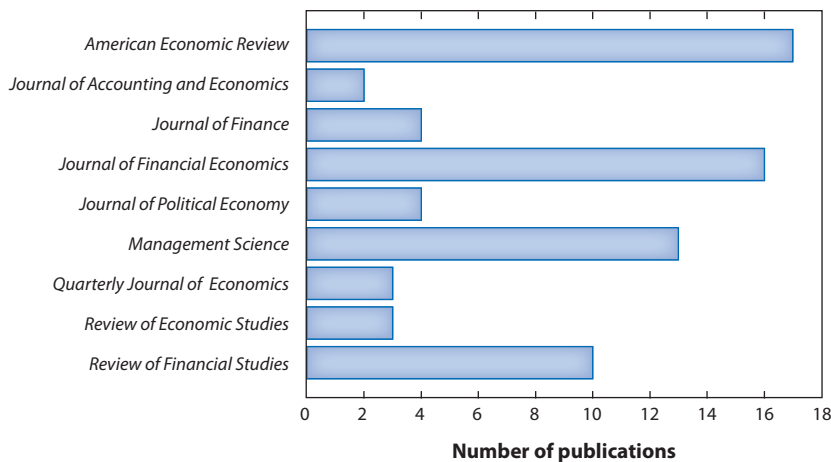


Figure 2

Distribution of papers on institutions and innovation across top journals between 2000 and 2019.

2. CULTURE

In this section we review the institutions and innovation literature that examines how the culture of a country, local community, or firm affects people's general attitudes toward innovation, as well as the motivation for and efficiency of conducting innovative activities. Because innovation is a long-term, risky, and opaque process that requires an adventurous spirit, patience, and perseverance, the cultural backgrounds of important players in the innovation process, such as inventors, managers, employees, investors, or even policy makers, as well as the social norms and ideologies underlying these people's mindsets about innovation, will play a vital role in shaping the processes and outcomes of innovative activities. This literature also explores the determinants of an innovation-friendly corporate culture and the implications of individual inventors' childhood experiences and ethnic backgrounds for their future innovation behaviors.

Using a panel of poor relief and social unrest data from 39 English counties over the period between 1650 and 1830, Greif & Iyigun (2012) find that England's premodern social institutions, namely the Old Poor Law, helped the country transition to the modern economy by reducing violent, innovation-blocking reactions from people worried about economic changes. They conclude that social institutions help mitigate the threat of violent social responses to labor-saving innovations.

Bénabou, Ticchi & Vindigni (2015) examine how religion affects innovation. Specifically, they relate 11 indicators of individual openness to innovation (e.g., attitudes toward science and technology, new versus old ideas, general change, personal risk taking and agency, imagination and independence in children) to five measures of religiosity, including beliefs and attendance at church. Using five waves of the World Values Survey and controlling for sociodemographics as well as country and year fixed effects, they find that greater religiosity is associated with less favorable views toward innovation.

Inclusive institutions, that is, institutions that provide broad access to economic opportunities instead of favoring the few at the expense of the many, could affect innovation as well. Exploiting the timing and geography of the French occupation of different German regions after the French Revolution, Donges, Meier & Silva (2018) find that the number of patents per capita more than doubled in counties with the longest occupation compared with unoccupied counties, and this effect was particularly strong for high-tech industries and counties with a developed banking sector or liberal social norms. They conclude that financial development and liberal social norms are important complements of inclusive institutions for creating an innovative environment.

Some "bad" social culture, such as bribery culture, also affects innovation. Using a large sample of small and medium-sized enterprises in 57 countries, Ayyagari, Demirgüç-Kunt & Maksimovic (2014) find that innovative firms pay more bribes than do noninnovators, especially in less developed countries, where bureaucratic regulations are prevalent and corporate governance is weak. However, such bribes do not seem to benefit the innovative firms in terms of obtaining government businesses or being able to evade more taxes. These authors conclude that corruption in developing countries has a negative effect on innovation.

Some papers focus on how innovation is shaped by firm-level corporate culture. In a seminal theoretical paper, Manso (2011) shows that the optimal incentive scheme to motivate innovation needs to tolerate early failure and reward for long-term success. In order to create such an innovative corporate culture, firms should adopt long-term compensation plans, offer job security, and provide timely feedback on performance to managers and key R&D employees.

Consistent with this theory, Tian & Wang (2014) find that IPO firms backed by more failure-tolerant venture capital (VC) firms produce more patents and patents with more citations,

especially for ventures that are subject to high failure risk. They develop a new measure of VC firms' failure tolerance on the basis of how these early-stage equity investors treated underperforming ventures in the past, and explore potential cross-sectional determinants of VCs' failure tolerance. Their analysis illustrates that for new business ventures to be innovative, early-stage major investors should embrace a risk-tolerance culture.⁴

Another strand of literature examines the detailed cultural, ethnic, and childhood backgrounds of inventors who carry out R&D activities. Using detailed data on patent applications and the operations of the foreign affiliates of US multinational firms, Foley & Kerr (2013) study how innovators with different cultural and ethnic backgrounds influence the global distribution of the multinationals' R&D and patenting activities. They infer the ethnicity of US-based innovators by using the names of inventors that appear in patent applications, and find that firms with more patents generated by US-based innovators of a particular ethnicity conduct more R&D and produce more patents in the countries associated with that ethnicity. As such, their study suggests that innovators' cultural and ethnic backgrounds are able to facilitate the disintegration of innovative activities across borders.

Bell et al. (2017) investigate the importance of childhood environment for a person's likelihood of becoming an inventor, using proprietary data on 1.2 million US inventors from patent records linked to tax records. They show that exposure to innovation during childhood through one's family or neighborhood has a positive causal effect on the person's propensity to invent in the future. Furthermore, these exposure effects are specific to technology classes and gender: Those who grow up in a neighborhood or family with more innovation in a specific technology class are more likely to patent in that class, and girls are more likely to invent in a particular class if they grow up in an area with more women who invent in that class.

A few authors explore how local risk-taking culture affects the incentives to engage in innovative activities. Both Chen et al. (2014) and Adhikari & Agrawal (2016) examine the role of local gambling culture in corporate innovation. Using a US county's ratio of Catholics to Protestants as a proxy for local gambling preferences, Chen et al. (2014) find that firms located in gambling-prone areas tend to undertake riskier projects, spend more on R&D, and generate greater innovative output. Adhikari & Agrawal (2016) reach a similar conclusion and find that the effect of local gambling attitudes toward innovation is heterogeneous for firms with different characteristics. To mitigate concerns about endogeneity, Adhikari & Agrawal (2016) utilize the Immigration and Naturalization Act of 1965 as a quasi-natural experiment.

Since CEOs are the key leaders of modern corporations responsible for major business strategies, their personal attributes and preferences exert a huge influence on corporate culture, which in turn can affect the incentives and outcomes of innovation. Thus, a series of papers examine how CEOs' risk-taking preferences and behavioral patterns shape firms' innovative activities.

Measuring CEOs' overconfidence on the basis of their option exercising behavior and their portrayal in media, Hirshleifer, Low & Teoh (2012) find that firms with overconfident CEOs take on riskier projects, make greater investments in innovation, and generate more patents with better quality even after controlling for the amount of R&D expenditures. Similarly, Galasso & Simcoe (2011) study the relation between CEO overconfidence and corporate innovation. They first develop a career concern model where CEOs innovate to showcase their abilities. The model predicts that overconfident CEOs are more likely to pursue risky innovative strategies, and that

⁴Similarly, Chemmanur, Loutskina & Tian (2014) find that the innovation productivity of entrepreneurial firms backed by corporate venture capital (CVC) firms is higher than that backed by independent venture capital (IVC) firms. One main underlying reason is that CVC firms are more failure tolerant than IVC firms.

this effect is larger in more competitive industries. Using a panel of large, publicly traded firms between 1980 and 1994, these authors find evidence consistent with the model.

Some papers in the literature explore CEOs' personal attributes other than their behavioral patterns such as overconfidence. For example, Sunder, Sunder & Zhang (2017) use CEOs' hobbies such as flying small aircraft to proxy for the degree of their sensation seeking, a personality trait defined as the desire to search for novel and exciting experiences that entail risk. They find that firms led by pilot CEOs generate more and higher-impact patents, and that CEOs who are pilots achieve better innovation outcomes by improving innovation efficiency and pursuing more diverse and original innovative projects. Their evidence provides empirical support for the importance of managerial personality traits in creating an innovation-friendly corporate environment. Related to this study, Mao & Zhang (2018) investigate how CEOs' risk incentives (i.e., Vega) affect firm innovation. To establish causality, they exploit compensation changes induced by the FAS 123R accounting regulation in 2005, which mandated stock option expensing at fair values. Relying on this identification strategy, they find a positive effect of CEOs' Vega on innovation activities.

3. DEMOGRAPHICS AND HUMAN CAPITAL

In this section we review the literature that explores the relation between innovation and the demographics (in terms of age, education, technical or immigration background, etc.) of an economy's workforce or a firm's key innovation-relevant employees, such as top managers or individual inventors. This body of literature also evaluates the importance of human capital and teamwork spirit for the efficiency and outcomes of innovation because the success of innovative activities crucially hinges on the talent, experience, effort, and morale of researcher teams as well as of their managers, who are responsible for raising capital in a timely and efficient manner and designing appropriate incentive contracts to generate sufficient capital-labor complementarities.

Derrien, Kecskes & Nguyen (2018) study the impact of local labor force demographics, especially the age structure of a commuting zone, on corporate innovation in the USA. At both the commuting zone and firm levels, they find that a younger labor force produces more innovation, as indicated by greater patent counts and citations. Furthermore, young people produce more innovation through the labor supply channel rather than through financing supply or consumer demand channels.

Also exploring the implication of worker age for innovation, Anelli et al. (2019) study whether a decline in the local population of young people reduces new firm creation and thus negatively affects entrepreneurship and innovation. By exploiting variation in emigration from Italian local labor markets, they find evidence consistent with the above prediction. They further show that the migration-driven labor outflows mostly affect the creation of firms owned by young people and those in innovative industries.

Using Italian administrative data from the period 1958 to 1973, Bianchi & Giorcelli (2019) examine how an inventor's STEM (science, technology, engineering, and mathematics) background affects his or her likelihood/style of doing innovation in the future. Specifically, the authors exploit an Italian education reform that led to an abrupt increase in the supply of STEM graduates in 1961, which allowed industrial students (as opposed to academic students) to enroll in university STEM majors for the first time. They show that such an exogenous increase in the number of people with STEM degrees tilted the type of innovation produced toward chemistry, medicine, and information technology rather than mechanics or industrial processes. Furthermore, it allowed individuals with STEM backgrounds to reach top positions within the corporate hierarchy and get more involved in the innovation process.

Acemoglu (2010) develops a theoretical model to study the conditions under which an economy's scarcity in labor supply encourages technology adoption or innovation. He defines a given technology as strongly labor saving if the advancement of the technology reduces the marginal product of labor (MPL) and as strongly labor complementary if such an advancement increases the MPL. The main result is that labor scarcity encourages technological advances (i.e., innovation) if the technology is strongly labor saving but discourages technological advances if the technology is strongly labor complementary. His findings thus indicate that the influence of a society's labor supply on innovation crucially depends on the nature of the technology underlying the innovative endeavors.

Another paper that studies the relation between labor supply and innovation is that by Bena & Simintzi (2017), who exploit the 1999 US–China bilateral agreement to examine whether and how access to cheap offshore labor affects domestic firms' innovation. They classify innovations into new goods (product innovations) and new production methods (process innovations) by performing a textual analysis of firms' patent applications. They find that US firms operating in China substantially reduce their share of process innovations, suggesting that these firms choose to use cheap offshore labor rather than investing in labor-saving innovation.

Several other papers examine whether and how skilled labor with foreign backgrounds contributes to the innovation process and performance. Hunt & Gauthier-Loiselle (2010) study whether skilled immigrants in the USA, a large fraction of whom have science and engineering degrees, enhance the production of innovation. Using a state-level panel between 1940 and 2000 and an instrumental variables approach, they find that a one-percentage-point increase in immigrant college graduates' population share leads to an approximately 9–18% increase in patents per capita.

Bernstein et al. (2018) attempt to quantify the extent to which immigrants contribute to US innovation both through their direct productivity and through their indirect spillover effects on their native collaborators. They find that immigrant inventors are generally more productive than native inventors in producing patents, especially those with more future citations and greater economic value. Furthermore, inventors with immigrant backgrounds tend to favor foreign technologies, interact with foreign inventors, and create positive externalities for native inventors' innovation activities. Finally, immigrant inventors' indirect spillover effects matter much more than their direct productivity in contributing to innovation success.

In a similar spirit, two contemporaneous papers examine how workers on H-1B visas (i.e., those with foreign backgrounds who are allowed to legally work in the USA) affect corporate innovation. Using data on H-1B labor condition applications combined with retail scanner data on products between 2006 and 2015, Khanna & Lee (2018) find that H-1B certification is strongly associated with higher product reallocation rates, which indicate greater innovation, defined as the entry of new products and the exit of outdated products.

Exploiting the lottery system of allocating H-1B visas in years of high demand, Dimmock, Huang & Weisbenner (2018) examine the effect of hiring high-skilled labor (i.e., workers on H-1B visas) on firm-level outcomes for small innovative firms. They find that H-1B visa lottery winners are more likely to receive additional VC funding, have successful exits in the form of IPOs, and have better innovation performance.

Related to the above three papers, Brown et al. (2019) compare the innovation behavior of foreign-born entrepreneurs with that of US-born entrepreneurs in high-tech industries. The authors find that immigrant-owned firms engage more in innovative activities for 15 of 16 different innovation measures, including the intensity of production or process innovation activities; R&D expenditures; and intellectual property (IP) outputs such as patents, copyright, and trademarks.

Several studies explore the heterogeneity in firm-specific human capital in affecting innovation. For example, Chemmanur et al. (2019) evaluate the effect of the quality of a firm's top

management, measured by managers' education, prior professional experience, and networks, on the firm's innovation activities by using a sample of 4,389 US firms from 1999 to 2009. They find that firms with higher-quality management teams spend more on R&D, generate more patents and patents with higher quality, and have a larger number of exploratory and exploitative patents. They further find that higher-quality management achieves innovation success by hiring a larger number of inventors, especially those with higher quality.

Liu, Mao & Tian (2018) compare the relative importance of human capital (provided by inventors) and organizational capital (provided by firms) in explaining innovation styles and outcomes. Using a sample of 204,678 inventors who worked for 5,722 US firms from 1970 to 2003, they find that inventors explain more variation in innovation performance, measured by patent counts and citations per patent, than firms do. The importance of the two in explaining innovation styles, measured by patent exploratory and exploitative scores, is about the same. In addition, inventors contribute more to innovation outcomes when they are better connected, in higher-mobility firms, and in high-tech industries.

A couple of papers illustrate that teamwork among coinventors exerts a huge influence on the success of innovation. Using administrative tax and patent data for US patent inventors from 1996 to 2012, Jaravel, Petkova & Bell (2018) examine the implications of team-specific human capital for inventors' lifetime earnings and innovativeness. Adopting a difference-in-differences (DiD) approach, they find that the demise of team collaboration caused by an inventor's exogenous premature death gives rise to a large and long-lasting decline in the coinventors' future earnings and innovation productivity.

In a similar study, Baghai, Silva & Ye (2017) explore the role of team-specific human capital and team stability in shaping innovation. Using microlevel data on individual inventors in the USA between 1975 and 2004, they find that when inventor teams are dissolved because of bankruptcy, those inventors who tend to work more in teams experience, on average, greater persistent negative effects on their future innovative productivity. In contrast, inventors who jointly move with their team members become more innovative thereafter. The evidence again shows that past collaboration experience of inventors is critical for their future innovation productivity.

Related to the above two papers, Zacchia (2020) analyzes how interactions among inventors of different firms influence knowledge spillovers and shape innovation activities. He constructs a network of public firms in which each link is a function of the relative proportion of the two firms' inventors who have previously collaborated with one another. Using this measure, he then shows that such cross-firm collaboration (in addition to teamwork collaboration, as shown by previous literature) also exerts a large influence on knowledge creation.

Finally, this literature also explores how organized labor affects firm innovation. For example, Bradley, Kim & Tian (2017) document a negative effect of enhanced labor power on both the quantity and quality of a firm's innovation output, using a regression discontinuity design framework that makes use of locally exogenous variation generated by union elections that pass or fail by a small margin of votes. In response to enhanced labor power, firms relocate their innovation activities from states where union elections win.

4. MARKET DEVELOPMENT

The development of an economy's markets and financial systems will directly influence the financing of firms attempting to engage in innovative activities and, in turn, their ability to do so. Recent literature has explored how innovation is shaped by market-based and banking-based financial systems, equity/stock and credit market developments, real estate market shocks, market sentiment and transparency, labor market frictions, product market competition, and the development of various key financial market players.

Tadesse (2006) compares market-based and bank-based financial systems in fostering technological innovation. Using a panel of 10 manufacturing industries across 34 countries over the period 1980–1995, the author finds that while market-based systems enhance innovation in all economic sectors, bank-based systems encourage faster technological progress in industries with greater information sensitivity, suggesting that the impact of financial systems on an economy's innovative performance depends on the nature and structure of its industries.

Using a data set that covers 32 developed and emerging countries, Hsu, Tian & Xu (2014) examine how financial market development affects innovation. By adopting a fixed-effect approach, they show that a country with better-developed equity markets will observe more innovation from industries that are more dependent on external financing and that are more high-tech in nature. By contrast, a better-developed credit market seems to thwart innovation in such industries. Along this line of research, Moshirian et al. (2020) explore the effects of financial market liberalization on technological innovation. Using a sample of 20 economies that experience stock market liberalization, they show that economies exhibit a higher level of innovation output after liberalization, and this effect is disproportionately stronger in more innovative industries. The relaxation of financial constraints, enhanced risk sharing, and improved corporate governance are three plausible underlying channels.

Using a data set that links the output of patent inventors with their housing transactions, Bernstein, McQuade & Townsend (2017) analyze how negative real estate market shocks, such as the decline in housing wealth during the 2008 Financial Crisis, affect technological innovation. They find that employees who experienced a negative shock to their housing wealth during the crisis pursued less risky projects and generated fewer patents with lower quality. The effects are stronger for employees with limited labor market opportunities or with little equity in their houses before the crisis.

A large strand of literature studies how credit markets, especially banking markets, influence the features, processes, and outcomes of innovation. Using Italian data from the 1990s, Benfratello, Schiantarelli & Sembenelli (2008) examine how local banking development affects corporate innovation. They find that a more developed banking system fosters process innovation, particularly in small or high-tech firms and in industries that are more dependent upon external finance. The positive effect of a banking system on product innovation is much weaker.

Four follow-up studies examine the effect of banking development on firm innovation using the staggered deregulation of banking activities in the USA. Amore, Schneider & Žaldokas (2013) find that interstate banking deregulation has a significantly positive impact on both the quantity and quality of innovation output by manufacturing firms, especially for those highly dependent on external capital and located closer to the newly expanded banks. Furthermore, they find that the greater ability of banks to geographically diversify credit risk after the deregulations is an important channel for the documented results.

Relatedly, Chava et al. (2013) find that intrastate bank deregulation reduces young and private firms' innovation activities by increasing the local market power of banks. In contrast, interstate bank deregulation enhances such firms' innovation output by decreasing the local market power of banks. In addition, these contrasting effects on innovation manifested in economic growth.

Complementing the above two studies, Cornaggia et al. (2015) analyze the effect of bank competition on innovation by both public and private firms in the USA. They focus on interstate bank deregulation, and find that banking competition decreases state-level innovation output by public firms but increases that by private firms relying on external finance and having limited access to local bank credit. They conclude that banking competition, by offering financing to small, innovative firms, helps the firms avoid being acquired by public corporations. The reduction in the

supply of innovative targets in turn lowers the proportion of state-level innovation generated by public firms.

Hombert & Matray (2017) also use the wave of intrastate banking deregulation in the USA to examine how the development of banking markets influences the level of innovation activity and the distribution of innovative human capital across the economy. They find that a negative shock to lending relationships reduces the number of innovative firms, especially firms that are small in size and facing information asymmetry—those that typically rely more on relationship lending. Furthermore, inventors working for smaller firms, especially younger and more productive ones, are more likely to leave to larger firms or move to other states unaffected by the negative shock to relationship lending.

Using US data from the Great Depression, Nanda & Nicholas (2014) find a negative association between bank distress and the level, quality, and trajectory of corporate innovation. This negative effect is more pronounced for innovative firms operating in capital-intensive industries but is mitigated in aggregate because a large number of such firms were located in counties with lower levels of bank distress.

Bian et al. (2017) compare the abilities of government-owned and privately owned banks to influence corporate innovation. Using a large sample of German credit relationships, they find that firms with more financing from government-owned banks engage less in innovation activities. Meanwhile, firms with more financing from privately owned banks generate a larger number of patents. For identification, these authors instrument the local credit supply from government-owned banks by the timing of such banks' distress events in local electoral cycles.

A potential disadvantage of the above-described papers is that they do not observe the direct effect of bank lending on corporate innovation, because banks are passive investors and they do not intervene in firms' operation when they are financially healthy. Gu, Mao & Tian (2017) make use of a setting with debt covenant violations when banks take control of firms. They find that bank interventions have a negative effect on innovation quantity but not on quality. In addition, they show that the decrease in innovation output is largely unrelated to the violating firm's core business, which actually helps these firms refocus their innovation effort and ultimately improves firm value. In summary, these studies highlight the important roles that credit markets, especially bank lending markets, play in the innovation process.

Dang & Xu (2018) examine, both theoretically and empirically, how market sentiment affects corporate innovation. Using a panel of 6,139 US public firms between 1985 and 2010, they find a positive correlation between firm-level innovation activities and aggregate stock market sentiment. Furthermore, their evidence shows that financially constrained firms are more likely to issue equity and invest more in R&D than are financially unconstrained firms at times of high market sentiment, which is consistent with a financing channel.

Using international data across 20 countries, Brown & Martinsson (2019) examine the net effect of a country's general information environment on innovation. They find that a country's overall level of transparency has a positive effect on the rates of R&D investment and patenting, especially in industries that are relatively more dependent on market-based financing sources (such as equity) than on bank debt. The cross-sectional results suggest that transparency encourages innovation by reducing the information costs associated with arm's-length financing. In contrast, they do not find a significant effect of transparency on the investments in tangible assets.

Mao & Wang (2019) argue that labor scarcity is an important economic channel through which access to finance affects innovation. Studying antebellum America from 1812 to 1860, with staggered passages of free banking laws and large differences in labor scarcity between free and slave states, they find that greater access to finance enhanced patenting activities at the state level. Furthermore, the effect was stronger in free states where labor was relatively scarce. They also find

an interesting pattern in states where slave labor was prevalent: Access to finance had a positive impact on the types of innovation that substituted for free labor, but a negative effect on those types that substituted for slave labor.

Some researchers study the effect of product market competition on innovation. Spulber (2013) theoretically shows the complementary roles of competition and IP protections in stimulating innovation. He finds that a market for inventions will be formed when IP is appropriable and the corresponding increase in competitive pressures fosters innovation incentives. By contrast, when IP is not fully appropriable, there is limited scope for the market for invention, which reduces competitive pressures and dampens the incentives to innovate. In such cases, firms vertically integrate their R&D and production operations and share their technologies with one another to appropriate the returns to IP.

Using panel data, Aghion et al. (2005) find an inverted-U relation between innovation output and the degree of product market competition. They explain this pattern by developing a theoretical model that examines the conflicting effects of competition on innovation based on industry structures: It has a negative effect on innovation in industries characterized by leader-laggard relations, whereas it enhances innovation for industries with neck-and-neck competitors. They also find supporting evidence that the average technological distance between leaders and followers increases with competition, and that the inverted-U pattern has greater slopes when industries are more neck-and-neck.

Finally, several papers explore how the development of key market players, such as multinational firms, financial analysts, institutional investors, activist shareholders, and short sellers, affect the incentives, style, and outcome of corporate innovation. Exploiting a detailed data set of 2,800 Spanish manufacturing firms from 1990 to 2006, Guadalupe, Kuzmina & Thomas (2012) study the association between foreign ownership by multinationals and firm innovation. Although foreign firms acquire the most productive firms within a given industry, the target firms also increase their own process innovation, along with the introduction of new machines and organizational practices, even after controlling for this selection effect. Moreover, acquired domestic firms that export through their multinational parents also increase product innovation and adopt more foreign technologies.

He & Tian (2013) find that firms covered by more financial analysts reduce their innovation output. For identification, they exploit the exogenous variation in analyst coverage generated by brokerage mergers and closures, as well as an instrumental variables method. Their evidence suggests that financial analysts, an important group of information producers on the capital markets, actually discourage firms from engaging in innovative activities by exerting too much pressure on managers to meet short-term goals.

Aghion, Reenen & Zingales (2013) explore the role of institutional investors in the production of innovation. They find that greater institutional ownership is associated with more innovation outcomes, such as citation-weighted patents per dollar of R&D expenses. They find evidence mostly consistent with the career concern hypothesis that managers dislike the career risks associated with innovative activities and that institutions' enhanced monitoring can mitigate such concerns. Luong et al. (2017) push this line of inquiry further by exploring the effect of foreign institutional investors on firm innovation. They show that foreign institutional ownership has a positive, causal effect on innovation because of three mechanisms: active monitoring, providing insurance against innovation failures, and promoting knowledge spillovers from high-innovation economies.

Brav et al. (2018) examine the impact of hedge funds, an important group of active institutional shareholders, on firms' innovation performance. They find that firms targeted by hedge fund activists improve innovation efficiency, in terms of higher innovation output but lower R&D expenditures, after intervention practices, and that the effect is more pronounced for firms with

more diversified innovation portfolios. The possible channels through which hedge fund activists help enhance innovation efficiency include the reallocation of innovative resources, the redeployment of human capital, and the change to board-level expertise.

He & Tian (2019) identify an unintended real effect of short sellers, another important type of institutional investor, on firms' innovation. To mitigate concerns over endogeneity, they make use of a quasi-natural experiment, Regulation SHO, which randomly assigns a subsample of the Russell 3000 index firms into a pilot program and removes the tick restriction on their stocks. They find that short sellers have a positive causal effect on the quality, efficiency, and value of patenting activities, consistent with the disciplinary role played by short sellers.

5. LAWS

An economy's legal system, especially the design and enforcement of laws governing various critical aspects of the innovation process, exerts a profound influence on corporate innovation. An emerging line of research has investigated a broad range of such aspects of the legal system, including patent (litigation) laws; trademark laws; intellectual property right (IPR) protection laws; bankruptcy laws; shareholder protection/litigation systems; insider trading rules; and laws affecting the composition or productivity of the labor force (especially knowledge-generating inventors), such as wrongful discharges, workplace smoking, and gender orientation.

Using data from the nineteenth century, Moser (2005) examines how patent laws affect the direction of innovation. He finds that the absence of patent laws in a country led its inventors to concentrate innovative activities in a small number of industries where secrecy was an effective alternative to patent grants, such as scientific instruments, food processing, and dye stuffs, making the country a technological leader in those industries. In contrast, inventors in countries with patent laws innovated in a more diversified set of industries. These findings suggest that patent laws help shape the direction of technological changes.

In a follow-up paper, Moser (2012), again using historical data, finds that the majority of innovations in Britain in 1851 were not patented. A further analysis that compares British and US data also reveals that patenting decisions were unresponsive to differences in patent laws but largely driven by cross-industry differences.

Lerner (2009) examines the impact of patent policies on innovation outcomes in an international setting. In particular, he analyzes 177 of the most significant shifts in patent policy across 60 countries and 150 years. Surprisingly, he does not find robust evidence that the strengthening of patent protection has a positive effect on innovation rates. He offers three possible explanations: imperfect measurement of innovative output, lack of test power due to a short sample period, and the failure of domestic patenting to respond to IPR enhancements.

Using the unique setting of patent invalidation decisions of the US Court of Appeals for the Federal Circuit, Galasso & Schankerman (2015) analyze the causal effect of patent rights on cumulative innovation in an economy. They find that invalidation leads to a 50% increase in subsequent citations to the focal patent, but that such an impact is highly heterogeneous and driven mainly by patents owned by large firms that appear to block small innovators. Thus, the evidence suggests that government policies should aim to facilitate more efficient patent licensing in some special environments.

Fang, Lerner & Wu (2017) explore how IPR protection affects innovation in a setting with poor legal and financial institutions, namely China. They find that innovation increases after the privatization of state-owned enterprises (SOEs) and that this effect is much larger in cities with stronger IPR protection. They conclude that both IPR protection and ownership structure jointly determine the efficacy of innovation.

By analyzing the 1996 Federal Trademark Dilution Act (FTDA), which granted additional legal protection to selected trademarks, Heath & Mace (2019) examine how trademark protection affects firms' innovation and product strategy. They find that the FTDA raised affected firms' operating profits by triggering more trademark-related lawsuits and lowering their industries' entries and exits. Furthermore, firms with enhanced legal protection for trademarks lowered their innovation inputs, generated fewer patents or new products, and recalled a larger number of unsafe products, indicating that more legal protection of trademarks exerts a negative influence on innovation motives and worsens product quality.

Appel, Farre-Mensa & Simintzi (2019) analyze whether and how the patent lawsuits initiated by nonpracticing entities (NPEs, or so-called patent trolls) affect entrepreneurial firms' employment, growth, innovation, and financing activities. Exploiting the staggered passage of antitroll laws in 32 US states, they find that the adoption of such laws leads to more innovation output measured by patenting. Such an increase in innovation activities is facilitated by greater early-stage VC funding and more loans with patents as collateral. They conclude that state antitroll laws can increase the net present value of investing in high-tech start-ups by reducing the litigation risks posed by frivolous patent demands.

Gao & Zhang (2017) examine the effect of US state-level employment nondiscrimination acts (ENDAs), which are laws that prohibit discrimination on the basis of sexual orientation and gender identity, on corporate innovation. Using a panel of 58,009 US public firms from 1976 to 2008, they find that the adoption of ENDAs leads to a significant increase in innovation output. Their paper argues that ENDAs enhance innovation by matching innovative firms to pro-LGBT employees, who are likely to be better inventors because they tend to be younger, better educated, more tolerant, more open-minded, and more risk taking; have more diverse backgrounds; and exhibit stronger ideological liberalism.

A strand of literature examines the effects of bankruptcy laws on innovation. In an international setting, Acharya & Subramanian (2009) test the conjecture that debtor-friendly bankruptcy laws encourage corporate innovation by promoting continuation upon failure whereas creditor-friendly laws have the opposite effect. Adopting a twofold empirical strategy, they find supporting evidence by showing that innovative industries exhibit greater intensity of patent creation, patent citation, and faster growth in countries with weaker creditor rights in bankruptcy. High-tech firms in countries with stronger creditor rights, by contrast, have lower leverage and innovate less.

In a related study, Cerqueiro et al. (2017) investigate the effects of personal bankruptcy laws on corporate innovation using US data between 1995 and 2005. Contrary to Acharya & Subramanian (2009), the authors find that bankruptcy laws with stronger debtor protection decrease patenting activities by small firms and reduce the average quality and risk of the generated patents. They argue that one reason for the negative effect of stronger debtor protection on innovation is the decreased supply of debt financing, especially for industries with strong dependence on external financing.

Brown, Martinsson & Petersen (2013), in an international setting, examine the effect of a country's legal system, especially the degree of its shareholder protection and the resulting implications for stock market access, on innovative investment at the firm level. They find that stronger shareholder protections and better access to stock market financing boost R&D investment, particularly by small firms, but not ordinary capital expenditures. Furthermore, they find that credit market development has only a modest impact on capital expenditures but no impact on R&D ones.

Two related papers by the same author team explore how labor laws affect corporate innovation. Acharya, Baghai & Subramanian (2014) find that wrongful discharge laws, that is, those that protect employees against unjust dismissal, spur innovation and new firm creation. The authors first develop a model in which wrongful discharge laws limit the possibility of a firm holding up its

employees, inducing more innovative effort by employees and thus increasing firm-level innovation output. Using the staggered adoption of wrongful discharge laws across US states, they find empirical support for the model prediction.

Acharya, Baghai & Subramanian (2013) also find evidence consistent with the above intuition using country-level changes in dismissal laws in the USA, the United Kingdom, France, and Germany. In particular, they find that more stringent labor dismissal laws, but no other labor laws, encourage innovation, especially for firms operating in innovation-intensive industries.

Using data from 74 economies between 1976 and 2006, Levine, Lin & Wei (2017) explore how the tightening of insider-trading laws influences patenting. Exploiting the staggered changes of insider-trading laws across countries, they find that the enforcement but not the enactment of insider-trading laws spurs the quantity, quality, scope, and originality of innovation output, with stronger effects for innovative and opaque industries. They argue that one means by which the restriction of insider trading enhances innovation is that it can improve the valuation of innovative activities and thus increase the flow of equity financing to such endeavors.

Gao et al. (2020) examine the effect of smoke-free laws, which ban smoking in workplaces, on corporate innovation. Exploiting the staggered passage of smoke-free laws by various US states since 2002, they find a significant relative increase in patent quantities and citations for firms headquartered in states that have adopted such laws. The effect is more pronounced for firms in states with stronger enforcement of such laws or weaker preexisting tobacco controls. The authors argue that smoke-free laws improve inventor health and productivity and help attract more productive inventors.

Exploiting the staggered passage of the universal demand (UD) laws across 23 US states from 1989 to 2005, Lin, Liu & Manso (2018) study whether and how shareholder litigation affects corporate innovation. They find that firms incorporated in states with UD laws, where shareholders face greater difficulties in filing derivative lawsuits against directors and managers, increase both the input and output of innovative activities and also enhance the quality and value of the innovation outcomes. The authors conclude that shareholder litigation constrains firms' abilities to innovate by exerting pressure on management.

Mezzanotti (2020) examines how patent litigation affects innovation by using the 2006 Supreme Court decision in *eBay Inc. v. MercExchange LLC* as an exogenous shock to patent enforcement. The ruling increased the flexibility of courts to remedy patent violations by ending the practice of granting a permanent injunction almost automatically after a violation. The author finds that this intervention had a positive effect on innovation input and output. Furthermore, the evidence indicates that patent litigation reduced innovation by lowering the returns from performing R&D activities and decreasing the amount of internal resources available for productive activities.

6. REGULATIONS AND POLICIES

The final strand of literature that we review analyzes how innovation is affected by government regulations and policies, including those concerning the regulation of market competition (e.g., antitrust policies), corporate as well as personal taxes, government-supplied subsidies and financial incentives to innovative activities, government spending, political uncertainty, the transparency of the general information environment, anticorruption campaigns, place-based policies, and policies affecting the IPO process of entrepreneurial firms.

Segal & Whinston (2007) examine how antitrust policies, which usually restrict the behavior of incumbents but provide leniency toward new entrants, affect industries where innovation is key to the success of competition. They develop a theoretical model to analyze the conflicting effects

of antitrust policies on the innovation incentives of incumbents versus entrants, and find that the direction of the net effect can be pinned down by fixing the rate of innovation while varying the innovation benefit and supply. By applying the model to several specific antitrust policies, they show that the above tension manifests only in certain scenarios and that entrant-friendly policies necessarily spur innovation.

An emerging strand of this literature exploiting both US and international data examines how tax policies influence innovation. Using staggered changes in state corporate tax rates in the USA, Mukherjee, Singh & Žaldokas (2017) study the effect of corporate taxation policy on firms' innovation incentives. They find that firms respond to tax increases by reducing their R&D and patenting activities as well as by introducing fewer new products to the market. By contrast, the response of innovation intensity to tax cuts is much weaker. The authors conclude that higher corporate taxes dampen the incentives of innovators by making them more risk averse. Exploiting a similar empirical strategy, Atanassov & Liu (2020) document that large corporate income tax cuts boost corporate innovation, which conflicts with the findings by Mukherjee, Singh & Žaldokas (2017). However, Atanassov & Liu (2020) also find a negative effect of tax increases on innovation. Furthermore, they examine several economic channels, such as corporate governance, financial constraints, asset tangibility, innovation capital, and the ability of tax avoidance.

Related to the above two studies, Akcigit et al. (2018) examine how personal and corporate income taxes affect individual inventors' innovation activities in the United States during the twentieth century. Using three new data sets and a battery of identification strategies, the authors find a negative effect of personal and corporate income taxes on both the quantity and quality of innovation. Meanwhile, they find evidence for the shifting of innovation activities across geographical areas in response to higher taxes. Corporate inventors seem to respond more to taxes than their noncorporate counterparts.

To analyze the effects of fiscal incentives on R&D investment and productivity growth, Chen et al. (2018) exploit the quasi-experiment of China's InnoCom program, a large fiscal incentive for R&D investment in the form of corporate income tax cuts. They find that firms are highly responsive to the tax incentives provided by the InnoCom program, but that a significant fraction of the response is due to the relabeling of administrative expenses.

Another paper that examines the effect of taxes on innovation using Chinese data is that by Cai, Chen & Wang (2018), who exploit a tax reform on manufacturing firms in China that switched the corporate income tax collection from local to state tax bureaus and thus reduced the effective tax rate by 10%. Adopting a regression discontinuity design, the authors find that the lowered tax rate improved both the quantity and quality of corporate innovation, especially for financially constrained firms and those practicing more tax evasion.

Another line of research focuses on how government-supplied subsidies and financial incentives to innovative activities shape the motivation, processes, and outcomes of corporate innovation. Howell (2017) evaluates the effect of government R&D subsidies on innovation. Using data on ranked applicants to the US Department of Energy's Small Business Innovation Research grant program, she finds that early-stage grants increase the financing, success, and profitability of innovation activities and that this effect is more pronounced for start-ups facing more financial constraints. She rules out certification as a possible mechanism for the finding but argues that the subsidy is useful because it allows the recipient firms to invest and reduce their technological uncertainty.

Using data from the China Employer Employee Survey, Cheng et al. (2019) also examine the effect of government subsidies on innovation. They find that state-owned and especially politically connected firms have priority in receiving such subsidies and that recipients of subsidies generate more patents domestically and are more likely to introduce new products. The authors conclude

that China's allocation of innovation subsidies is inefficient and does not encourage groundbreaking innovations.

Related to the above two studies, Bell et al. (2019) examine the impact of financial incentives, such as R&D subsidies/grants or tax cuts, on the supply of inventors. Using panel data covering a large population of inventors in the USA from 1996 to 2012, the authors first show that the private returns to innovation (measured by inventors' income in their tax records) are extremely right-skewed, are highly correlated with scientific impact (i.e., citations), and are often the largest in the middle of an individual's career. They then build a theoretical model of career choices to match the above evidence, which predicts that financial incentives have limited potential to increase aggregate innovation in an economy.

In a similar spirit, Kong (2020) studies how government spending affects corporate innovation output. He finds a negative impact of government spending on innovation output. Moreover, the reductions in innovation outcomes are pronounced mostly for firms operating in labor-intensive industries, those headquartered in states with lower unemployment rates, and those that rely more on government subsidies, suggesting that resource diversion is an underlying mechanism through which the increased government spending stifles corporate innovation.

A couple of papers explore how political uncertainty and corporate political activities influence the incentives and efficiency of innovation. Using cross-country data, Bhattacharya et al. (2017) explore whether policy itself or policy uncertainty matters more for technological innovation. For identification, they adopt a fixed-effect approach and exploit exogenous variation based on ethnic fractionalization. They find that policy uncertainty but not policy itself exerts profound influence on a country's innovation activities. Specifically, policy uncertainty hurts a country's incentive to innovate and thus reduces its innovation quantity, quality, and originality.

In relation to that study, Ovtchinnikov, Reza & Wu (2020) analyze how firms' political activism reduces political uncertainty and therefore boosts innovation. The evidence shows that firms engage more in innovative activities if they support more politicians, winning politicians, politicians on Congressional committees with jurisdictional authority over the firms' industries, and politicians who join those committees. For identification, the authors exploit the unexpected Republican win in the 1994 midterm election in the USA and the subsequent decision by the Speaker of the House, Newt Gingrich, to appoint four junior Congressmen to committee chairman positions. They also provide evidence for intraindustry and geographical spillovers of political activism.

Using Italian data on firms and employees, Akcigit, Baslandze & Lotti (2018) examine how political connections affect firm dynamics, innovation, and creative destruction. Exploiting a quasi-random discontinuity caused by local elections, the authors find a positive impact of firm-level political connections on employment, revenues, and viability, but a negative effect on productivity growth and innovation efforts. They also find some aggregate effects of firm-level political connections on industry dynamics and social welfare.

In relation to the above line of research, a few papers examine whether stable institutions promote innovation in general. For example, Fich, Nguyen & Petmezas (2019) document that terrorism thwarts innovation by increasing the economic uncertainty facing firms near the attacks and threatening the personal security of these firms' employees, especially inventors. Using historical data on ethnic and political violence, Cook (2014) finds that political conflict and domestic terrorism have negative effects on the level, direction, and quality of patenting activities in a society. Furthermore, Cook & Gerson (2019) conceptually argue that discrimination toward minorities and women during the innovation process hinders the development of patentable ideas in the technology workplace. They predict that eliminating the gender and racial gap in the US innovation process could raise the US gross domestic product per capita by 2.7%. In a related study, Manso,

Balsmeier & Fleming (2019) argue that uncertainty might have differential effects on exploratory innovation versus exploitative innovation.

Several papers explore how policies regarding the transparency of an information environment affect firms' innovation activities. Laux & Stocken (2018) develop a theoretical model to examine the effects of accounting standards and regulatory enforcement on innovation. They find that more stringent accounting standards led to a trade-off between a lower cost of capital and heavier regulatory penalties. The authors show how optimal accounting standards should be set in light of these trade-offs as well as the sensitivity of regulatory penalties to the magnitude of standard violations.

Adopting a DiD analysis based on a US regulatory shock that increased transparency about mutual fund managers' portfolio choices, Agarwal, Vashishtha & Venkatachalam (2018) find that a greater requirement to disclose portfolio holdings exerts short-term pressure on fund managers and thus exacerbates myopic corporate behavior by reducing firm managers' incentives to innovate. In a complementary paper, Fu et al. (2020) study how the direct regulation of firms' financial reporting frequency affects corporate innovation. Using a DiD approach, they find that higher reporting frequency reduces the output of corporate innovation, which is consistent with the hypothesis that frequent reporting induces managerial myopia and thus impedes corporate innovation.

Using international data from 29 countries and the mandatory adoption of International Financial Reporting Standards as a shock to transparency, Zhong (2018) shows that more transparency, in terms of (a) financial reporting quality, (b) the use of global accounting standards, and (c) the quality of the external information environment, leads to more corporate effort in investing in R&D by reducing managerial career concerns. Moreover, by facilitating efficient resource allocations, greater transparency in a country also enhances the efficiency of innovation.

A few recent papers use rich data from China to examine how government policies influence corporate innovative activities. Exploiting the staggered establishments of national high-tech zones in China and using a DiD approach, Tian & Xu (2019) find that this place-based policy has a positive effect on local innovation output and entrepreneurial activities. Further analysis reveals three possible mechanisms through which this policy enhances innovation and entrepreneurship: easier access to financing, greater reductions in administrative burdens, and better talent cultivation facilitated by national high-tech zones.

Relying on plausibly exogenous variation in partial privatization expectation generated by China's split share structure reform in 2005, Tan et al. (2020) explore how partial privatization of SOEs in China affects corporate innovation. They find that partial privatization prospects have a positive effect on corporate innovation. Better alignment of interests between government agents and private shareholders as well as improved stock price informativeness are two plausible underlying mechanisms.

Using China's occasional suspension of IPOs as a quasi-experimental setting, Cong & Howell (2019) examine whether the delay in timely access to public equity markets affects innovation. They find that the temporary listing delay caused by IPO suspensions decreases the affected firms' innovation outputs measured by patenting outcomes. They argue that the heightened uncertainty facing the delayed firms as well as the financing constraints due to the lack of timely access to public equity capital are two main mechanisms through which the effect occurs.

7. CONCLUSION AND FUTURE DIRECTIONS

In this section we briefly discuss our own views on future research on institutions and innovation. First, we believe that it would be fruitful to develop new empirical proxies that better capture the

extent of corporate innovation activities than R&D expenditures and patenting-based measures. A few attempts have been made in the literature. For example, building on patent-based innovation measures, Manso, Balsmeier & Fleming (2019) point out that it is important to use patent/citation information to distinguish between two types of innovation strategies, exploratory and exploitative innovation, because standard innovation measures (i.e., R&D and patenting) do not capture firms' shifts between such innovative strategies. They further find that firms focus more on exploration during contractions and on exploitation during expansions. In addition, a couple of recent papers have proposed new innovation measures based on either textual analysis or new product introductions (e.g., Bellstam, Bhagat & Cookson 2017; Mukherjee, Singh & Žaldokas 2017). However, these new measures have no obvious advantages for the current R&D/patenting-based measures and thus have not yet been widely accepted by the profession.

Second, clever identification strategies need to be designed to establish causal links between institutions and innovation. While some existing studies (especially recent ones) have paid increasing attention to endogeneity issues, it is still difficult to rule out alternative interpretations of many findings, possibly because of the nonexperimental nature of the social sciences.

Third, more research could be done on the consequences of technological innovation for institutions. For example, how do governments adjust their laws, regulations, and policies in response to innovation shocks and technological progresses? How might innovation waves shape the culture of modern business enterprises or even local regions? Can technological advances and innovation strategies change the demographics of the corporate or local labor force and thus affect the various features of social institutions? We believe these are interesting questions worthy of investigation.

In this article, we have reviewed the recent literature on institutions and innovation, which has grown tremendously over the past few years. These papers are either published in top accounting, economics, finance, and management journals or accepted for presentation at top academic conferences (e.g., American Economic Association meetings, American Finance Association meetings, National Bureau of Economic Research group meetings, and Western Finance Association meetings). The literature reviewed here mostly explores how social and corporate culture, demographic characteristics, market development, laws, regulations, and policies influence the motivation and various aspects of innovation activities. As such, this review has attempted to offer a synthetic and evaluative monograph of academic research that links different types of institutions and technological innovation.

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Errata

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