Not All Technologies Are Created Equal for Stakeholders: Constituency Statutes, Firm Stakeholder Orientation and Investments in Technology Generality

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ABSTRACT

Previous research has analyzed the effect of stakeholder orientation on the amount of technological investment firms make but has ignored its effect on the characteristics of that investment. To address this gap, we explored the impact of stakeholder orientation on the degree of generality of a firm's technological investment. More general technologies (i.e., technologies easily deployable in a wider range of industries) are more likely to promote major changes in the firm's scope. However, these changes undermine the value of stakeholders' past relationship-specific investments, which are tailored to a certain firm scope. Therefore, more stakeholder-oriented firms will invest in less general technological assets to reduce stakeholder concerns and opposition. This negative effect will be stronger in more uncertain industries, where stakeholders are more concerned that firms might use technology generality to change their scope following the realization of previously unforeseen contingencies. However, it will be weaker in more competitive industries, where stakeholders tend to make less relationship-specific investments and are less concerned with changes in firm scope triggered by an increase in technology generality. We test our hypotheses by exploiting the enactment of constituency statutes in 34 U.S. states during the period 1976–2000 as a plausibly exogenous variation in firms' stakeholder orientation.

INTRODUCTION

An increasing amount of research has acknowledged the importance of firms' relationships with stakeholders (Berman et al. 1999, Hillman and Keim 2001, Wang et al.2009, Harrison et al. 2010, Crilly and Sloan 2012, Klein et al. 2012, Wang et al. 2016, Hoskisson et al. 2018). However, the organizational implications of a firm's stakeholder orientation, namely, a firm's attention to its nonfinancial stakeholders, are far from being fully understood (Barney and Harrison 2020).

An important area of debate concerns the relationship between stakeholder orientation and technological investment. Previous work suggests that stakeholder orientation affects firms' investment decision, and in particular firms' technological investment decisions. However, some scholars have argued that more stakeholder-oriented firms might invest more in technology and innovation because focusing on stakeholders fosters long-term orientation and grants access to new knowledge (Wang and Bansal 2012, Flammer and Kacperczyk 2016, Li et al. 2018). On the contrary, other scholars have posited that stakeholder-oriented firms tend to make less technological investments to prevent stakeholder concerns about the organizational changes that new technologies might produce (Srivastava et al. 2009, Atanassov, 2013, Hampel et al. 2020).

In the current work, we contribute to this debate by offering a more nuanced understanding of the relationship between stakeholder orientation and investment in new technologies. We propose that stakeholders in general—and in particular employees, suppliers, and customers, that is, the "three primary stakeholder groups in the firm value chain" (Hoskisson et al. 2018: 285)—might not be equally worried about all firms' investments in novel technologies. Rather, stakeholders are concerned about a firm's technological investment to the extent that such investment could promote major organizational changes at their detriment. We propose that stakeholder concerns will depend on the degree of generality of a firm's technological investment—namely, the scope of deployability (and redeployability) across industries of the technologies a firm invests in (Bresnahan and Gambardella 1998, Conti et al. 2019a). Examples of technologies characterized by a high degree of generality are diode lasers, whose potential uses span a wide range of industries, from medical devices to computers and toys (Conti et al. 2019a); some materials such as fullerenes, which are usable in several different markets, including automotive, aerospace, and power generation (Gambardella and McGahan 2010); or, even more clearly, recombinant DNA (Feldman and Yoon 2011) and machine learning algorithms (Brynjolfsson and MacAfee 2014), both of which apply to such a broad variety of industries to fully deserve the name of "general purpose technologies" (Bresnahan and Trajtenberg 1995).

Technologies vary in their degree of generality based on the number of industries where they can easily be deployed. Hence, investments in more general technological resources that have the potential to be deployed to a larger number of industries, give a firm increased flexibility in changing its organizational scope over time (Anand and Singh 1997, Helfat and Eisenhardt 2004, Gambardella and McGahan 2010, Levinthal and Wu 2010, Feldman and Yoon 2011, Gambardella and Giarratana 2013, Sakhartov and Folta 2014, Anand et al. 2016, Folta et al. 2016, Karim and Capron 2016, Conti et al. 2019b). However, employees, suppliers, and customers tend to make investments that are specific to the firm and its strategy and have little to no value if the firm changes its focus. Investments of this kind fall into the broader category of relationship-specific investments (Wang et al. 2009, Klein et al. 2012, Hoskisson et al. 2018, Williamson 1983). For stakeholders, any change in the firm's industry focus could imply losing returns on these past relationship-specific investments tailored to the strategy and industry focus employed by the firm at the time in which those investments were made. In fact, should the firm exit all extant markets and terminate its relationships with existing stakeholders, stakeholders' investments could even be fully lost (Hoskisson et al. 2018).

Therefore, we suggest that stakeholders are concerned about—and might negatively react to—firms' investment in more general technologies. From the stakeholders' perspective, such investments increase the possibility of changes in the organizational scope, thus enhancing the risk of losing their past relationship-specific investments. Hence, the more a company is stakeholder oriented, the lower the generality of the technologies it will invest in to reduce possible stakeholder concerns and negative reactions. This negative effect will be amplified in more uncertain industries, where stakeholders are more concerned that firms investing in technology generality will switch to new industries when unforeseen and unfavorable contingencies occur in the current industry. Instead, this effect will be attenuated in more competitive industries, where stakeholders tend to make less relationship-specific investments and, hence, are less concerned about changes in the organizational scope that a firm investing in technology generality might make.

Using a difference-in-differences approach and the enactment of constituency statutes as a plausibly exogenous variation for the importance that public corporations attribute to the interests of nonfinancial stakeholders (Flammer and Kacperczyk 2016, Karpoff and Wittry 2018, Ni 2020), we find support for our claim that a greater stakeholder orientation reduces the generality of the technologies in which a firm invests; furthermore, this effect is negatively moderated by industry uncertainty and positively moderated by industry competition.

These results contribute to the important debate on the impact of stakeholders—and firm stakeholder orientation—on technological investment and innovation (e.g., Wang and Bansal 2012, Atanassov 2013, Flammer and Kacperczyk 2016, Hampel et al. 2020). In this regard, the current paper reconciles prior conflicting results by suggesting that whether the effect of stakeholder orientation on firm technological investment is positive or negative might depend on the *characteristics* of the technologies considered—and in particular on their degree of generality.

Our results also contribute to the research on general purpose technologies (Bresnahan and Trajtenberg 1995, Bresnahan and Gambardella 1998). Research in this area has emphasized that these technologies have a positive impact on social welfare in that they generate spillovers across industries and, therefore, act as an “engine of growth” (Bresnahan and Trajtenberg 1995: 83, Feldman and Yoon 2011). Our observation that stakeholder-oriented firms might be less likely to make investments in general (purpose) technologies leads to the recognition of an overlooked societal tradeoff. The welfare of firms’ stakeholders—which increases when firms are more attentive to stakeholders’ needs—might come at the detriment to the growth of the overall economy—which might decrease if stakeholder-oriented firms invest in less general technologies.

Finally, our results contribute to research of technological resource redeployment and scope (Helfat, 1994; Katila & Ahuja, 2002; Folta, Johnson & O'Brien, 2006, O'Brien & Folta, 2009, Toh & Kim, 2013; Toh, 2014). By showing that investment in technology generality is influenced by a firm's stakeholder orientation, our work emphasizes the importance of stakeholder orientation as an antecedent to firms' investment in redeployable resources.

THEORETICAL DEVELOPMENT

Stakeholder Orientation and Technological Investments

Stakeholders—in particular, employees, suppliers, and customers—make critical relationship-specific investments (Hoskisson et al. 2018). For instance, employees often invest significant effort in understanding how a specific firm operates or how to work effectively with a specific group of colleagues (Becker 1962, Wang and Barney 2006). Similarly, suppliers usually make significant investments in tangible and intangible assets to coordinate their operations with those of specific client firms (Hoskisson et al. 2018). In addition, customers often make relationship-specific investments when the proper use of a new product sold by a certain company requires significant learning efforts (Hoskisson et al. 2018). All these investments made by stakeholders might be crucial for a firm's competitive advantage (e.g., Wang et al. 2009, Klein et al. 2012).

As a result, the importance of stakeholders has become increasingly acknowledged in scholarly and practitioner debate. Scholars have suggested that firms should devote more consideration to the interests of their stakeholders, not only because a greater stakeholder orientation would be instrumental to increase a firm's competitive advantage, but also because it would be normatively fair (Freeman 1984, Donaldson and Preston 1995, Jones 1995, Hillman and Keim 2001, Berrone et al. 2009, Harrison et al. 2010, Crilly and Sloan 2012, 2014, Hawn and Ioannou, 2016, Jones et al. 2018). Relatedly, managers have been recognizing the importance of managing firms in the interests of all stakeholders. A case in point is the recent Statement on the Purpose of a Corporation, a document signed by nearly 200 CEOs of the most important U.S. companies, declaring their commitment to managing their companies for the benefit of all stakeholders.

However, the organizational implications of stakeholder orientation are still not fully understood (Jones et al. 2018, Barney and Harrison 2020). In particular, previous research has produced conflicting evidence about the effect of a firm's stakeholder orientation on technological investments. A first stream of research has proposed that firms attentive to their stakeholders' interests invest more in new technologies and are more innovative for two intertwined reasons. First, protected stakeholders might be in the position of embracing experimentation without fearing the risks associated with it—such as the termination of their relationship with the focal firm in the case of failure (Flammer and Kacperczyk 2016). Second, stakeholders, compared with shareholders, might naturally be more interested in a firm's long-term performance because of the longer-term nature of their relationship with the focal company (Wang and Bansal 2012). Therefore, a closer relationship with stakeholders should help managers avoid short-termism and its detrimental effects on technological investments (e.g., He and Tian 2013, Troyer and Ahuja 2015).

A second stream of research has, instead, advanced the opposite view that stakeholder orientation hinders a firm's incentive to invest in new technologies because these investments would generally be met with concern and resistance by stakeholders (Srivastava et al. 2009, Atanassov 2013, Hampel et al. 2020). The idea is that those stakeholders most directly involved in the firm's value chain (such as employees, suppliers, and customers) make relevant relationship-specific investments that have little to no value outside the focal firm and are tailored to a certain strategy (Wang et al. 2009, Klein et al. 2012, Hoskisson et al. 2018). Hence, stakeholders might be concerned about the possibility of a novel technology triggering a major organizational change that would make their past relationship-specific investments obsolete. Some anecdotal evidence supports this view. For example, when General Motors announced the possibility of investing in electric engine technology, employees expressed their fear that such an investment could harm the value of their relationship-specific investments—for instance, by making their accumulated expertise in the extant production process obsolete[1]. A related case in point is that of Impossible, an analog instant film producer (Hampel et al. 2020). A small but passionate community of customers was initially at the heart of the company's success. However, when Impossible invested in digital photography, customers started attacking the company because they felt threatened that this organizational change could make their past relationship-specific investments (e.g., time dedicated to the community or to provide feedback to the firm's management or to become expert users, and even money invested in buying films for their cameras) useless.

Previous research has focused on the effect of stakeholder orientation on the amount of firm technological investment but has mostly ignored the effect on the *characteristics* of that investment. However, a firm's attention to its stakeholders might affect its technological trajectory, promoting certain types of technological investments while inhibiting others. This occurs, we suggest, because a large portion of the investments made by stakeholders are *relationship specific* and lose value when the firm changes its organizational scope. Hence, a firm's technological investments in general technologies— which increase the chances of a firm moving across industries— are not in line with stakeholders' interests. This logic, which has largely been neglected in previous work, might be at the root of the mixed evidence about the effect of stakeholder orientation on the amount of technological investment—which is positive according to some studies (e.g., Wang and Bansal 2012, Flammer and Kacperczyk 2016) and negative according to others (e.g., Atanassov 2013, Hampel et al. 2020), possibly because the sign of the effect depends on the type of technologies considered. Therefore, studying this issue more closely would enrich our understanding of the organizational implications of stakeholder orientation for the very important domain of investments in technology.

[1]https://www.wired.com/story/shift-electric-vehicles-strike-gm/.

In the next section, we clarify what technology generality is, how it provides firms with organizational flexibility, and why, for this reason, it might meet the resistance of stakeholders—such that stakeholder-oriented firms will invest in less general technologies.

The Effect of Technology Generality on Firms and Their Stakeholders

The idea of technology generality has been introduced by Bresnahan and Trajtenberg, who refer to general purpose technologies (GPTs) as those "characterized by the potential for pervasive use in a wide range of sectors" (1995: 84). More recent work, however, has extended this concept and recognized that any technology is characterized by a certain degree of applicability across domains. Thus, technology generality, rather than being a discrete characteristic—such that a particular technology is general or not—is a continuous attribute, such that any technology has a certain degree of generality, as defined by the number of industries to which it can be (re)deployed to (Conti et al. 2019a).

Furthermore, whereas GPTs are the extreme end of a spectrum, other technologies might still be considered significantly general and expand a firm's strategic opportunities and choices, even if their breadth of application does not reach the extremely high levels of GPTs (Conti et al. 2019a, Gambardella et al. 2021, Gambardella and Giarratana 2013, Hall et al. 2001, Teece 2018, Valentini 2012).

Technologies characterized by a high degree of generality are very important and pervasive in today's economy (Gambardella et al. 2021; Teece, 2018). Some real-world examples of technologies might help in understanding what technology generality implies for firms' potential ability to move across sectors. Within the realm of laser technologies, for instance, the diode laser is one of the most general lasers because it can be applied, with minimal adaptation costs, in several sectors, ranging from medical devices to telecommunications and electronics. Hence, firms investing in the diode laser can relatively easily move across any of those markets by redeploying the technology (Conti et al. 2019b). Similarly, but in a different technological field, fullerene, a carbon allotrope, is a technology whose potential uses span several industries. Firms such as Hyperion that have invested in this material have entered several different markets, including automotive, aerospace, and power generation (Gambardella and McGahan 2010). In a still different technological domain, Uber's search and matching algorithm also represents a very general technology because it can be used not only in the personal transportation industry, but also for food delivery, commercial transportation, and bike rentals. By investing in this algorithm, Uber has been able to expand its corporate scope over time.

As the previous examples indicate, firms investing in more general technologies have more flexibility to change their organizational scope by entering new markets or switching between markets (e.g., Gambardella and McGahan 2010). However, many of the investments that stakeholders make in the relationship with the firm are relationship specific and tailored to a certain firm scope (e.g., Wang and Barney 2006, Klein et al. 2012, Hoskisson et al. 2018). Thus, for two distinct but related reasons, stakeholders are likely to perceive a firm's investments in technologies that are characterized by a high degree of generality as detrimental to their interests.

First, stakeholders might fear that the company will leverage the increase in technology generality to exit some of the industries in which it is active and enter new ones. Even if the technologies are scale-free assets (Levinthal and Wu, 2010)—and, therefore, their employment in a new market does not necessarily imply their withdrawal from one of the firm's existing markets—to generate value in a certain market, they still need to be coupled with complementary assets (such as, for instance, downstream production and distribution assets or managerial attention), which are often scarce, costly, and not scale free. Therefore, the redeployment of a general technology to new markets often implies a diversion (or even a divestment) of non-scale-free resources away from extant markets. Such a shift would make stakeholders' relationship-specific investments, which are tailored to the current firm scope, lose value—

or even become worthless in the extreme case where the company exits all current industries and terminates existing relationships with its current stakeholders[2].

Second, stakeholders will oppose a firm's investment in general technologies because they will be concerned that such an investment will make the firm more likely to behave opportunistically. Indeed, a company investing in more general technologies could use the increased possibility of changing its organizational scope as a bargaining weapon to appropriate the value of its stakeholders' relationship-specific investments. For example, a company that has invested in more general technologies might lower employees' wages under the credible threat of moving to different industries, thus terminating employment relationships in the current ones. In the face of this threat, employees might be forced to accept a salary decrease because the termination of their employment would imply losing their prior relationship-specific investments. In this sense, investments in more general technologies might increase the hold-up risk faced by stakeholders once they have made relationship-specific investments (Williamson 1985, Wang et al. 2009, Hoskisson et al. 2018).

Notably, stakeholders might not agree on the characteristics of the technologies the focal firm should invest in. For instance, customer utility would be increased by investments in labor-saving technologies that decrease production costs, whereas employees would naturally oppose this investment. However, we propose that if we abstract from or hold constant any other characteristics and just focus on the degree of generality, all stakeholders likely prefer the focal firm to invest in more specific technology

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[2] Consider, for instance, the case of a company specialized in vaccines that has to decide whether to invest in a *specific* technology only effective for targeting viruses or a *general* technology effective in targeting viruses and possibly other areas (cancer, autoimmune diseases, etc.). We suggest that all stakeholders—despite possible difference across them—would generally prefer the firm to invest in the specific technology because investments in the general technology open up the possibility that the firm might (completely or partially) divest from the virus area and enter new markets. If so, the company's employees with expertise specific to the vaccine area would see the value of their accumulated experience and education in vaccines diminish substantially. Similarly, suppliers that might have fine-tuned their production for offering to the focal firm's products and services specific for the vaccine area would see the value of their investment diminish. Even hospitals that used to buy vaccines from the focal company and that have possibly invested in relation-specific infrastructure (such as special syringes or thermal container) would clearly be worse off.

because they have made relation-specific investments that are tailored to the current firm's scope and that general technologies could put at stake.

As a result, we expect firms that are keener to take stakeholders interests into account in their decisions to reduce their investment in general technologies. To be more concrete, let us consider, for instance, an environmental change that induced firms to be more responsive to the interests of all their stakeholders, thus enhancing firms' stakeholder orientation. A change in this direction was represented, in relatively recent years, by the enactment constituency statutes in several US states. These legislations have allowed public firms incorporated in those states to acknowledge the interests of stakeholders when making decisions (Mitchell 1992). However, they are generally quite vague as they do not specify all possible stakeholder groups, what the needs of each stakeholder are, nor how directors should weigh the interests of varying groups. So, the enactment of constituency statutes has most likely encouraged companies to address the common concerns of *all* stakeholder groups—such as their concern of losing their past investments in firm-specific assets. As a result, constituency statutes determined an increase in stakeholder orientation, which should be accompanied by a reduction in firms' investment in technology generality.

Overall, thus, we hypothesize the following:

H1. When a firm has a greater stakeholder orientation, the degree of generality of the technological investment it makes is lower.

The above reasoning suggests that stakeholder-oriented firms are likely to invest in less general technologies to prevent stakeholder concern that an increase in technology generality might undermine their past relationship-specific investments. If so, we expect stakeholder-oriented firms to invest in less (more) general technologies when their concern for stakeholders is stronger (weaker). This is likely to depend on the attributes of the industry in which a firm operates.

In particular, industry uncertainty is likely positively correlated with stakeholder concern about losing their relationship-specific investments because of a firm's investment in more general technology. We refer to industry uncertainty as the unpredictability of the future states of an industry because of possible exogenous variations in consumers' tastes and preferences, technological shifts, or regulatory changes (Sutcliffe and Zaheer 1998). Should an unfavorable variation occurs, a firm's management might respond by exiting the industry. Thus, in more uncertain industries, stakeholders are more afraid that the firms investing in technology generality will switch to new industries when unfavorable and unforeseen contingencies occur in the current industries. This shift will naturally undermine stakeholders' prior relationship-specific investments (Hoskisson et al. 2018). Second, in the presence of industry uncertainty, opportunistic behavior is more likely to occur: writing complete contracts that regulate the behavior of the parties under different contingencies might prove impossible when the number of possible contingencies escalates (Klein et al. 1978, Williamson 1985). Thus, stakeholders perceive a more concrete possibility that technology generality will serve the firm as a bargaining weapon to capture the value of their relationship-specific investments.

One could argue that stakeholders, especially in more uncertain environments might support firms' investments in technology generality, as these would increase the chance of firm surviving amidst unpredicted industry economic downturns, by entering new industries. However, this reasoning neglects two important considerations. First, higher uncertainty entails a higher chance of both industry downturns and upturns. During industry upturns, firms with more industry-dedicated technologies might be able to make more profits—and so possibly accumulate slack resources as cushion for when things get worse (Gambardella et al. 2021). Hence, the relationship between technology generality and survival in an uncertain industry environment is ambiguous. Second, stakeholders might not necessarily hope for their company's survival, if this implies the firm divesting from the current industry and entering a new one. In a different industry, stakeholders' past firm-specific investments would be less valuable and, as such, stakeholders might appropriate a lower portion of the value created—or even see their relationship with the firm terminated. So, from the stakeholders' point of view, failure in the *focal* industry might be as bad as survival in a *new* industry.

Overall, we conclude that under higher industry uncertainty, stakeholders are more concerned about losing their relationship-specific investments because of an increase in technology generality. Hence, they would more strongly oppose firms' investments in more general technologies. To avoid this, stakeholder-oriented firms will invest in technologies characterized by a lower degree of generality.

Thus, we hypothesize the following:

H2. The negative effect of a firm's stakeholder orientation on the degree of generality of its technological investment is stronger in more uncertain industries.

A second industry attribute affecting stakeholder concern about losing their relationship-specific investments should a firm invest in more general technologies is industry competition—or the extent to which an industry is characterized by the presence of many firms, each with low market power. The intuition here is that, in this circumstance, stakeholders make less relationship-specific investments, opting instead for investments that are more deployable across different firms. This naturally translates into a lower concern of losing prior investments in the case of a change in the firm's scope.

This line of reasoning applies to different types of stakeholders. For instance, as outlined by Becker (1962), employees might invest in skills that are easily transferable across different companies vs. relationship-specific skills that are not redeployable elsewhere. Employees working in a competitive industry that is populated by many potential employers will find it relatively more convenient to invest in skills usable across firms in the industry or possibly across industries (Fallick et al. 2006), hence being less prone to make relationship-specific investments. Also, suppliers often face the decision to make investments tailored to the needs of a certain customer firm versus investments redeployable across several potential customers (Hoskisson et al. 2018). Suppliers facing a competitive downstream market that is populated by several potential customer companies will probably invest more in assets usable with several of those customers or even with customers across industries rather than in assets specific to a few of them (Cen et al. 2016, Conti et al. 2019a).

Overall, we suggest that in more competitive industries, stakeholders make less relationship-specific investments. Therefore, they are less concerned about the risk of losing these investments if the focal firm invests in more general technologies and eventually changes its scope. As a result, in more competitive environments, stakeholders react less negatively to an increase in technology generality, and stakeholder-oriented firms invest in more general technologies. Therefore, we advance the following:

H3. The negative effect of a firm's stakeholder orientation on the degree of generality of its technological investment is weaker in more competitive industries.

METHODS

Sample and Data

To investigate how a firm's stakeholder orientation influences the generality of the technologies in which the firm invests, we focus on the effect of stakeholder orientation on the generality of a firm's patents. There are relevant practical advantages to concentrating our empirical analyses on patents to map firm technologies. First, the information on patents is completely codified and public. Second, there are well-established measures of patent usage-generality, such as the generality index developed by Hall et al. (2001) and that is based on forward citations.

In our dataset, we include all granted patents whose application was filed in the United States by a public firm during the period 1976–2000. We focus on patented technologies whose assignee is a public company incorporated in a U.S. state. The information about patents comes from the most recent update of the National Bureau of Economic Research (NBER) patent database (www.nber.org/patents), which provides citations for all U.S. patents granted from 1976 to 2006. Using public firms is, first, consistent with our focus on firm stakeholder orientation, which is particularly salient in the context of public companies. Moreover, for public firms, it is relatively easy to identify subsidiaries over time, ensuring that each patent is assigned to the proper assignee. We use the concordance file provided by Bessen

(2009) to connect the assignee identification number of the NBER patent data set with the Compustat GVKEY identification number. These connections reveal the firms and subsidiaries identified in the "Who Owns Whom?" database. Ownership may change through mergers, acquisitions, or spinoffs, and when an organization is acquired/merged/spun-off, its patents likely go to the new owner. These changes were tracked using data on the mergers and acquisitions of public companies reported in the SDC database. In total, we could gather data on 466,058 U.S. patents, applied for during the period 1976–2000, and eventually granted to public companies, as the sample in the empirical analysis.

The selection of the time period was mainly because of practical reasons. First, it was exactly during this period that 34 U.S. states enacted the so-called constituency statutes, allowing corporate directors to consider stakeholders' interests when making business decisions. As such, they provide exogenous variation in the importance that U.S. public corporations attribute to the interests of nonfinancial stakeholders (Flammer and Kacperczyk 2016, Karpoff and Wittry 2018). Second, the last version of the NBER patent database includes information about all utility patents granted from January 1976 to December 2006. Thus, it is natural to begin our analysis with 1976 and end it with 2000 because after this date, it would be difficult to obtain a reliable measure of the number of received forward citations—which is the basis for computing Hall et al.'s (2001) generality index.

Variables

Independent variable

A firm's stakeholder orientation is the extent to which it prioritizes the welfare of its stakeholders. In principle, measuring such a construct is quite problematic. First, datasets measuring the extent to which companies implement policies to address the needs of their stakeholders, such as the Kinder, Lydenberg, Domini & Co. (KLD) database, do so for a limited number of years and for a nonrandom subset of the largest U.S. public companies. Second, any variable measuring stakeholder orientation based on the voluntary implementation of policies by a firm's management might correlate with unobservable managerial preferences such that its use would necessarily lead to endogeneity bias. Therefore, consistent with previous research (Luoma and Goodstein 1999, Atanassov 2013, Flammer and Kacperczyk 2016, Ni 2020), we use the U.S. states' enactment of constituency statutes—statutes allowing firms to acknowledge the interests of stakeholders, including firms' employees, suppliers, and customers, when making decisions (Mitchell 1992)—as an *exogenous* increase in stakeholder orientation, or in the extent to which firms consider the interest of their stakeholders as a corporate priority.

It is worth noting two aspects of constituency statutes that make them an ideal exogenous measure of stakeholder orientation. First, previous research has shown that the enactment of constituency statutes has led to a significant increase in the extent to which companies are attentive to the needs of *all* their stakeholders and, hence, implement policies in the stakeholders' favor. Indeed, both Atanassov (2013) and Flammer (2018) find that the enactment of constituency statutes is associated with a sizable increase—between 9 percent and 20 percent—in the number of corporate actions toward stakeholders, as reported by KLD data. Similarly, Luoma and Goodstein (1999) find that constituency statutes have induced firms to have boards of directors more aligned to stakeholders' interests. To be sure, we do not expect all firms to react by increasing their level of stakeholder orientation. However, we expect the introduction of the statutes to lead *at least some firms* to increase their degree of stakeholder orientation, which, therefore, on average, will increase. Hence, if our regression analysis reveals that the average level of investment in technology generality has decreased for firms operating in the states in which the statutes were enacted in the period subsequent to their introduction, this can be interpreted as evidence of the hypothesized relationship.

Second, statutes offer plausibly exogenous variation in a firm's orientation toward stakeholders. The introduction of the statutes has not depended on any particular firm's strategic decision or lobbying activity[3]. Rather, they have been the result of a large debate over corporations' purposes and legal

[3] Notably, according to Karpoff and Wittry (2018), only a very limited number of companies (eight) have possibly been involved in the lobbying for these laws and only in a very few states (five). Hence, overall, constituency statutes can be considered as completely exogenous for the vast majority of firms in our sample.

obligation to society; this debate has also been reflected in court decisions, which, historically, have deferred to a shareholder view, according to which the corporations' main responsibility is to serve the interest of stockholders (e.g., Orts 1992). This has resulted in the general tendency of managers to favor the interest of shareholders to prevent the risk of potential lawsuits. However, in recent years, an increasingly growing group of management, economics, and law scholars have argued that a broad variety of non-shareholding constituencies have legitimate interests in a corporation's actions because such constituencies affect and are affected by firm decisions. Influenced by this scholarly debate, policymakers have enacted constituency statutes that give corporate leaders a legally enforceable mechanism—beyond case law and business judgment rule—for considering stakeholder interests without incurring the risk of being sued for doing so (Orts 1992).

The statutes' key principle is that a corporation's decisions should, or at least may, be made in the interests of nonfinancial stakeholders, including employees, customers, suppliers, the environment, the local community, and any other potentially affected constituency. For example, the Pennsylvania statute says that "the board of directors, committees of the board and individual directors of a domestic corporation may, in considering the best interests of the corporation, consider the effects of any action upon employees, upon suppliers and customers of the corporation and upon communities in which offices or other establishments of the corporation are located, and all other pertinent factors" (15 Pa. Cons. Stat. § 516(a)). Table 1 lists all the states that have enacted a constituency statute and the year of their enactment (which we collected from Karpoff and Wittry 2018).

Insert Table 1 about here

The state of incorporation (and not that of location) is what determines which constituency statute, if any, applies to a given company. Indeed, the state of incorporation establishes the laws that determine the corporate governance of the company, including whether managers should strategize only in the interests of their shareholders or instead should or might also consider the interests of their stakeholders (Bertrand and Mullainathan 2003, Karpoff and Wittry, 2018). Therefore, we would expect that if a company's state of incorporation has enacted constituency statutes, the management of that company will be entitled to consider stakeholders' interests when making business decisions, including the type of technology to develop[4]. We obtain information on states of incorporation from Compustat. Whereas Compustat reports the state of incorporation for only the latest available year, anecdotal, and empirical evidence suggests that changes in the states of incorporation are rare (e.g., Romano 1993). In line with this, Cheng et al. (2004) report that none of the 587 Forbes 500 firms in their panel changed their state of incorporation during their sample period of 1984–1991.

Dependent variable

To measure the generality of a firm's technological investments, we focus on patents, and we measure the generality of firms' patented technologies. There are at least two advantages to using a patent generality measure in our context. First, the fact that information on patents is completely codified and public reduces any measurement bias that would affect investments in other technological assets that are difficult to quantify, either because firms tend to strategically avoid releasing information about these assets (e.g., trade secrets) or because these assets are inherently hard to measure (e.g., tacit knowledge). Second, there are well-established measures of patent generality, such as the generality index developed by Hall et al. (2001), which we use in the current paper.

The measure is built based on the definition that technology is more general when it can easily be deployed or redeployed across a larger number of domains. In the context of patented technologies, all technologies are assigned to a certain technological domain by a patent examiner at the time of patent application. The "use" of patented technologies by subsequent technologies can be tracked based on their

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[4] For this reason, previous studies have used the state of incorporation as the relevant state for assessing the effect of changes in laws affecting firms' corporate governance. This is, for instance, what, among others, Bertrand and Mullainathan (2003) do in their seminar papers on the relationship between corporate governance laws and firms' decision (including R&D decisions). Or what, more recently, has been done by Karpoff and Wittry (2018).

forward citations: if a follow-up technology builds on a focal technology, the patent document related to the follow-up technology is expected to cite the patent of the focal technology.[5] Thus, Hall et al.'s (2001) index builds on the idea that considering the dispersion of a focal patented technology's forward citations is a straightforward way to identify its generality. The more general a certain type of technology is, the more it will be cited by patents classified in a diversified set of technological classes, as opposed to being cited by patents in a narrow set of technological domains. In more detail, Hall et al.'s (2001) measure of technology generality is built as 1 minus the Herfindahl index of concentration of a patent's forward citations in technological classes, as defined by the International Patent Classification (IPC) of technological classes. In formula:

$$\text{Generality}_i = 1 - \sum_{j}^{n_i} s_{ij}^2 \quad (1)$$

where s_{ij} denotes the percentage of citations received by patent i that come from the patents classified in class j, out of the n_i patent classes where the patent is cited. Based on (1), if a patent receives citations from patents classified into several different fields, the generality measure will be high; instead, if the citations come from patents classified in only a few fields, it will be low (close to zero). This measure might be downward biased when the total number of forward citations to the focal patent is small. To correct for this bias, we follow Hall et al. (2001) and obtain a corrected measure of technology generality by multiplying the previous measure for N_i/N_i-1, where N_i is the total number of citations received by the focal patent. As robustness checks, we also replicate our analysis using alternative measures of generality: the generality index built using all IPC technological classes contained in the citing patent documents (as opposed to using only the main class of the citing patent document), and the number of technological classes associated with a patent.

[5] In every patent, some citations are included by the inventor, whereas other are included by the patent examiner. In the context of our work, it is not relevant to disentangle between the citations included by the inventor vs. those included by the examiner. Both types of citations are indeed indicative of the degree of generality of the technology because both types capture the extent to which a focal patent is used—in the case of citations included by the inventor—or at least potentially usable—in the case of citations included by the examiner—in the same domain in which it was originally conceived vs. in a different domain.

Moderating variables

To test hypothesis 2, we construct an annual measure of industry uncertainty, following Jurado et al. (2015) and Bloom et al. (2018). More specifically, we estimate a firm profit forecasting equation by computing the residuals of that equation (which represent the unpredictable profit component), and then, we compute the yearly cross-sectional standard deviation of such residuals for all firms operating in a certain industry (as defined by the SIC two-digit level) and year. Per the form of the profit forecasting equation, we regress current firm profitability (as measured by industry return on assets) on the profitability of the previous year, including firm fixed effects and a (linear) time trend. To test hypothesis 3 and assess the moderating effect of industry competition on the relationship between stakeholder orientation and technology generality, we compute (1 minus) the Herfindahl-Hirschman index of market concentration, here based on the sales of each company in any industry (as defined by SIC two-digit level) and year.

Control variables

Even though we believe our treatment to be exogenous, we include a number of additional and relevant controls that might affect the dependent variable as a way to improve the efficiency of our estimates. We include technological category fixed effects—a dummy variable for each of the 37 technological categories defined by Hall et al. (2001)—to control for any heterogeneity in generality inherent in specific technological fields. At the firm level, we control for several variables that might affect the degree of generality of technologies produced by a firm, such as company size, company age, the amount of money invested in R&D, and company profitability level, cash holdings, and leverage. Size is measured as the natural logarithm of 1 plus the overall number of employees. Age is measured as the natural logarithm of 1 plus the number of years since the company was first covered by Compustat. Profitability is measured as the ROA or the ratio of earnings before interest and taxes to the book value of total assets. R&D is the natural logarithm of 1 plus R&D expenses. Cash holdings are the ratio of cash and short-term investments to the book value of total assets. Leverage is measured as the sum of long-term debt and debt in current liabilities divided by the stockholders' total equity. Because some companies do not specify the level of their R&D expenditures, following previous literature, we set the missing values equal to zero and include an additional control that indicates missing R&D values (see, e.g., Hall et al. 2005, Flammer and Kacperczyk 2016). We control for firm fixed effects, which account for any time-invariant firm heterogeneity—including the industry where the firm operates, which is quite stable over time. We also control for the (logarithm of) number of business segments in which the firm was active in any given year. Furthermore, we control for both the state of incorporation and year dummies[6]. Including these controls implies that, as we will describe in detail in the next section, we are using a difference-in-differences framework with multiple treatment units (i.e., states) and multiple treatment periods (i.e., years). To be sure, for companies that do not change their state of incorporation in the sample period—which are the vast majority—the state of incorporation fixed effects is naturally subsumed in the firm fixed effects, which we also include in our specifications. Table 2 provides the summary statistics of the variables used in the empirical analysis, as well as the pairwise correlations between these variables.

Insert Table 2 about here

Empirical Strategy

To analyze how an increase in a firm's orientation toward stakeholders influences technology generality, we use a difference-in-differences methodology based on the enactment of the 34 constituency statutes between 1976 and 2000, as listed in Table 1 (which constitute our "treatments"). Since the introduction of the constituency statutes is staggered over time, the composition of both the treatment and the control groups changes over time as more states are progressively treated. Overall, our approach is similar to Bertrand and Mullainathan's (2003) application of the difference-in-differences methodology in the

[6] Our results are also robust to including state of location fixed effects, state of location times year fixed effects, industry fixed effects (analyses available upon request).

presence of staggered treatments at the state level. Specifically, we estimate the following regression at the patented-technology level:

$$Generality_{ifst} = \beta 1 * Constituency\ Statute_{st} + \gamma * X + \varepsilon_{ifst} \quad (2)$$

where i indexes patents; f indexes firms; t indexes years; and s indexes states of incorporation. Generality is the dependent variable of interest; Constituency Statute is the “treatment dummy,” which is a dummy variable that equals 1 if the company is incorporated in a state that has passed a constituency statute by year t and 0 otherwise. The letter ε is the error term. Following Bertrand and Mullainathan (2003), to account for serial correlation of the error term, we cluster standard errors at the state of incorporation level (which is the level at which the treatment occurs). X is the vector of (one-period-lagged) control variables, including state and year fixed effects. Performing the analysis at the technology level is theoretically consistent with our theory, in which we focus on the type of technology in which a firm is investing. Furthermore, the natural alternative of aggregating the data at the firm (or even at the state) level would not allow us to control for the technological field where the firm is investing; it would also give equal weight to any firms (or states), regardless of whether and the extent to which they are investing in any new assets.

Equation (2) is estimated by using ordinary least squares (OLS). The coefficient of interest is β1, which measures the effect of constituency statutes on technology generality. Hypothesis 1 predicts that β1 is negative and significant.

To test hypotheses 2 and 3 about the differential effect of an increase in stakeholder orientation—as proxied by the enactment of constituency statutes—across industries, we interact our treatment with the previously defined variables measuring industry uncertainty and industry competition. In more detail, we estimate the following models:

$$Generality_{ifst} = β1*Constituency\ Statute_{st} + β2*Constituency\ Statute_{st}*Uncertainty + γ*X + ε_{ilst}\ (3)$$

$$Generality_{ifst} = β1*Constituency\ Statute_{st}+ β3*Constituency\ Statute_{st}\ *Competition + γ*X + ε_{ilst}\ (4)$$

Based on hypothesis 2, we expect β2 to be negative—such that the negative effect of stakeholder orientation on technology generality is greater in more uncertain industries. Instead, based on hypothesis 3, we expect β3 to be positive, meaning that the negative effect of stakeholder orientation on technology generality will be weaker in more competitive industries.

RESULTS

Main Results

To provide some preliminary evidence of the hypothesized effects, we start from a univariate difference-in-differences analysis. Because our treatment—or the enactment of constituency statutes—has a staggered enactment—that is, different states have been "treated" in different years—doing a univariate difference-in-differences test of our theory implies the nontrivial choice of defining a common before and after for all treated and control states. The constituency statutes were mostly enacted between 1985 and 1990 (cf. Table 1). Therefore, we have excluded any years between 1985 and 1990, and we have considered all years before 1985 as our "before" period and all years after 1990 as our "after period." Also, for testing hypotheses 2 and 3, we have to dichotomize our continuous moderating variables (industry uncertainty and competition). Thus, we define a patent as generated in a high uncertainty (competition) industry if the assignee is in an industry with an above-the-average value of uncertainty (competition) compared with other patents in our sample. In this way, the analysis becomes a univariate difference-in-difference-in-differences because we assess the before versus after effect of the treatment on the generality of patents generated by treated versus control firms in high versus low uncertainty (competition) industries.

The univariate analysis provides preliminary support to our hypothesis. As predicted by our hypothesis 1, the enactment of constituency statutes significantly decreases by 0.007 the level of generality of technologies treated firms are investing in vis-à-vis control firms (p=0.002). This coefficient corresponds to about a 1.3 percent decrease in the average technology generality, here considering that the average value of generality in our sample is, as Table 2 shows, 0.548. Second, the univariate difference-in-difference-in-differences analysis shows that the negative effect of stakeholder orientation on technology generality is stronger of high- versus low-uncertainty industries, which is consistent with hypothesis 2 (β=-0.011, p=0.047) but weaker in high- versus low-competition industries, which is consistent with hypothesis 3 (β=0.048, p=0.000).

Insert Table 3 about here

The findings of the univariate difference-in-differences analyses are promising and provide preliminary support for our theory. However, they need to be corroborated in multivariate framework. Hence, we begin by assessing the effect of constituency statutes—which represent an increase in the firms' stakeholder orientation, here on patent generality—which constitutes our measure of technology generality. Table 4 shows the results. Based on the simplest specification of column 1, the enactment of constituency statutes is generally associated with a decrease in technology generality of 0.014, and the effect is statistically significant (p=0.004). This coefficient corresponds to about a 2.6 percent decrease in the average technology generality, here considering the average value of generality in our sample. At first sight, the size of the effect might appear small. However, it must be considered that the enactment of a constituency statute in a state does not oblige the firms in that state to become more stakeholder oriented. Rather, it merely *allows* firms to become more stakeholder oriented without incurring the risk of being sued by shareholders. Hence, our analysis only captures the effect of an increase in stakeholder orientation on that subset of companies that, following the enactment of constituency statutes, have chosen to become more stakeholder oriented. This implies that the effect of the constituency statutes that we observe is a conservative estimate of the real effect of stakeholder orientation on our dependent variable. Moreover, the negative effect of constituency statutes on technology generality is substantially confirmed across all specifications we use. In particular, it holds valid both when including controls for firm-level variables (Table 4, column 2) and when restricting the time window around the enactment of constituency statutes to plus/minus five (10) years to capture their effect net of any other shock occurring around the same time (Table 4, columns 3 and 4). Overall, we can conclude that our results broadly support hypothesis 1.

Insert Table 4 about here

We next analyze how the impact of an increase in stakeholder orientation changes according to the industry-level factors on which we focus on in our theory. Based on hypothesis 2, we argue that the negative effect of constituency statutes should be greater in more uncertain sectors. The findings in Table 5 support our expectation. As shown in column 1, the interaction between constituency statutes and our industry-level measure of uncertainty is negative and statistically significant at the conventional level (β=-0.001, p=0.000). A one standard deviation increase in uncertainty (6.827) increases the negative effect of stakeholder orientation by a not large but still economically meaningful amount (about 0.007), here considering the average value of technology generality in our sample (0.548).

Hypothesis 3 is also supported (Table 5, column 3). Consistent with our expectation the interaction between the enactment of constituency statutes and industry competition is positive and statistically significant. Furthermore, the coefficient representing this interaction also constitutes an economically significant effect (β=0.024, p=0.007). Specifically, a one standard deviation increase in competition (0.086) reduces the negative effect of stakeholder orientation on technology generality by 0.002.

Insert Tables 5 about here

Notably, all our results are robust to using alternative measures of generality. Indeed, we tried an alternative patent generality measure built using all IPC classes (rather than only the main class) of the citing patent documents. As Table 6 shows, the findings are completely consistent with those obtained using Hall et al.'s (2001) measure of generality that we have used in the main analyses. Furthermore, one might be concerned that a measure of generality based on forward citations might also capture technological value. This is unlikely to be the case. In fact, in our sample, technological generality and forward citations are, if anything, slightly negatively correlated. In addition, the generality index proposed by Hall et al. (2001) includes a correction that takes into account the number of citations. However, to address this issue, we also replicate the analyses: (a) controlling for the number of forward citations a patent receives and (b) using the number of IPC classes with which the patent has been associated by the patent examiner at the time of application as an alternative measure of technology generality (Lerner 1994, Novelli 2015). Overall, the results (available upon request) are largely consistent with our theory.

Insert Table 6 about here

Validity of the Identification Strategy

Our difference-in-differences methodology relies on a few but basic assumptions. First, the treated and control units (i.e., states) should display a similar trend before the treatment (i.e., the enactment of constituency statutes). Second, our treatment should be exogenous—that is, unrelated to any state characteristics related to our dependent variable (technology generality as proxied by patent generality). We assess the validity of such assumptions with several robustness checks.

Parallel trend. Our methodological approach—difference-in-differences—relies on the parallel-paths assumption, which states that the average change in the outcome for the treated in the absence of treatment should equal the average change in the outcome for the nontreated. To verify that there were no divergent trends across states before the change in stakeholder orientation—and to assess how the constituency statutes' effect occurs over time—we construct a dynamic difference-in-differences model, here by using a set of dummies that measure the distance in years from the enactment of the law before and after its introduction. Specifically, we replace the treatment dummy with a set of dummy variables up to three years before the treatment and up to five years following the treatment. The coefficients reported in models 1—also displayed by Figure 1—and 2 of Table 7 indicate that there is no difference across states in the patterns of entry and growth orientation of ventures founded prior to constituency statute enactments, suggesting that our results are not driven by diverging pretreatment trends. By contrast, the level of generality drastically declines precisely one year following the treatment—and then stays approximately at the same level in the following two years.

Insert Table 7 & Figure 1 about here

Another way to test the parallel trend assumption is to perform placebo tests. A first version of these placebo tests consists of performing an additional difference-in-differences estimation using a "fake treatment" group not affected by the treatment—here, by the enactment of constituency statutes—and comparing this group with the same control group as that used in the "real" difference-in-differences estimation. Here, we expect to find a zero effect. If not, the effect must derive from some underlying pretreatment difference between the fake treatment group and control group, which would cast doubts about the validity of the control group in the first place. In our case, as a fake treatment group, we choose technologies produced by U.S. public firms not incorporated in the United States—and, as such, not affected by the constituency statutes—and we set the treatment year to 1988, the year by which most constituency statutes were enacted. The control group is essentially the same as that used in the main difference-in-differences analysis because it is composed of a sample of patents applied for by U.S. public firms incorporated in U.S. states where the constituency statutes were not enacted. Table 8 (columns 1 and 2) shows the results of this placebo test. As expected, we find no significant effect of the fake treatment.

A second possible placebo test uses the "real" treatment group and compares it with an alternative control group. We expect to find not only a significant effect of the treatment, but also a point estimate of the treatment coefficient similar to that found in the main analysis. If not, the control group used in the main analysis would be questionable. To implement this placebo test, we use the sample of patents applied for by U.S. public firms not incorporated in the United States as the alternative comparison group, whereas the treatment group includes, as in our main analysis, the patents applied for by firms incorporated in states where constituency statutes have actually been enacted. The findings, which are reported in Table 8 (columns 3 and 4), show not only that the effect of constituency statutes is negative and significant, but also that the magnitude (-0.012, as reported in column 3) is very similar to that found in the main analysis (-0.013, as reported in Table 4, column 2). Overall, this reinforces the validity of our identification approach.

Insert Table 8 about here

Reverse causality. A potential criticism is that the passage of constituency statutes is determined by firms in states or, more broadly, by the economic conditions of a state. If so, the treatment would not be exogenous to our outcome. Nevertheless, this concern is mitigated because of three reasons. First, accounts of the political economy of these reforms suggest that lobbying has, in general, played a marginal role because in the vast majority of states, the enactment of constituency statutes has not been influenced by any lobbying activity (Flammer and Kacperczyk 2016, Karpoff and Wittry 2018). Second, to rule out potential reverse causality concerns, we examine the dynamics of the treatment effect. If reverse causation explains our results, then we would expect the enactment of constituency statutes to have a negative and significant "effect" already before the enactment occurs. However, we find no evidence for such preexisting trends (see Table 7). Changes in technology generality occur only after (not before or contemporaneous with) the enactment of constituency statutes. Finally, we empirically verify whether states' economic conditions have influenced the enactment of constituency statutes. Table 9 reports the results of linear probability models where the dependent variable is a dummy for the enactment of constituency statutes and the explanatory variables are the (log of) population and GDP, the number of patented technologies in a given state-year, and the average generality of technologies in a given state-year. The estimated coefficients are far from statistically significant. These results suggest that neither the main state's economic characteristics nor any variables specifically related to our technology generality measure drive the enactment of constituency statutes. This reinforces our confidence in the exogeneity of our treatment—and, as a consequence, in the causal effect of stakeholder orientation on technology generality.

Insert Table 9 about here

Unobserved differences between treated and control states. Another potential concern is that treated and control states may differ along unobserved characteristics and that these differences may correlate with the state-level characteristics related to both the enactment of constituency statutes and the types of technologies in which firms are investing. This concern, which would violate the treatment exogeneity assumption, is unlikely to explain our results for several reasons. First, as discussed earlier, we find no evidence of preexisting trends. This suggests that treated and control firms are on similar paths before the treatment. Second, to further control for possible unobserved heterogeneity, we restrict our sample to states that are more similar to each other by eliminating possible outliers such as Delaware, where most U.S. firms are generally headquartered (Table 10, column 1); California, by far the biggest U.S. state in terms of both population and GDP (Table 10, column 2); and both California and Delaware simultaneously (Table 10, column 3). Finally, to obtain a control group of states that are as similar as possible to the treated states, we exclude any state that has not yet eventually enacted a constituency statute (Table 10, column 4). Overall, results confirm that the treatment effect on technology generality remains negative and, thus, largely consistent with our theory.

Insert Table 10 about here

Other Robustness Checks

Other concerns address the reliability of our measures of both the independent and dependent variables. First, because constituency statutes have also been interpreted as antitakeover laws—because they could create obstacles to hostile takeovers based on stakeholders' interests—we replicate our analyses, including any antitakeover laws approved by U.S. states in the period considered. Second, we assess whether the findings are valid when using alternative measures of technology generality.

Controlling for antitakeover laws. Constituency statutes are considered by some authors (e.g., Karpoff and Wittry 2018) as so-called antitakeover laws, together with other regulations that aim more explicitly at reducing the likelihood of hostile takeovers—such as business combination laws, control share acquisition laws, poison pill laws, and fair price laws. Research has focused extensively on the effect that antitakeover laws might have on innovation in general (e.g., Chemmanur and Tian 2018) or on specific types of innovation (Amore and Bennedsen 2016), focusing in particular on the impact of business combination laws. Hence, it becomes crucial for the purpose of our study to ensure not only that the effect of constituency statutes is not confounded by the impact of other antitakeover laws but also that the effect of such statutes is because of an increase in stakeholder orientation rather than to any possible antitakeover effect. To do this, we replicate our analysis, including the controls for different types of the so-called second-generation antitakeover laws introduced over time by different states during the analyzed period. The results on the impact of constituency statutes on technology generality are shown in Table 11 and are largely consistent with previous analysis.

Insert Table 11 about here

Firm-level specifications. We also check whether the negative effect of the enactment of constituency statutes on technology generality is also supported when performing the analysis at the firm level. In our view, the main technology-level approach that we have adopted in the current paper produces accurate estimates of the effect of the constituency statutes on technology generality than would a firm-level analysis. First, the technology-level analysis allows us to control for technology-level variables (e.g., the technological field), which might confound the effect of the treatment. Second, it allows us to consider each technological investment made by the firm in a patent, whereas a firm-level analysis assigns equal weight to each firm, regardless of whether it has made multiple investments versus none.

In a related research article, Flammer and Kacperczyk (2016) study the effect of constituency statutes on different firm-level innovation outcomes, finding no effect on the average generality of firm patents. In the spirit of allowing a comparison of that result with those presented in the present study, we replicate our analysis at the firm level, finding a result in line with Flammer and Kacperczyk (2016) (Table 12, column 1). However, once we produce the firm-level analysis, attributing a higher weight to firms producing more technologies—which is in line with our objective of studying the effect of stakeholder orientation on individual technological investments—we find the results to be consistent with our theory. In more detail, we employ "analytic weights," which are used to account for differential precision—and importance—across observations (as in Borjas et al. 2008, Ottaviano and Peri 2012). Because the firm-level measure of generality represents the averages of different numbers of the underlying patent-level observations, it makes sense to account for this difference. In practice, this implies assigning more weight to firms whose mean is computed using a larger number of patent-level observations—the analytic weights being exactly equal to the square root of the number of patent-level observations contributing to the firm-level average generality measure. The results of the analysis at the firm level that are conducted in this way, as reported in Table 12, columns 2 through 5, corroborate the idea that a greater corporate stakeholder orientation induces firms to invest in less general technological assets.

Insert Table 12 about here

Alternative measure of uncertainty. Finally, we conducted our analyses using a different measure of industry uncertainty. Our main measure of uncertainty was computed starting from the residuals of a firm profit-forecasting equation, which represent the unpredictable profit component. Another valid measure of industry uncertainty could be computed based on the variance of companies' stock market returns. To build this alternative measure, we collected the daily stock market prices of all companies in our sample between January 1976 and December 2000. We calculated the daily returns for each company, and we averaged those returns at the industry (SIC 2 digit) level. Then we computed the unexpected component (or errors) of the industry returns via an autoregressive model, and we fitted a GARCH (1,1) model, which gave us an estimate of the predicted industry daily variance. Finally, to obtain an industry-year measure of uncertainty, we averaged the industry-daily variance at the year-industry level and annualized it. The theoretical predictions are supported even when using the new measure of industry uncertainty, as the interaction between an increase in stakeholder orientation and firm uncertainty remains negative and significant (Table 13, columns 1-2). Notably, the results are also corroborated when, before computing our measure of industry uncertainty, we exclude any diversified firms operating in more than one business segment (Table 13, columns 3-4).

Insert Table 13 about here

CONCLUSIONS

Previous research has largely investigated how stakeholder orientation influences technological investments and innovation. Yet with a few notable exceptions (Gambeta et al. 2019), the emphasis has mainly been on the amount of technological investment rather than on the *characteristics* of investment that firms decide to pursue. In the present paper, we focus on the impact of stakeholder orientation on the degree of generality of a firm's technological investment—or its scope of deployability across different business domains, which typically provides firms with the flexibility to change their organizational scope more easily. We argue that firms aiming at enhancing stakeholders' welfare avoid investing in more general technologies because these technologies enable firms to engage in major organizational changes, hence meeting the concerns and resistance of current employees, suppliers, and customers. The results of our paper largely support our theoretical predictions and provide significant contributions to several streams of research.

First, our work sheds novel light on the strategic management debate regarding the effect of stakeholder orientation on innovation. The conclusions of previous research have been mixed, with some studies pointing out how more stakeholder-oriented firms make more technological investments (e.g., Flammer and Kacperczyk 2016) and other studies instead reaching the opposite conclusion (e.g., Atanassov 2013). We reconcile these findings and offer a more nuanced picture of the relationship between stakeholder orientation and innovation. We propose that stakeholder-oriented firms might avoid investments in technologies that open up possibilities for major organizational changes. Our results that stakeholder orientation is negatively associated with the generality of technological investment is consistent with this view.

Relatedly, the current paper contributes to the research about resource redeployment and firm scope (Helfat 1994, Katila and Ahuja 2002, Helfat and Eisenhardt 2004, Folta, Johnson & O'Brien, 2006, Toh and Kim 2013, Sakhartov and Folta 2014, Toh 2014). Previous research has identified investments in more general assets that can be redeployed across multiple markets as an antecedent of organizational scope (Helfat and Eisenhardt 2004, Conti et al. 2019a, Gambardella and McGahan 2010, Sakhartov and Folta 2014) and has emphasized the role that different environmental conditions, such as uncertainty, can have in this context (Folta, Johnson & O'Brien, 2006; O'Brien & Folta, 2009). We complement research in this area by suggesting that stakeholders' concerns and opposition might be a type of redeployment cost associated with investing in and using those assets (Anand and Singh 1997, Helfat and Eisenhardt 2004, Sakhartov and Folta 2014). In doing so, the current study also highlights an interesting tension between firms' investment in more general technologies and a reduction in the welfare of stakeholders—such that technologies characterized by a high degree of generality might be less social welfare enhancing than what is commonly held (e.g., Bresnahan and Trajtenberg 1995).

Finally, the current paper contributes to the stream of research trying to bridge the resource-based view of the firm with the property rights view of the firm (see, e.g., Wang and Barney 2006, Hoskisson et al. 2018). The resource-based view considers firm resources as the main determinant of firm performance (e.g., Penrose 1959, Rumelt 1984, Wernerfelt 1984, Peteraf 1993). However, this view overlooks the dynamics related to the appropriation of the returns from investments in relationship-specific resources. A very relevant issue here is that stakeholders would not invest in valuable relationship-specific assets when there is the risk of having the returns on those investments expropriated (Hoskisson et al. 2018). Our work emphasizes that investment in less general technologies can be one firm-level mechanism that protects stakeholders' relationship-specific investments from the risk of expropriation, thus incentivizing them to invest in the development of a firm's resource base. Future research should further explore this insight.

The current paper also has some limitations. First, it focuses on public firms. Although the conflict between shareholders and stakeholders is more relevant and problematic for public firms, it would be interesting for future research to learn more about the extent to which managers of private firms consider stakeholders' interests when making technological investments. Second, the present paper focuses on patents and measures firms' investments in (more versus less general) technologies. Whereas we anticipate that our logic will easily transfer to the case of other types of resources, an extension of the investigation in this direction would certainly be valuable. Finally, the validity of our empirical findings depends on the quality of the identification strategy that we have used. In principle, we cannot completely exclude that some omitted variables (e.g., a state culture), can affect both the enactment of constituency statutes, and the type of technological investments made by firms, therefore biasing our estimates. At the same time, the several robustness checks we have conducted, as well as prior research, suggest that our identification approach is valid. However, it would be valuable for future research to further support our conclusions by replicating the analysis via different research designs, such as a (field) experiment.

Despite its limitations, the current paper has relevant implications for practitioners and policymakers. In particular, it might help make sense of some of the consequences of the digital transformation that we have observed over the last decade. Companies such as Facebook, Amazon, or Uber have been extremely successful because of their investments in technologies characterized by a high degree of generality. Yet despite their sky-high market valuation, these companies have attracted serious criticisms because of their treatment of employees, customers, and suppliers, leading several commentators to conclude that "much of the wealth created by these companies" is passed on "to a small number of insiders who own stock" instead of being distributed among stakeholders[7]. The current paper's results stimulate a reflection on whether the shareholders' benefits associated with investments in highly general digital technologies are large enough to overcome the negative impact of these investments on stakeholders. If not, what could practitioners and policymakers do to compensate for these societal costs? Assessing the broad social welfare implications of investment in technological assets with a high degree

[7]https://www.nytimes.com/2018/11/06/business/dealbook/gig-economy-equity-sec-rule-701-uber-airbnb.html

of generality and formulating possible actions and policies for correcting their negative effects on stakeholders is an interesting avenue that we entrust to future research.

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TABLES

Table 1. Constituency Statutes

State	Year	State	Year
Arizona	1987	Nebraska	1988
Connecticut	1988	Nevada	1991
Florida	1989	New Jersey	1989
Georgia	1989	New Mexico	1987
Hawaii	1989	New York	1987
Idaho	1988	North Caroline	1993
Illinois	1985	North Dakota	1993
Indiana	1986	Ohio	1984
Iowa	1989	Oregon	1989
Kentucky	1988	Pennsylvania	1990
Louisiana	1988	Rhode Island	1990
Maine	1985	South Dakota	1990
Maryland	1999	Tennessee	1988
Massachusetts	1989	Vermont	1998
Minnesota	1987	Virginia	1988
Mississippi	1990	Wisconsin	1987
Missouri	1986	Wyoming	1990

Source: Karpoff and Wittry 2018

Table 2. Descriptive Statistics and Pairwise Correlations

		Obs	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1	Technology Generality	466,058	0.548	0.326	0.000	1.000	1.000										
2	Constituency Statute	466,058	0.219	0.413	0.000	1.000	-0.043	1.000									
3	Firm Size	466,058	3.718	1.600	0.000	7.040	0.002	0.173	1.000								
4	Firm Age	466,058	3.272	0.715	0.000	3.912	0.020	0.253	0.587	1.000							
5	Firm R&D Expenditure	466,058	5.314	2.145	0.000	9.094	-0.056	0.243	0.772	0.446	1.000						
6	Firm Profitability	466,058	0.106	0.145	-30.215	0.775	-0.014	0.000	0.139	0.142	0.112	1.000					
7	Firm Cash Holdings	466,058	0.110	0.134	-0.002	0.995	-0.063	-0.140	-0.422	-0.446	-0.139	-0.140	1.000				
8	Firm Leverage	466,058	0.768	5.625	-674.828	2051.895	0.008	0.040	0.056	0.032	0.039	-0.020	-0.047	1.000			
9	Diversification	466,058	0.935	0.748	0.000	2.833	0.059	-0.001	0.386	0.373	0.189	0.036	-0.315	0.034	1.000		
10	Uncertainty	466,058	3.813	6.827	0.046	757.406	-0.047	0.149	0.072	0.006	0.170	-0.039	0.041	0.023	0.099	1.000	
11	Competition	466,058	0.923	0.086	0.173	0.993	-0.034	-0.013	-0.278	-0.088	-0.101	0.005	0.085	-0.029	-0.203	-0.117	1.000

Table 3. Impact of the Enactment of Constituency Statutes on Technology Generality, Univariate Analysis

Hypothesis 1	Generality	Standard Error	t-statistic	P>t
Before				
Control (80180)	0.577			
Treated (60049)	0.572			
Diff (T-C)	-0.006	0.002	-3.26	0.001**
After				
Control (158742)	0.529			
Treated (86939)	0.516			
Diff (T-C)	-0.013	0.001	9.67	0.000**
Diff-in-Diff	-0.008	0.002	3.38	0.002**
Hypothesis 2	Generality	Standard Error	t	P>t
Before				
Control - High Uncertainty (12071)	0.561			
Control - Low Uncertainty (68109)	0.580			
Treated - High Uncertainty (10359)	0.575			
Treated - Low Uncertainty (49690)	0.571			
Diff (T-C)	0.024	0.005	4.94	0.000**
After				
Control - High Uncertainty (63390)	0.498			
Control - Low Uncertainty (95352)	0.550			
Treated - High Uncertainty (47245)	0.497			
Treated - Low Uncertainty (39694)	0.537			
Diff (T-C)	0.013	0.003	4.55	0.000**
Diff-in-Diff-in-Diff	-0.011	0.006	-1.99	0.047*
Hypothesis 3	Generality	Standard Error	t	P>t
Before				
Control - High Competition (52275)	0.578			
Control - Low Competition (27905)	0.576			
Treated - High Competition (30656)	0.566			
Treated - Low Competition (29393)	0.578			
Diff (T-C)	-0.014	0.004	3.79	0.000**
After				
Control - High Competition (134073)	0.519			
Control - Low Competition (24669)	0.583			
Treated - High Competition (64285)	0.508			
Treated - Low Competition (22654)	0.537			
Diff (T-C)	0.034	0.003	10.06	0.000**
Diff-in-Diff-in-Diff	0.048	0.005	9.65	0.000**

Number of observations in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 4. Impact of the Enactment of Constituency Statutes on Technology Generality, Main Effect, OLS Regression

VARIABLES	(1) Technology Generality	(2) Technology Generality	(3) Technology Generality (from t-5 to t+5)	(4) Technology Generality (from t-10 to t+10)
Constituency Statutes	-0.014**	-0.013**	-0.013**	-0.011**
	(0.004)	(0.003)	(0.003)	(0.003)
Uncertainty		-0.000	0.000	0.000*
		(0.000)	(0.000)	(0.000)
Competition		-0.028	0.001	0.050
		(0.037)	(0.042)	(0.044)
Firm Size		-0.000	0.001	0.001
		(0.003)	(0.002)	(0.001)
Firm Age		-0.012**	-0.015**	-0.013**
		(0.003)	(0.002)	(0.002)
Firm R&D Expenditures		0.001	-0.001	-0.001*
		(0.002)	(0.002)	(0.001)
Firm Profitability		0.007*	0.010*	0.009*
		(0.003)	(0.004)	(0.004)
Firm Cash Holdings		0.014 †	0.012	0.013
		(0.007)	(0.008)	(0.011)
Firm Leverage		0.000*	0.000*	0.000*
		(0.000)	(0.000)	(0.000)
Firm Diversification		-0.002	0.002	0.004**
		(0.004)	(0.002)	(0.001)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.551**	0.606**	0.594**	0.546**
	(0.001)	(0.027)	(0.036)	(0.035)
Observations	466,058	466,058	431,596	361,092
R-squared	0.153	0.153	0.154	0.159

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 5. Impact of the Enactment of Constituency Statutes on Technology Generality, Main Effect and Interaction Effects, OLS Regression

VARIABLES	(1) Technology Generality	(2) Technology Generality	(3) Technology Generality	(4) Technology Generality	(5) Technology Generality
Constituency Statutes	-0.012**	-0.011**	-0.036**	-0.036**	-0.030**
	(0.003)	(0.003)	(0.007)	(0.008)	(0.009)
Constituency Statutes X Uncertainty	-0.001**	-0.001*			-0.000*
	(0.000)	(0.000)			(0.000)
Constituency Statutes X Competition			0.024**	0.025**	0.020*
			(0.007)	(0.009)	(0.009)
Uncertainty	0.000*	0.000†		-0.000	0.000†
	(0.000)	(0.000)		(0.000)	(0.000)
Competition		-0.018	-0.033	-0.026	-0.017
		(0.039)	(0.045)	(0.036)	(0.038)
Firm Size		-0.000		-0.000	-0.000
		(0.003)		(0.003)	(0.003)
Firm Age		-0.012**		-0.012**	-0.012**
		(0.003)		(0.003)	(0.003)
Firm R&D Expenditures		0.001		0.001	0.001
		(0.002)		(0.002)	(0.002)
Firm Profitability		0.008**		0.007*	0.008**
		(0.003)		(0.003)	(0.003)
Firm Cash Holdings		0.013†		0.013†	0.012†
		(0.007)		(0.006)	(0.007)
Firm Leverage		0.000*		0.000*	0.000*
		(0.000)		(0.000)	(0.000)
Firm Diversification		-0.002		-0.002	-0.002
		(0.004)		(0.004)	(0.004)
Firm Fixed Effects	Included	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included	Included
Constant	0.551**	0.599**	0.582**	0.604**	0.597**
	(0.001)	(0.028)	(0.041)	(0.026)	(0.028)
Observations	466,058	466,058	466,058	466,058	466,058
R-squared	0.153	0.153	0.153	0.153	0.153

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 6. Impact of Enactment of Constituency Statutes on Technology Generality, Alternative Measure of Technology Generality: All Citing Patents Classes

VARIABLES	(1) Technology Generality (All Classes)	(2) Technology Generality (All Classes)	(3) Technology Generality (All Classes)	(4) Technology Generality (All Classes)
Constituency Statutes	-0.010**	-0.008**	-0.033**	-0.027**
	(0.003)	(0.003)	(0.008)	(0.008)
Constituency Statutes X Uncertainty		-0.000*		-0.000*
		(0.000)		(0.000)
Constituency Statutes X Competition			0.026*	0.021*
			(0.010)	(0.009)
Uncertainty	-0.000	0.000*	-0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Competition	-0.023	-0.014	-0.021	-0.012
	(0.030)	(0.032)	(0.029)	(0.031)
Firm Size	-0.005*	-0.005*	-0.005*	-0.005*
	(0.002)	(0.002)	(0.002)	(0.002)
Firm Age	-0.019**	-0.019**	-0.019**	-0.019**
	(0.002)	(0.002)	(0.002)	(0.002)
Firm R&D Expenditures	0.003	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Firm Profitability	0.001	0.002	0.001	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Firm Cash Holdings	0.012	0.011	0.011	0.011
	(0.008)	(0.008)	(0.007)	(0.007)
Firm Leverage	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Diversification	-0.002	-0.001	-0.002	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.588**	0.581**	0.585**	0.579**
	(0.016)	(0.017)	(0.015)	(0.016)
Observations	466,058	466,058	466,058	466,058
R-squared	0.185	0.185	0.185	0.185

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 7. Dynamic Difference-in-Differences Model

VARIABLES	(1) Technology Generality	(2) Technology Generality
t-3	0.002	0.003
	(0.005)	(0.005)
t-2	-0.001	0.001
	(0.005)	(0.005)
t-1	-0.001	0.001
	(0.006)	(0.006)
t	-0.003	-0.001
	(0.004)	(0.005)
t+1	-0.010*	-0.008
	(0.004)	(0.005)
t+2	-0.010*	-0.008†
	(0.004)	(0.004)
t+3	-0.011†	-0.009
	(0.006)	(0.006)
t+4	-0.018**	-0.016**
	(0.005)	(0.005)
Uncertainty		-0.000
		(0.000)
Competition		-0.024
		(0.038)
Firm Size		-0.000
		(0.003)
Firm Age		-0.012**
		(0.003)
Firm R&D Expenditures		0.001
		(0.002)
Firm Profitability		0.007*
		(0.003)
Firm Cash Holdings		0.013†
		(0.007)
Firm Leverage		0.000*
		(0.000)
Firm Diversification		-0.002
		(0.004)
Firm Fixed Effects	Included	Included
Year Fixed Effects	Included	Included
Technology Categories Fixed Effects	Included	Included
State Fixed Effects	Included	Included
Constant	0.553**	0.605**
	(0.003)	(0.027)
Observations	466,058	466,058
R-squared	0.153	0.153

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 8. Placebo Tests

VARIABLES	(1) Technology Generality	(2) Technology Generality (from t-5 to t+5)	(3) Technology Generality	(4) Technology Generality (from t-5 to t+5)
Placebo Treatment	-0.007	0.001		
	(0.007)	(0.004)		
Constituency Statutes			-0.012**	-0.006*
			(0.004)	(0.002)
Uncertainty	0.000†	0.000†	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Competition	0.013	-0.081**	-0.075**	-0.096**
	(0.062)	(0.025)	(0.018)	(0.013)
Firm Size	0.006	0.005	0.006	0.013**
	(0.005)	(0.010)	(0.006)	(0.004)
Firm Age	-0.008*	0.002	-0.003	-0.003**
	(0.003)	(0.003)	(0.002)	(0.001)
Firm R&D Expenditures	0.000	0.003†	0.006*	0.006**
	(0.002)	(0.001)	(0.002)	(0.001)
Firm Profitability	0.008†	0.002	0.019	0.036**
	(0.004)	(0.003)	(0.012)	(0.013)
Firm Cash Holdings	0.009	0.023*	0.016*	0.034**
	(0.008)	(0.009)	(0.007)	(0.012)
Firm Leverage	-0.000	-0.000	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Diversification	0.001	0.003†	-0.010**	0.004
	(0.002)	(0.001)	(0.003)	(0.007)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.521**	0.576**	0.552**	0.524**
	(0.016)	(0.075)	(0.042)	(0.032)
Observations	488,856	181,272	384,300	279,334
R-squared	0.148	0.141	0.124	0.123

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 9. Impact of State Economic and Political Characteristics on the Probability of Enacting Constituency Statutes

	(1)	(2)	(3)
VARIABLES	Enactment of Constituency Statutes	Enactment of Constituency Statutes	Enactment of Constituency Statutes
Log GDP	0.069	0.064	0.064
	(0.076)	(0.075)	(0.075)
Log Population	-0.192	-0.196	-0.196
	(0.155)	(0.155)	(0.154)
Log Number of Patents		0.005	0.005
		(0.005)	(0.006)
Log State Average Technology Generality			-0.004
			(0.033)
Year Fixed Effects	Included	Included	Included
State Fixed Effects	Included	Included	Included
Constant	2.136	2.235	2.235
	(2.097)	(2.082)	(2.081)
Observations	899	899	899
R-squared	0.139	0.139	0.139
Number of States	51	51	51

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 10. Impact of Enactment of Constituency Statutes on Technology Generality, Excluding Outlier States or Including only Treated States

VARIABLES	(1) Technology Generality Excluding companies incorporated in Delaware	(2) Technology Generality Excluding companies incorporated in California	(3) Technology Generality Excluding companies incorporated in Delaware OR California	(4) Technology Generality Including only companies incorporated in treated states
Constituency Statutes	-0.011**	-0.014**	-0.012**	-0.011**
	(0.003)	(0.003)	(0.003)	(0.002)
Uncertainty	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Competition	-0.074*	-0.028	-0.075*	-0.075*
	(0.029)	(0.038)	(0.029)	(0.030)
Firm Size	-0.006	-0.000	-0.005	-0.006
	(0.005)	(0.003)	(0.005)	(0.005)
Firm Age	-0.006	-0.012**	-0.009	-0.009
	(0.007)	(0.003)	(0.007)	(0.009)
Firm R&D Expenditures	0.004	0.001	0.004	0.004
	(0.004)	(0.002)	(0.004)	(0.004)
Firm Profitability	0.006	0.006*	0.004	0.006
	(0.011)	(0.003)	(0.013)	(0.014)
Firm Cash Holdings	0.025†	0.011†	0.016	0.020†
	(0.012)	(0.006)	(0.011)	(0.011)
Firm Leverage	0.000	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Diversification	-0.008**	-0.002	-0.007**	-0.008**
	(0.002)	(0.004)	(0.002)	(0.002)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.640**	0.606**	0.646**	0.652**
	(0.051)	(0.028)	(0.052)	(0.058)
Observations	193,141	461,066	188,149	179,920
R-squared	0.138	0.153	0.137	0.131

Robust standard errors clustered by state in parentheses, ** $p<0.01$, * $p<0.05$, † $p<0.1$

Table 11. Impact of Enactment of Constituency Statutes on Technology Generality, Controlling for Antitakeover Laws

VARIABLES	(1) Technology Generality	(2) Technology Generality	(3) Technology Generality	(4) Technology Generality
Constituency Statutes	-0.014**	-0.013**	-0.013**	-0.014**
	(0.003)	(0.003)	(0.004)	(0.004)
Business Combination Statute	0.006†	0.005†	0.008*	0.007†
	(0.003)	(0.003)	(0.004)	(0.003)
Poison Pill Endorsement Statute			0.001	0.002
			(0.005)	(0.004)
Fair Price Statute			-0.006	-0.005
			(0.004)	(0.004)
Control Share Acquisition Statute			0.009†	0.008
			(0.005)	(0.005)
Uncertainty		-0.000		-0.000
		(0.000)		(0.000)
Competition		-0.029		-0.021
		(0.037)		(0.037)
Firm Size		-0.000		-0.001
		(0.003)		(0.003)
Firm Age		-0.012**		-0.012**
		(0.003)		(0.003)
Firm R&D Expenditures		0.001		0.001
		(0.002)		(0.002)
Firm Profitability		0.007*		0.007*
		(0.003)		(0.003)
Firm Cash Holdings		0.014†		0.012†
		(0.007)		(0.007)
Firm Leverage		0.000*		0.000*
		(0.000)		(0.000)
Firm Diversification		-0.002		-0.002
		(0.004)		(0.004)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.548**	0.603**	0.546**	0.599**
	(0.002)	(0.027)	(0.002)	(0.029)
Observations	466,058	466,058	466,058	466,058
R-squared	0.153	0.153	0.153	0.153

Robust standard errors clustered by state in parentheses, ** $p<0.01$, * $p<0.05$, † $p<0.1$

Table 12. Impact of Enactment of Constituency Statutes on Technology Generality, Firm-level Analysis

VARIABLES	(1) Technology Generality	(2) Technology Generality (Analytic Weights)	(3) Technology Generality (Analytic Weights)	(4) Technology Generality (Analytic Weights), from t-10 to t+10	(5) Technology Generality (Analytic Weights), from t-5 to t+5
Constituency Statutes	0.004	-0.017**	-0.015**	-0.013**	-0.009**
	(0.006)	(0.005)	(0.003)	(0.003)	(0.002)
Uncertainty			-0.000	-0.000	0.000†
			(0.000)	(0.000)	(0.000)
Competition			-0.068	-0.042	0.011
			(0.044)	(0.053)	(0.057)
Firm Size			0.001	0.003	0.005**
			(0.005)	(0.003)	(0.001)
Firm Age			-0.012**	-0.017**	-0.014**
			(0.004)	(0.003)	(0.002)
Firm R&D Expenditures			-0.000	-0.002	-0.003**
			(0.003)	(0.002)	(0.001)
Firm Profitability			0.014**	0.018**	0.015**
			(0.005)	(0.007)	(0.004)
Firm Cash Holdings			0.008	0.006	0.010
			(0.006)	(0.006)	(0.011)
Firm Leverage			0.000**	0.000**	0.000**
			(0.000)	(0.000)	(0.000)
Firm Diversification			-0.004	0.001	0.002*
			(0.004)	(0.001)	(0.001)
Firm Fixed Effects	Included	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included	Included
Constant	0.574**	0.552**	0.646**	0.639**	0.579**
	(0.001)	(0.001)	(0.044)	(0.056)	(0.049)
Observations	22,102	22,102	22,102	20,646	17,675
R-squared	0.382	0.677	0.679	0.678	0.687

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Table 13. Alternative Measure of Uncertainty

VARIABLES	(1) Technology Generality	(2) Technology Generality	(3) Technology Generality	(4) Technology Generality
Constituency Statutes	-0.013**	-0.008**	-0.011**	-0.011**
	(0.003)	(0.003)	(0.003)	(0.003)
Constituency Statutes X Uncertainty		-0.141*		-0.006**
		(0.061)		(0.001)
Uncertainty	-0.054	0.023	-0.001	0.003**
	(0.039)	(0.027)	(0.001)	(0.001)
Competition	-0.025	-0.009	-0.053*	-0.052*
	(0.035)	(0.037)	(0.023)	(0.023)
Firm Size	-0.000	-0.001	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Firm Age	-0.012**	-0.012**	-0.010**	-0.010**
	(0.003)	(0.003)	(0.003)	(0.003)
Firm R&D Expenditures	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Firm Profitability	0.007*	0.008*	0.008*	0.008*
	(0.003)	(0.003)	(0.003)	(0.003)
Firm Cash Holdings	0.014†	0.011	0.004	0.004
	(0.007)	(0.007)	(0.009)	(0.009)
Firm Leverage	0.000*	0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Diversification	-0.002	-0.002	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Firm Fixed Effects	Included	Included	Included	Included
Year Fixed Effects	Included	Included	Included	Included
Technology Categories Fixed Effects	Included	Included	Included	Included
State Fixed Effects	Included	Included	Included	Included
Constant	0.605**	0.590**	0.629**	0.628**
	(0.027)	(0.027)	(0.022)	(0.022)
Observations	466,058	466,058	411,227	411,227
R-squared	0.153	0.153	0.161	0.161

Robust standard errors clustered by state in parentheses, ** p<0.01, * p<0.05, † p<0.1

Figure 1. Dynamic Effect of Constituency Statutes on Technology Generality