Intellectual Property Rights, Holdup, and the Incentives for Innovation Disclosure

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Abstract: We study how the assignment of property rights between employees and their employers influences disclosures that reveal the productivity and ability of individual employees. To do so, we examine the effect of a court ruling that significantly shifted the assignment of intellectual property rights from inventors to their employers, but that was otherwise likely exogenous with respect to disclosure. Using a within-firm-year difference-in-differences design estimated across a sample of multiple firms, we find that firms accelerate their patent disclosures for innovations created by their inventors affected by the ruling, relative to their patent disclosures for innovations created by their unaffected inventors. Our results suggest that the assignment of intellectual property rights and the potential for hold up problems between employees and their employers can affect disclosure decisions.

Keywords: corporate innovation, disclosure, holdup

JEL: J41, J61, 030

1. Introduction

We study how the assignment of intellectual property rights for successful innovations between inventors and their employers—and, in particular, a shift from the former to the latter—affects disclosures about these innovations. Corporate innovation is an increasingly important source of growth, value creation, and competitive advantage. Although innovative activities within corporations have the potential to generate large relationship-specific economic rents, their proprietary nature can also give rise to significant contracting and information asymmetry problems. Innovation is also an inherently risky activity that tends to occur over a relatively long-horizon and, if successful, results in outcomes that are impossible to specify *ex ante*. Consequently, contracts that govern innovative activities are difficult to specify and necessarily incomplete (e.g., Holmstrom, 1989; Aghion and Tirole, 1994; Manso, 2011).

As a result of the contracting and information asymmetry problems around innovation, innovators and their corporate employers can "hold up" the other party to extract the rents generated by their relationship. For example, inventors can hold up their employers by credibly threatening to switch firms and take any innovations, knowledge, or ability developed at their employer with them (Kang and Lee, 2020). Conversely, firms can hold up their employee inventors by restricting their mobility and, more generally, taking actions that diminish the inventor's labor market value and allowing them to pay below-market real wages

The assignment of intellectual property rights can affect this hold up problem by altering the ability of inventors and their corporate employers to appropriate the returns to innovation *ex post*. When employers have stronger rights to successful innovation, it diminishes their inventor employees' ability to capture the value associated with their innovations and vice versa. Both parties can also take deliberate actions to influence their ability to capture returns to innovation *ex*

post. For example, firms can withhold or delay disclosure about successful innovation that could enhance their inventor employees' labor market value and mobility. Conversely, inventors can attempt to publicize or accelerate disclosure about successful innovations to enhance their labor market value and mobility. In this paper, we study how an arguably exogenous shift in the assignment of intellectual property rights for innovation from inventors to their employers affects disclosure about innovative activities.

Although prior studies examine how the assignment of intellectual property rights affects corporate employers' R&D and patenting decisions, it is not clear how the assignment influences disclosure about these innovative activities. This is an important gap in the literature because the value of innovation is not confined to the innovative firm, but also includes *others' use of this information*. Others' use of innovative information necessarily depends on if, how, and when the innovation is disclosed. Innovation is often referred to as the "engine of growth" precisely because of the knowledge spillovers that allow others to build upon it (e.g., Solow, 1957; Romer, 1990).

For example, Bloom et al. (2013) estimate that the social returns to R&D are 2-3 times larger than are the private returns due to knowledge spillovers, which only occur when an innovation is disclosed (see also Hall et al., 2010). Indeed, the timely and wide-spread dissemination of innovative ideas is one of the primary arguments for the existence of the patent system and its provision of a temporary monopoly to inventors in the form of patents (Dyer et al., 2020). Consequently, understanding how the assignment of property rights between inventors and their employers affects disclosure about innovation is important.

There are at least two challenges that likely explain the current gap in our understanding of the relation between the assignment of intellectual property rights between inventors and their employers and disclosure about innovation. First, it is difficult, if not impossible, to observe the

intellectual property rights of the parties to any specific relationship and, to the best of our knowledge, no reliable empirical proxies exist. Second, the relation between intellectual property rights and disclosure is potentially endogenous (e.g., more skilled inventors may bargain for stronger property rights and more disclosure). To overcome these challenges, we examine the final decision in *Alcatel v. Brown*, which was an important court case that significantly altered the assignment of intellectual property rights in many states.

In *Alcatel v. Brown*, the court held that an employee inventor's abstract idea constitutes an innovation that an employer could claim, even if the employer could not prove that the inventor developed the idea with the employer's resources. The appeals court's decision in *Alcatel v. Brown* was widely publicized with various eye-catching headlines, including: "We own what you think."[1] Moreover, many articles chronicled the defendant—and inventor employee—Evan Brown's legal woes and bankruptcy. Although the court's decision in *Alcatel v. Brown* did not establish a binding precedent outside of Texas, it likely set a persuasive precedent that would inform the future decisions of other state and federal courts (Lobel, 2014). Consequently, the appeals court's decision in *Alcatel v. Brown* resulted in a significant shift of the intellectual property rights for innovations from inventors to their employers. Consistent with this, we find that inventors affected by the final decision in *Alcatel v. Brown* experience an almost 50% reduction in their propensity to change employers, relative to their same-firm counterparts that were not affected.

The final decision in *Alcatel v. Brown* is also plausibly exogenous with respect to disclosures about innovation, other than through its effect on the assignment of property rights. State court judges, such as the Texas judge who decided the appeal in *Alcatel v. Brown*, are not bound by other state and federal governments and are not likely to be influenced by lobbying from

[1] https://www.salon.com/2004/08/18/evan_brown/ retrieved July 11, 2020.

labor unions, corporations, or political parties (Klasa et al., 2018). Moreover, even if the Texas judge's decision did endogenously relate to firms' disclosure though some indirect channel such as lobbying, this endogenous relation would likely be specific to inventors located in Texas. Because we remove inventors located in Texas from our analyses, it seems unlikely that any such endogeneity biases our results. Importantly for our research design, the final decision in *Alcatel v. Brown* did *not* affect inventors in nine states that explicitly restricted the enforceability of employment contracts in intellectual property assignment disputes. This allows us to compare the change in innovation disclosure for inventors affected by the final *Alcatel v. Brown* decision to the change in innovation disclosure for their unaffected counterparts in these nine states to draw more credible causal inferences.

To document the effect of intellectual property rights on the disclosure of innovation, we follow prior work and define an inventor as an individual who patents (e.g., Akcigit et al., 2016; Moretti and Wilson, 2017; Bell et al. 2019).[2] We focus on patent applications as the unit of analysis and use firms' patent disclosure decisions to measure the timing of the disclosure of innovation. All patent applications filed with the USPTO must be disclosed on the USPTO website by a deadline. Although the precise deadline varies (see Section 2.2 for details), the average deadline in our sample is 1,053 days. However, applicants can—and, often do—choose to have their application disclosed prior to this deadline (on average, applicants in our sample disclose after 399 days).[3] We study how the final decision in *Alcatel v. Brown* affects the timing of this choice.

[2] Patents as a proxy for innovation are not without drawbacks, as not all innovations are patented (Griliches, 1990; Glaeser, 2018). We believe this drawback is limited in our setting because we compare patented innovations to other patented innovations. Consequently, our design holds the decision to patent fixed.

[3] Anecdotal evidence suggests that firms' intellectual property lawyers "make" this disclosure decision, with input from inventors and managers.

Because patent disclosures credibly reveal the outcome of the R&D process, which is long horizon and opaque, they are a valuable source of information. Consequently, the timing of firms' patent disclosures affects the decisions of investors, competitors, and other stakeholders.[4] Moreover, patent disclosures represent a credible, public signal about inventors' innovative successes. Our focus on the timing of patent disclosure mirrors prior work that studies manager earnings forecasts or the early adoption of accounting standards, which accelerate information from the mandatory release date to the voluntary disclosure date.

Our empirical specification uses variation in both *which* inventors were affected by the final *Alcatel v. Brown* decision and time-series variation in *when* they were affected, as well as a variety of fixed effects, to rule out potential alternative explanations for our findings. In particular, we include inventor-firm fixed effects to control for time-invariant attributes of the inventor and their match with their employer (e.g., the inventor's innate ability). This ensures that the resulting specification isolates cross-sectional differences in the effect of the final decision in *Alcatel v. Brown*. We also include inventor home zip code fixed effects to control for differences across geographic areas (e.g., Silicon Valley). This ensures that the resulting specification isolates time-series variation in the effect of the *Alcatel v. Brown* decision, and is therefore a difference-in-difference specification.

Finally, we include firm-year fixed effects to control for any unmeasured time-varying factors that influence firms' disclosure decisions, such as capital market and competitive concerns (e.g., Glaeser et al., 2020; Glaeser and Landsman, 2020). Consequently, the resulting empirical specification effectively compares the change in a firm's disclosure about its innovations created by employees affected by *Alcatel v. Brown* to the change in *the same firm's* disclosure about its

[4] E.g., Glaeser et al., 2020; Glaeser and Landsman, 2020; Hegde et al., 2020a,b; Kim and Valentine, 2020.

innovations created by its employees who were not affected, *at the same point in time*. This within-firm and time design allows us to draw a sharp contrast between inventors who work for the same employer at the same point in time and are similar along all of the dimensions captured by the other controls, but differ only in where they reside and, in turn, their property rights to their innovations.

We find that firms accelerate their patent disclosures for innovations created by inventors who were affected by the final decision in *Alcatel v. Brown* compared to their contemporaneous patent disclosures for innovations created by their inventors who were not affected by the decision. These results suggest that the final decision in *Alcatel v. Brown*, which resulted in a significant shift in property rights from inventors to their employers, accelerated firms' disclosure about their innovations.

We supplement our primary findings along several dimensions. First, we find no evidence that firms' disclosures about the innovations of its inventors affected by *Alcatel v. Brown* trended differently prior to the final decision in the case (i.e., we conduct a "parallel trends test" and find no evidence of differential pre-treatment trends). Second, we examine the differential effect of *Alcatel v. Brown* on the disclosure of innovations created by inventors who have many prior patents ("superstars"). Firms have little need or ability to disguise the talent of their superstar inventors by delaying patent disclosures because superstars' long history of successful innovation already reveals their talent. Consistent with this, we find that the disclosure of superstars' innovations is significantly less affected by the final decision in *Alcatel v. Brown*.

Third, we find that inventors affected by *Alcatel v. Brown* subsequently exhibit a lower rate of mobility—as evidenced by less frequent changes in employers—which is consistent with the court's decision shifting property rights away from inventors and towards employers. We also find

some evidence that more timely disclosure of successful innovation is associated with greater inventor mobility, consistent with prompter disclosure allowing inventors to signal their ability to the external labor market (see also Kim and Valentine, 2020). Fourth, we repeat our main tests both (i) including inventors located in Texas, and (ii) including patent class-year fixed effects and find that our results are largely unchanged.

Our paper contributes to the voluntary disclosure literature by documenting how the assignment of intellectual property rights between inventors and their employers affects the timing of patent disclosures. We also contribute to the literature that examines how firms' explicit and implicit labor contracts—which are an economically important class of contracts within the firms' nexus of contracts—influence their information environment in general and their disclosure policies in particular.[5,6] Prior studies in this literature find that reductions in employee mobility or the presence of unions generally results in less disclosure of good news and more disclosure of bad news (e.g., Aobdia, 2018; Gao, Zhang, and Zhang, 2018; Li, Lin, and Zhang, 2018). We show that a decrease in the property rights on the output of an important class of employees—namely inventors—leads to a reduction in firms' disclosure that are specifically linked to those employees' output (rather than disclosure in general).

Similarly, we contribute to the innovation literature by drawing attention to the important, but easily overlooked—and arguably neglected—issue of whether, when, and how information about successful innovation is made public and therefore available for others to use. Most prior research focuses on the production of innovation and the associated costs and benefits that are

[5] Firms' contractual relationships with their employees include not only *explicit* employment contracts, but also *implicit* promises, such as job security and the potential for promotion (Titman, 1984; Cornell and Shapiro, 1987; Maksimovic and Titman, 1991; Bowen et al., 1995; Dou et al., 2016; Hamm et al., 2018; Dey and White, 2019).

[6] Viewing firms as a nexus of interrelated contracts (Alchain and Demsetz, 1972; Jensen and Meckling, 1976; Fama and Jensen, 1983) suggests that their other important contractual relationships, such as those with employees, should influence managers' actions and decision, which should be made with the objective of maximizing the joint value of all of the contracts within the nexus.

"internalized" by the innovating firm. We identify a previously overlooked "internalized" benefit—namely firms' ability to "hold up" their innovators—that results in a costly externality in the form of delayed disclosure (a tragedy of the anticommons). Our work also informs the innovation literature on the mobility of inventors, by documenting how the threat of mobility and potential misappropriation affects patent disclosure, as well as by documenting that the decision in *Alcatel v. Brown* significantly reduced inventor mobility (e.g., Akcigit et al., 2016 and Moretti and Wilson, 2017).

We organize the rest of the papers as follows. Section 2 discusses related literature and provides institutional background. Section 3 discusses our research design and Section 4 our sample. Section 5 discusses our results and Section 6 concludes.

2. Related literature and background

2.1. Related literature

Our study builds on the literature that examines how employees and their employers share the rents generated by their employment relationships. Pakes and Nitzan (1983) explain how "the private rate of return to research resources (and hence research employment) is determined, in part, by the degree to which a firm can maintain proprietary rights (monopoly power) over the information produced in its research laboratories." However, they also note that "… little work has been done on how firms facing this appropriability problem ought to behave. That is, how should a firm act in order to protect its innovations?" Kim and Marschke (2005) find that one way in which firms respond to the appropriability problem is to reduce their investment in innovation and

substitute from secrecy towards patenting.[7] We add to this line of research by arguing that, conditional on choosing to patent, firms' disclosure practices about their innovations provides another margin to address the appropriability problem.

Our focus on disclosure decisions also allows us to build on the literature that examines how employee mobility affects firms' disclosure practices. Aobdia (2018) and Li et al. (2018) find that reductions in employee mobility caused by regulations leads to less corporate disclosure by increasing the proprietary costs of disclosure. In contrast, we find that a shift in the assignment of property rights from inventors to employers leads to increased disclosure about innovation. This difference highlights an important way in which our research design differs from those in most prior studies: we focus on firms' disclosures about specific innovations that are made by specific employees. Consequently, our specifications are more granular—and allow us to draw different inferences—than those of most prior work that examines firm-level disclosure decisions.

Reductions in employee mobility and shifts in the assignment of property rights away from inventors and towards employers have two countervailing effects on firms' proprietary costs. On the one hand, both lead to a direct reduction in proprietary costs by reducing the potential leakage of information. On the other hand, they also lead to an indirect increase in proprietary costs by causing firms to invest more in generating proprietary information. By focusing on firms' disclosures about specific innovations, we are able to abstract away from the latter and isolate the former.

Our focus on the disclosure of inventors' innovations also allows us to contribute to the literature on career concerns and disclosure. Ali et al. (2019) finds that the Inevitable Disclosure

[7] Bradley, Kim, and Tian (2017) and Mann (2018) also examine how shifts in bargaining power between unions and creditors affects firms' propensity to patent. Dasgupta et al. (2019) study hold-up and innovation in supply chain relationships.

Doctrine (IDD), which reduced employee mobility, asymmetrically affects the withholding of bad news based on whether managers wish to signal good performance to the external labor markets to enhance their mobility or to their current employer to avoid termination. In contrast, Gao et al. (2018) find that the IDD causes firms to decrease their income-increasing earnings management because it reduces the need to project financial stability to their employees to retain them.[8]

We build on this literature by documenting how shifts in the assignment of property rights from inventors to their employers affects the timeliness of innovation disclosure. Consequently, we study how employees' labor market concerns affects their manager's disclosure choices, rather than how the managers' labor market concerns influence the manager's disclosure decisions. Moreover, we consider the broader question of how the assignment of property rights affects disclosure.

We also contribute to the literature on the causes and consequences of the timing of firms' patent disclosures. Using the American Inventors Protection Act as a setting, Hegde et al. (2020a,b) and Kim and Valentine (2020) find that prompter patent disclosures result in increased efficiency of price discovery and knowledge spillovers in innovation. Kim and Valentine (2020) also show that prompter patent disclosure causes greater inventor mobility. Glaeser et al. (2020) show that shorter-horizon managers are more likely to choose patenting than secrecy to protect their successful innovations. They argue that this is consistent with shorter-horizon managers using the patent system to credibly reveal the existence of their successful innovations to shareholders and other capital market participants. Glaeser and Landsman (2020) show that product market competition causes firms to accelerate their patent disclosures to deter product market rivals, while technological competition causes firms to delay their patent disclosure to avoid revealing enabling

[8] See also, Bova (2013), who finds that firms with unionized employees are more likely to miss analyst forecasts to reduce the bargaining power of the union.

information to technological rivals. In total, this literature concludes that patent disclosure timeliness has real effects and is an important firm decision.

2.2. Background on patent disclosure

The patent system is built on the grand bargain: in exchange for the right to exclude others from the production or use of a novel device, process, apparatus, formula, or algorithm for a specified period, inventors provide a detailed disclosure of how to independently recreate their innovation.[9] This disclosure creates positive externalities by preventing the costly duplication of research efforts and by creating knowledge spillovers that allow others to build upon their innovations, which drive technological and economic growth (Romer, 1990). As the below quotes demonstrate, the importance of this disclosure is well known:

"By disclosing the knowledge behind an invention for all of the world to build upon, each generation stands on the platform created by the previous generation, leveraging yesterday's inventions to develop tomorrow's innovation."

- Director of the United States Patent and Trademark Office, David Kappos

"When a patent is granted and the information contained in it is circulated to the general public and those especially skilled in the trade, such additions to the general store of knowledge are of such importance to the public wealth that the Federal Government is willing to pay the high price of 17 years of exclusive use for its disclosure, which disclosure, it is assumed, will stimulate ideas and the eventual development of further significant advances in the art."

- The U.S. Supreme Court (Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470).

The timing of these disclosures is consequential: prompter disclosure accelerates knowledge spillovers and reduces the inefficient (and socially wasteful) duplication of research efforts (Kim and Valentine, 2020; Hegde et al. 2020a). Prompter disclosure can also affect the allocation of capital because of information asymmetry around innovation (Aboody and Lev, 2000; Hegde et al. 2020b).

[9] This period is currently 20 years from the application filing date for U.S. utility patents and 14 years from the grant date for U.S. design patents.

Recognizing the value of prompt disclosure, the USPTO requires the publication of patent disclosures on the USPTO website by a deadline.[10] This deadline is the earlier of 18 months after filing and the decision date for applications also filed in foreign jurisdictions and the decision date for all others ("domestic-only applications"). Further, the USPTO publishes domestic-only applications 18 months after filing by default, although domestic-only applicants can choose to opt out of this default. All applicants can request at any time that the USPTO publish their in-process application. We study how the assignment of intellectual property rights for successful innovations between inventors and their employer affects this timing choice.

2.3. Background on Alcatel v. Brown

Evan Brown is a software developer from Texas who claimed to have conceived the idea for a software program in 1976, long before he joined DSC Communications (subsequently acquired by Alcatel). In 1996, Brown asked DSC to release him from his invention disclosure agreement in order to pursue development of his idea without DSC's interference. Both Brown and DSC recognized the value of this program and after a year of unsuccessful negotiation, DSC fired Brown and brought a breach of contract action against him.

DSC claimed that Brown violated his employment agreement when he failed to disclose the idea. DSC sought a declaratory judgment granting ownership of the idea to DSC and requiring Brown to disclose the idea in full. The 219th Judicial District Court of Texas found in July 2002 that the idea was an invention falling under the terms of the employment agreement between Brown and Alcatel, which entitled Alcatel to "full legal right, title and interests" of any inventions. In 2004, the Texas Appeals Court turned down Brown's appeal of the 2002 decision.

[10] Consistent with the notion that these disclosures are an important source of information, the USPTO website receives millions of visits each month: https://developer.uspto.gov/analytics.

The Appeals Court decision generated significant public and academic interest.[11] Many articles discussed Brown's bankruptcy and difficulty complying with the court's requirement that he not only disclose his idea in full, but also that he pay Alcatel's attorneys' fees of $332,000. Moreover, while the Appeals Court decision did not set a formal legal precedent outside of Texas, it arguably established persuasive precedent that would have been expected to inform any subsequent decisions by other state and federal courts in similar cases (Lai, 2003; Lobel, 2014). Consequently, the final decision in *Alcatel v. Brown* shifted the property rights around innovations from inventors to their employers.

However, and importantly for our research design, this shift in property rights did not extend to nine states that explicitly limited the enforceability of intellectual property assignment agreements with employee invention legislation. For example, California explicitly limited the enforceability of employee agreements in a way that rendered the final decision in *Alcatel v. Brown* moot for Californian inventors; California Codes Labor Code Section 2870-2872: "(a)ny provision in an employment agreement that provides that an employee shall assign or offer to assign any rights in an invention to his/her employer shall not apply to an invention that the employee develops entirely on his or her own time without using the employer's equipment, supplies, facilities, or trade secret information." Inventors in these states were likely aware of the fact that they were not affected by the final decision in *Alcatel v. Brown*, as the following passages illustrate:[12]

> *"…Alcatel vs. Evan Brown was tried in Texas. According to GitHub, California's notoriously lax enforcement of these kinds of employment agreements has helped Silicon Valley prosper. The state laws allow 'employees to own the work they produce on personal equipment and time'. That means, if you have a brilliant idea, it stays your brilliant idea."*

[11] E.g., Lai (2003), Lobel (2014), and Sample (2018), as well as various press articles on the decision with eye-catching titles such as, "We Own What You Think" https://www.salon.com/2004/08/18/evan_brown/.
[12] https://jaxenter.com/github-intellectual-property-employees-132562.html. Retrieved July 11th, 2020.

3. Research design

3.1. Disclosure measures

Following Glaeser and Landsman (2020), we examine two measures of patent disclosure timeliness. By examining disclosure timeliness, we mirror prior work that examines other disclosures that accelerate the revelation of information, such as manager earnings forecasts (manager forecasts accelerate earnings news from the 10-K or 10-Q release date to the forecast release date). Our focus on disclosure timeliness also allows us to compare patent applications. Consequently, our analysis compares successful applications and holds the act of successfully innovating and choosing to patent the underlying innovation fixed. Because the information about non-disclosing applications is revealed *ex post*, we are able to observe applicants that chose not to disclose. In other words, we can compare applicants who choose to credibly disclose today, to those who choose to delay disclosure.

Both of our measures of patent disclosure timeliness are inverse measures that reflect the degree to which applicants delay disclosure. The first, ln(*Days to Actual Disclosure*) is the natural logarithm of the number of days between the patent application date and the date the USPTO publicly discloses the application, less 14 weeks for USPTO processing. To control for differences in mandatory disclosure deadlines across applications, we include ln(*Days to Latest Possible Disclosure*) as a control when using ln(*Days to Actual Disclosure*) as the dependent variable. Ln(*Days to Latest Possible Disclosure*) is the natural logarithm of the number of days between the filing date and when the applicant must disclose their application.[13] We remove observations

[13] The application disclosure deadline is the earlier of 18-months in days following the foreign filing date and the approval date for applications seeking foreign protection, and the approval date for all others. We obtain data on foreign protection and priority dates from the USPTO research datasets: https://www.uspto.gov/learning-and-resources/electronic-data-products/historical-patent-data-files; https://www.uspto.gov/learning-and-resources/electronic-data-products/patent-examination-research-dataset-public-pair; https://www.uspto.gov/learning-and-resources/ip-policy/economic-research/research-datasets.

where *Days to Actual* disclosure is negative or exceeds *Days to Latest Possible Disclosure* due to potential data issues.

Our second measure of patent disclosure timeliness is *Percentage Disclosure Delay*, which is *Days to Actual Disclosure* divided by *Days to Latest Possible Disclosure*. Values of one for *Percentage Disclosure Delay* suggest that the applicant delayed disclosure as long as possible, where values of zero suggest that the applicant disclosed immediately.

We present the frequency histogram of *Days to Actual Disclosure* in Figure 1. The two most frequent disclosure choices are disclosing fairly early in the application process and at the 18 month deadline for firms that file abroad concurrently with the U.S. application. We present the frequency histogram of *Days to Latest Possible Disclosure* in Figure 2. The large spike represents the deadline for applicants seeking foreign protection around the same period that they file with the USPTO (typically 18 months after filing). We present the frequency histogram of *Percentage Disclosure Delay* in Figure 3. The histogram highlights that patent applicants wait until the mandatory deadline to disclose slightly over 10% of the time. The histogram also highlights that there is a great deal of variation in disclosure choices.

3.2. Regression model

We use our measures of disclosure delays as dependent variables in the following difference-in-difference specification:

$$\begin{aligned} \textit{Patent Disclosure Delay}_{i,j,t} = {} & \beta_0 + \beta_1 \textit{Affected by Alcatel v. Brown}_{i,t} \\ & + \beta_2 \textit{Inventor-Firm HQ in Same State}_{i,f,t} + \gamma' X_{s,t} \\ & + \textit{Firm} \times \textit{InventorFE} + \textit{Firm} \times \textit{YearFE} + \textit{Inventor LocationFE} \\ & + \varepsilon_{i,j,t}, \end{aligned} \tag{1}$$

where *i* indexes inventors, *j* indexes patent applications, *f* indexes firms, *s* indexes inventor home states, and *t* indexes application years.

Our main variable of interest is A*ffected by Alcatel v. Brown*$_{i,t}$, which is an indicator that takes the value one if an inventor is affected by the final decision in *Alcatel v. Brown* after Evan Brown's appeal was rejected in 2004. We remove inventors living in Texas, whose judiciary decided *Alcatel v. Brown* and Brown's appeal, from the analysis to avoid any potential endogeneity.[14] Consequently, we compare the difference in firms' disclosure decisions for innovations created by inventors affected by *Alcatel v. Brown* after the final decision, to the difference in disclosure decisions for innovations created by unaffected inventors after the final decision (i.e., we estimate a difference-in-difference model).

We include a variety of controls and fixed effects in Eq. (1) to address potential alternative explanations and to increase the precision of our estimates. *Inventor-Firm HQ in Same State* is in an indicator if the inventor lives in their employer's headquarters state, and controls for the degree of separation between the inventor and their employer (e.g., Glaeser et al., 2020). *X* is a vector of time varying controls for conditions in the inventor's home state: *Personal Tax Rate* is the top bracket income tax rate in the inventor's home state as calculated in Armstrong et al. (2019), which prior work suggests can affect inventor mobility and individual risk taking preferences (e.g., Moretti and Wilson, 2017; Armstrong et al., 2019). *Corporate Income Tax Rate* is the top statutory income tax rate, which may affect corporate risk taking and where corporations locate inventor because their wages are tax deductible (e.g., Langenmayr and Lester, 2017 and Ljungqvist, Zhang,

[14] In Table 6, we report results including Texas and find our inferences are unchanged.

and Zuo, 2017). *R&D Tax Credit* is the statutory rate at which firms may claim a state R&D tax credit, which may affect where firms locate inventors and their propensities to invest in inventors.[15]

We also include a variety of fixed effects. *Firm×InventorFE* are firm-inventor fixed effects, which control for time-invariant aspects of the inventor and their match with their employer. Consequently, we study how firms' disclosure choices for innovations created by different inventors change over time. *Firm×YearFE* are firm-year fixed effects that control for all time-varying features of the firm, including those that are difficult to measure or observe such as competition and manager preferences (e.g., Glaeser and Landsman, 2020; Glaeser et al., 2020). Consequently, we compare firms' disclosure choices for innovations created by inventors who work for the same firm, at the same point in time, but are differently affected by the final decision in *Alcatel v. Brown*.

Inventor LocationFE are fixed effects for the inventor's home zip code that control for time-invariant aspects of the inventor's home zip code.[16] We cluster standard errors by inventor, firm, and issue date to address potential time series dependence within inventors and firms and cross-sectional dependence within patent issue dates.

4. Sample and descriptive statistics

4.1. Sample

We construct our sample beginning with all successful patent applications filed with the USPTO between 2003 and 2006. We use that time period to balance the sample before and after

[15] We collect data on state research and development tax credits and statutory carrybacks and carryforward periods from Wilson (2009) and tax forms available on state Department of Revenue websites.
[16] Available at https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/5F1RRI. We thank the authors of Li et al. (2014) for making the data publicly available.

the final decision in *Alcatel v. Brown*.[17] Following Glaeser and Landsman (2020), we remove observations where the disclosure *deadline* is within 180 days of the application filing date to ensure firms face a meaningful disclosure choice. We require non-missing data on all inventor, state, and patent variables. Our final sample consists of 73,496 patent applications filed between January 1, 2003 and December 31, 2006.

Table 1 presents sample descriptive statistics. The average disclosure deadline is 1,053 days after filing. On average, applicants disclose 399 days after filing. The average of *Percentage Disclosure Delay* of 40% suggests most applicants voluntarily disclose about half way through the application process, although the standard deviation of *Percentage Disclosure Delay* suggests significant variation in this choice. 22% of sample observations are affected by the final decision in *Alcatel v. Brown* (recall that none are affected prior to 2005).

We examine successful applications because unsuccessful applications may never be disclosed. Moreover, the underlying economics of successful and unsuccessful applications may not be comparable. We also focus on patent applications made by public U.S. firms to ensure the necessary data for our employer fixed effects. Consequently, our results may not generalize to private applicants, abandoned patent applications, or unpatented innovations (Glaeser and Guay, 2017). However, we believe that our theoretical foundations should help mitigate these concerns. Moreover, public firms' successful innovations are economically important and their disclosures are inherently interesting.[18]

5. Results

5.1. Shifts in inventor-firm property rights and patent disclosure delays

[17] We thank the authors of Kogan et al. (2017) for making this data available on Noah Stoffman's website: http://iu.box.com/patents.

[18] E.g., Hirschey et al. (2012), Kogan et al. (2017), Kim (2018) and Valentine (2018), Glaeser and Landsman (2020).

We present the results of estimating Eq. (1) in Table 2. Columns (1), (3), and (5) present results using ln(*Days to Actual Disclosure*) as the dependent variable and columns (2), (4), and (6) present results using *Percentage Disclosure* as the dependent variable. We progressively add controls in columns (1)-(2), (3)-(4), and (5)-(6) to examine how their inclusion affects our inferences.

The results in columns (1) and (3) suggest that the final decision in *Alcatel v. Brown* resulted in an 8.7% decrease in the time until disclosure (*t*-statistics of 2.94).[19] The results in column (5) suggest that the final decision in *Alcatel v. Brown* resulted in a 9.1% decrease in the time until disclosure (*t*-statistic of 2.97). The results in columns (2) and (4) suggest that the final decision in *Alcatel v. Brown* resulted in a 2.8 percentage point decrease in the time until disclosure (*t*-statistics of 3.50). The results in column (6) suggest that the final decision in *Alcatel v. Brown* resulted in a 2.9 percentage point decrease in the time until disclosure (*t*-statistic of 3.63).

Together, the results in Table 2 suggest that the final decision in *Alcatel v. Brown*, which significantly shifted property rights from inventors to their employers, accelerated the disclosure of innovation.

5.2. Shifts in inventor-firm property rights and patent disclosure delays, parallel trends

One of the key assumptions necessary for a causal interpretation of the results documented in Table 2 is the parallel trends assumption (i.e., the assumption that the change in the timing of disclosure for innovations created by inventors affected by *Alcatel v. Brown* would have been the same as the timing for innovations created by inventors unaffected by *Alcatel v. Brown*, absent *Alcatel v. Brown*). In Table 3, we examine whether the timing of disclosure of innovations created by inventors affected by *Alcatel v. Brown* trended differently to the timing of disclosure of

[19] From the median of *Days to Actual Disclosure*, this translates into prompter disclosure by 39 days.

innovations created by unaffected inventors, prior to the final decision (i.e., we conduct a "parallel trends test"). To do so, we re-estimate Eq. (1) after including five additional variables, *Affected by Alcatel v. Brown*$_{i,t-n}$, which takes the value 1 *n* years before 2005 if the inventor lives in one of the states affected by the final decision in *Alcatel v. Brown*. The coefficients on these variables capture whether the disclosure outcomes of innovations created by inventors affected by *Alcatel v. Brown* trended differently in each of the five years prior to the final decision.[20]

We report the result of estimating Eq. (1) including these five additional variables in Table 3. The addition of these variables results in an expanded sample of 268,058 patent applications. *Affected by Alcatel v. Brown*$_{i,t-2}$ is dropped due to multicollinearity. The coefficients on the remaining additional variables provides little evidence of differential pre-treatment trends: Only one of the eight coefficients are statistically significantly different from zero at the 10% level, which is about what one would expect by chance alone, and there is no evidence of progressively larger coefficients prior to *Affected by Alcatel v. Brown*$_{i,t}$. In total, the evidence in Table 3 is consistent with the parallel trends assumption.

5.3. Shifts in inventor-firm property rights, patent disclosure delays, and superstar inventors

We extend our main results by examining whether superstar inventors are differentially affected by the final decision in *Alcatel v. Brown*. Firms likely do not worry about accelerating patent disclosures and affecting the labor market value of extremely prolific superstar inventors, because superstars have patented so much in the past that the labor market likely has a strong prior that their ability is high. Consequently, *Alcatel v. Brown* should have less of an effect on the

[20] We choose to include five years of lags because *Alcatel v. Brown* was initially decided in 2002. Consequently, including additional lags helps us determine whether disclosure outcomes differentially trended prior to this initial decision. These lags also help us determine whether inventors changed their behavior when the final decision in the case was reached in 2004, or if they changed their behavior in anticipation (note that this type of anticipatory behavior would not create endogeneity bias, but would instead suggest that the treatment year of 2005 is not the correct treatment year).

disclosure of innovations made by superstar inventors. To test this prediction, we modify Eq. (1) to include an indicator if the inventor is a superstar, or $Superstar_{i,t}$, and interact that indicator with *Affected by Alcatel v. Brown*$_{i,t}$. Following prior work, we define superstars as those in the top 10% of the total number of patent filings in the prior ten years (e.g., Glaeser et al., 2020).

We present the results of estimating the modified Eq. (1) in Table 4. The coefficients on *Affected by Alcatel v. Brown*×*Superstar* are about half the magnitude of the coefficients on *Affected by Alcatel v. Brown* and opposite in sign (*t*-statistics on the interaction of 2.24 and 2.00). Consequently, these results suggest that firms alter their disclosures about innovations created by superstar inventors affected by *Alcatel v. Brown* by about 50% less than they do their disclosures about innovation created by their other inventors affected by *Alcatel v. Brown*. In total, the results in Table 4 suggest that disclosures about innovations created by superstar inventors, for whom the labor market likely has a strong prior are high ability, are less affected by *Alcatel v. Brown*.

5.4. Shifts in inventor-firm property rights, patent disclosure delays, and firm-specific relationships

We extend our main results by examining whether inventors with firm-specific relationships are differentially affected by the final decision in *Alcatel v. Brown*. Prior research suggests that firm-specific relationships substitute for formal property rights. For example, prior work suggests that a past relationships between two contractual parties can mitigate potential hold up created by a lack of formal property rights (Klein, Crawford, and Alchian, 1978; Dyer and Singh, 1998; Dasgupta et al., 2020). Therefore, inventors that have built stronger relationships with a firm are less likely to be affected by the shift in the allocation of property rights as a result of the final decision of the *Alcatel v. Brown* case. To test this prediction, we follow prior research and measure the strength of the inventor's firm-specific relationships using the length of the

inventor's tenure with the firm. Specifically, we modify Eq. (1) to include the inventor's tenure with the firm, or $Tenure_{i,t}$, and interact that variable with *Affected by Alcatel v. Brown*$_{i,t}$.

We present the results of estimating the modified Eq. (1) in Table 5. The coefficients on *Affected by Alcatel v. Brown*×*Tenure* are opposite in sign relative to the coefficients on *Affected by Alcatel v. Brown* (*t*-statistics on the interaction of 4.08 and 3.88). We find that the magnitude of the marginal effect of *Affected by Alcatel v. Brown* decreases by approximately 60% as $Tenure_{i,t}$ increases from its value at the 25th percentile to its value at the 75th percentile.[21]

Consequently, the results in Table 5 suggest that *Alcatel v. Brown* alters firms' disclosure decisions about innovations created by inventors with strong firm-specific relationships by about 60% less than firms' disclosures about innovations created by their other inventors. In total, the results in Table 5 suggest that disclosures about innovations created by inventors with stronger firm-specific relationships, whose long tenure substitutes for formal property rights, are less affected by *Alcatel v. Brown*.

5.5. Shifts in inventor-firm property rights, patent disclosure delays, and inventor mobility

We further extend our main results by examining whether inventors affected by the final decision in *Alcatel v. Brown* are less mobile, and whether prompter patent disclosure is associated with greater inventor mobility. To do so, we re-estimate Eq. (1) after including our measures of patent disclosure timeliness as independent variables, and replacing them as dependent variables with an indicator equal to one if the inventor switches employers in the next five years, or *Inventor Changes Employers*.

We present the results of estimating the modified Eq. (1) in Table 6. The results suggest that inventors affected by the final decision in *Alcatel v. Brown* are 1.8 to 1.9 percentage points

[21] Sample distribution of $Tenure_{i,t}$ used to calculate these coefficient magnitudes can be found in Table 1.

less likely to switch employers in the next five years. These magnitudes are quite large, as the baseline rate of mobility is 4% (consequently, *Alcatel v. Brown* reduced affected inventors' mobility by almost 50%). We also find some evidence that prompter patent disclosure is associated with greater inventor mobility when using *Percentage Disclosure Delay* to measure patent disclosure timeliness in column (3) (*t*-statistic of 1.67). However, we note these latter results are associations and should be interpreted as such (note that Kim and Valentine, 2020 present causal evidence that prompter patent disclosure increases inventor mobility using a difference-in-differences design).

5.6. Robustness tests

5.6.1 Robustness tests: Including inventors located in Texas

In Table 7, we repeat our main results including inventors located in Texas. We repeat the sequences of controls, dependent variables, and fixed effects from Table 2 and continue to find similar results, albeit slightly smaller in magnitude. We conclude that our main results are robust to including inventors located in Texas, whose judiciary decided *Alcatel v. Brown*.

5.6.2 Robustness tests: Including patent class-year fixed effects

In Table 8, we repeat our main results including patent class-year fixed effects to control for any differences in the propensity to disclose early across patent classes. However, we note that these fixed effects may represent "bad controls" to the extent that inventors substitute between patent classes in light of different disclosure timeliness. Nonetheless, we repeat the sequences of controls, dependent variables, and fixed effects from Table 2 and continue to find similar results, again albeit slightly smaller in magnitude. We conclude that our main results are robust to including patent class-year fixed effects.

6. Conclusion

We study how *Alcatel v. Brown*, which exogenously shifted property rights for innovations from inventors to their employers, affected the disclosure of innovation. We find that firms accelerate their patent disclosures for innovations created by inventors affected by *Alcatel v. Brown*, relative to their patent disclosures for innovations created by unaffected inventors. These findings suggest that disclosure is one margin of response that firms use to mitigate potential hold up problems with inventor employees. We contribute to the literature that examines how firms' explicit and implicit labor contracts—which are an economically important class of contracts within the firms' nexus of contracts—influence their information environment in general and their disclosure policies in particular.

Our focus on patent disclosures also contributes to the innovation literature by highlighting the role of disclosure in the patent process. Prior work argues that the knowledge spillovers from innovation are a valuable public good, and hence the government should incentivize innovation (e.g., Romer, 1990). Therefore, most prior work implicitly or explicitly assumes that the goal of the patent system is to incentivize innovation by granting valuable monopoly rights to inventors (e.g., Hall et al., 2014). However, incentivizing innovation does not fully explain the existence of the patent system, as alternative incentives, like expanded R&D tax credits, can also lead to more innovation without creating deadweight losses from monopolies. However, these alternative incentives do not create disclosure of innovation – which is necessary for knowledge spillovers to occur and create growth – as they will likely lead to inventors protecting their innovations with secrecy. Consequently, the goal of the patent system is to encourage innovation *and* the disclosure

of that innovation (see, e.g., the Supreme Court's decision in Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470).[22]

[22] *"When a patent is granted and the information contained in it is circulated to the general public and those especially skilled in the trade, such additions to the general store of knowledge are of such importance to the public wealth that the Federal Government is willing to pay the high price of 17 years of exclusive use for its disclosure, which disclosure, it is assumed, will stimulate ideas and the eventual development of further significant advances in the art."*

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Appendix A. Variable Definitions

Patent variables

Days to Latest Possible Disclosure	The number of days until the patent application must be published (for applications seeking foreign protection the earlier of 18-months after filing abroad and the patent decision date, and for all others the application decision date).
Days to Actual Disclosure	The number of days until the USPTO publishes the patent filing, either at the request of the applicant or because the disclosure deadline passes, less 14 weeks for publication delays.
Percentage Disclosure Delay	The number of days until the disclosure of a patent filing, divided by the number of days until the latest possible disclosure.

State variables

Personal Tax Rate	The top bracket income tax rate in the inventor's home state as calculated in Armstrong et al. (2019) to reflect federal cross-deductibility.
Corporate Income Tax Rate	The top statutory income tax rate in the state.
R&D Tax Credit	The statutory rate at which firms may claim a state R&D tax credit.

Inventor variables

Inventor-Firm HQ in Same State	An indicator that is equal to one if the inventor is located in the same state as the headquarter state of the employer and zero otherwise.
Inventor Changes Employers	An indicator that is equal to one if the inventor changes employer in the next 5 years and zero otherwise.
Affected by Alcatel v. Brown	Our differences-in-difference estimator, which reflects whether the lead inventor on a patent application is affected by the final decision in *Alcatel v. Brown*. Specifically, an indicator that takes the value one after 2004 if the inventor does not live in any of the nine states that explicitly limit the enforceability of intellectual property assignment agreements with employee invention legislation. The nine states are California, Delaware, Illinois, Kansas, Minnesota, North Carolina, Nevada, Utah, and Washington.
Superstar	An indicator that is equal to one if the inventor is in the top 10% based on the total number of patent filings in the past ten years.
Tenure	The number of years an inventor has patented with a firm, where the beginning year is identified by the first year the inventor appears in the sample for a patent application with the firm. The sample period starts from the year 1985 for this calculation.

Figure 1
This figure presents the frequency histogram of the days until patent disclosure.

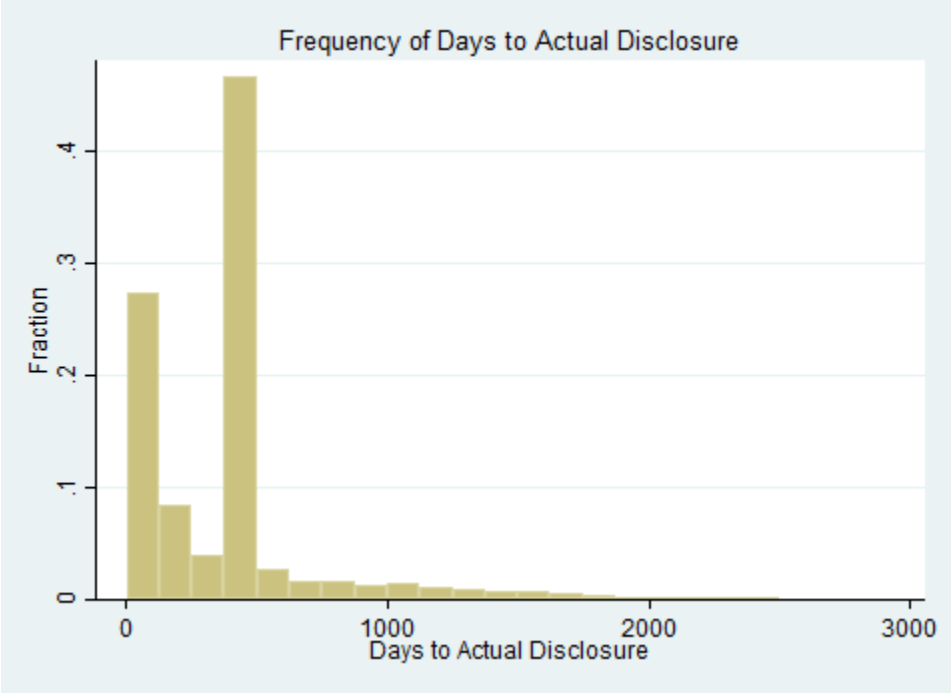

Figure 2
This figure presents the frequency histogram of the days until the latest possible patent disclosure

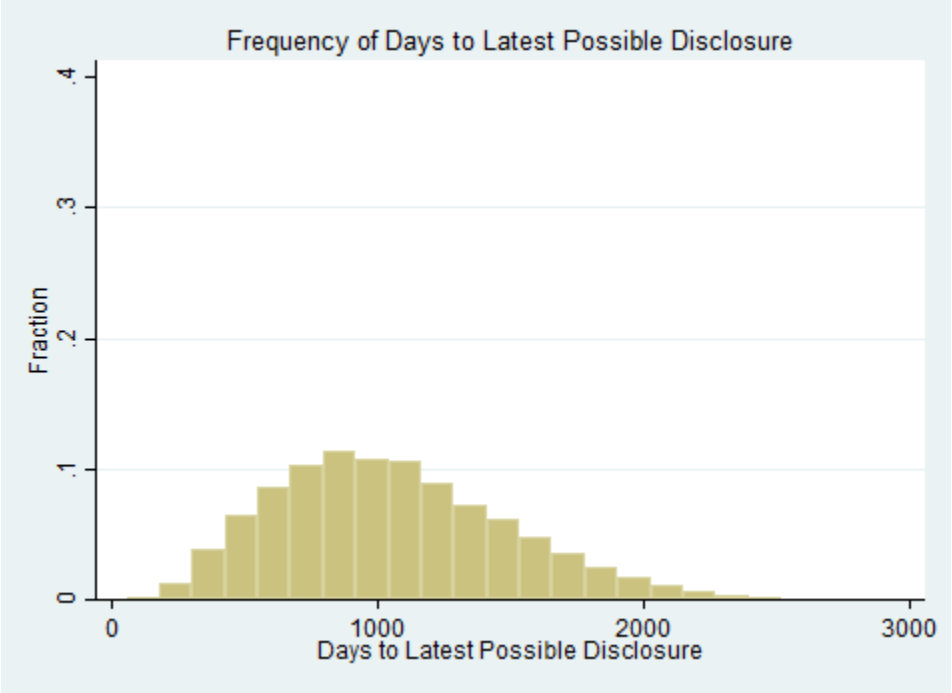

Figure 3
This figure presents the frequency histogram of the days until patent disclosure divided by the days until the latest possible disclosure.

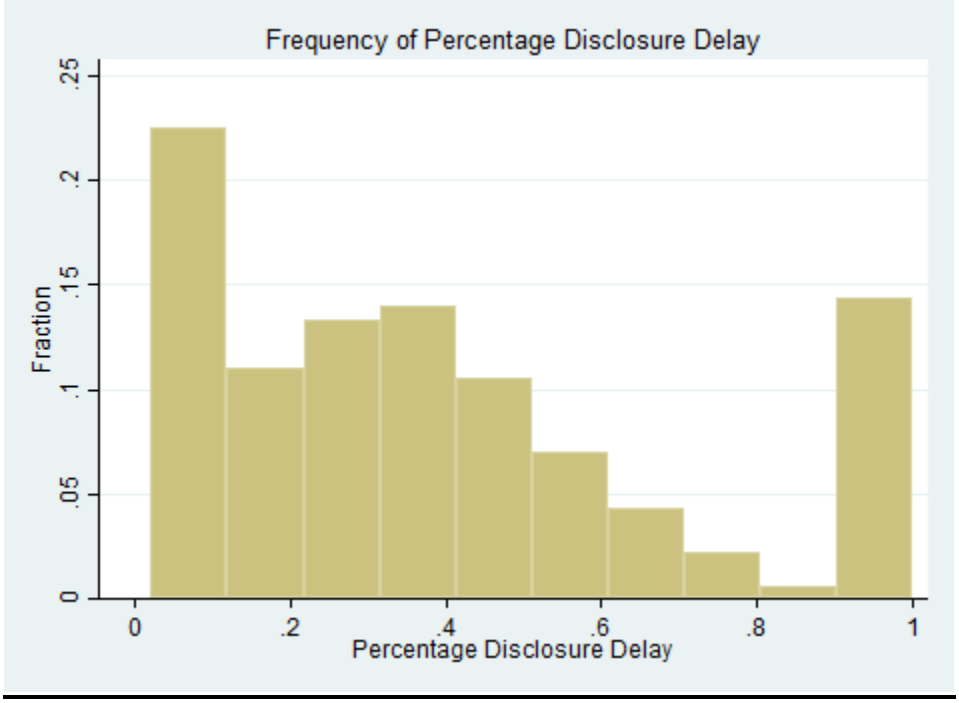

Table 1

Descriptive statistics

This Table presents descriptive statistics for our sample. Our final sample consists of 73,496 patent applications filed between January 1, 2003 and December 31, 2006.

Variable:	Observations	Mean	Std	25th	Median	75th
Patent variables:						
Days to Latest Possible Disclosure	73,496	1052.85	429.03	732.00	1013.00	1334.00
ln*(Days to Latest Possible Disclosure)*	73,496	6.87	0.45	6.60	6.92	7.20
Days to Actual Disclosure	73,496	399.02	342.47	111.00	450.00	456.00
ln(*Days to Actual Disclosure*)	73,496	5.57	1.05	4.72	6.11	6.12
Percentage Disclosure Delay	73,496	0.40	0.31	0.14	0.34	0.56
State variables:						
Personal Tax Rate	73,496	0.41	0.03	0.40	0.42	0.42
Corporate Income Tax Rate	73,496	0.07	0.03	0.08	0.09	0.09
R&D Tax Credit	73,496	0.08	0.06	0.00	0.06	0.15
Inventor variables:						
Inventor-Firm HQ in Same State	73,496	0.60	.	.	.	.
Inventor Changes Employers	73,496	0.04	.	.	.	.
Affected by Alcatel v. Brown	73,496	0.21	.	.	.	.
Tenure	73,496	3.99	3.14	1.00	3.00	7.00

Table 2

Shifts in inventor-firm property rights and patent disclosure delays

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*) (1)	*Percentage Disclosure Delay* (2)	ln(*Days to Actual Disclosure*) (3)	*Percentage Disclosure Delay* (4)	ln(*Days to Actual Disclosure*) (5)	*Percentage Disclosure Delay* (6)
Affected by Alcatel v. Brown	-0.091***	-0.028***	-0.091***	-0.028***	-0.095***	-0.029***
	[0.031]	[0.008]	[0.031]	[0.008]	[0.032]	[0.008]
ln(*Days to Latest Possible Disclosure*)	0.600***		0.600***		0.605***	
	[0.012]		[0.012]		[0.012]	
Inventor-Firm HQ in Same State			-0.135	-0.001	-0.079	-0.007
			[0.164]	[0.055]	[0.229]	[0.067]
Personal Tax Rate					-0.399	0.137
					[0.746]	[0.241]
Corporate Income Tax Rates					1.418	-0.974
					[6.120]	[1.713]
R&D Tax Credit					-3.617	-0.715
					[2.288]	[0.633]
Fixed Effects:						
Firm×Inventor	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year	Yes	Yes	Yes	Yes	Yes	Yes
Inventor Location	Yes	Yes	Yes	Yes	Yes	Yes
Observations	76,065	76,065	76,065	76,065	73,496	73,496
Adjusted R^2	0.654	0.651	0.654	0.651	0.653	0.649

Table 3

Inventor-firm shifts in property rights and patent disclosure delays, parallel trends

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers, and the shift in each of the next five years. *Affected by Alcatel v. Brown*$_{i,t-2}$ is dropped due to collinearity. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
	(1)	(2)
Affected by Alcatel v. Brown$_{i,t}$	-0.066**	-0.022***
	[0.027]	[0.008]
Affected by Alcatel v. Brown$_{i,t-1}$	-0.007	-0.006
	[0.023]	[0.007]
Affected by Alcatel v. Brown$_{i,t-3}$	-0.025	-0.003
	[0.025]	[0.008]
Affected by Alcatel v. Brown$_{i,t-4}$	0.010	0.007
	[0.027]	[0.008]
Affected by Alcatel v. Brown$_{i,t-5}$	-0.015	-0.012*
	[0.022]	[0.007]
ln(*Days to Latest Possible Disclosure*)	0.770***	
	[0.007]	
Inventor-Firm HQ in Same State	0.003	0.003
	[0.030]	[0.009]
Personal Tax Rate	0.936	0.372*
	[0.611]	[0.219]
Corporate Income Tax Rates	-3.925	-1.983*
	[2.986]	[1.016]
R&D Tax Credit	-2.288***	-0.694***
	[0.831]	[0.221]
Fixed Effects:		
Firm×Inventor	Yes	Yes
Firm×Year	Yes	Yes
Inventor Location	Yes	Yes
Observations	268,058	268,058
Adjusted R^2	0.732	0.792

Table 4

Shifts in inventor-firm property rights and patent disclosure delays, superstar inventors

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers, interacted with an indicator if the inventor is a superstar (i.e., in the top 10% of patent filings in the prior ten years). All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
	(1)	(2)
Affected by Alcatel v. Brown	-0.127***	-0.037***
	[0.033]	[0.009]
Affected by Alcatel v. Brown×Superstar	0.076**	0.018**
	[0.034]	[0.009]
Superstar	0.019	-0.003
	[0.030]	[0.009]
ln(*Days to Latest Possible Disclosure*)	0.605***	
	[0.012]	
Inventor-Firm HQ in Same State	-0.084	-0.008
	[0.230]	[0.068]
Personal Tax Rate	-0.384	0.141
	[0.745]	[0.241]
Corporate Income Tax Rates	1.515	-0.963
	[6.138]	[1.715]
R&D Tax Credit	-3.649	-0.721
	[2.293]	[0.634]
Fixed Effects:		
Firm×Inventor	Yes	Yes
Firm×Year	Yes	Yes
Inventor Location	Yes	Yes
Inventor-Firm Same State	Yes	Yes
State Controls	Yes	Yes
Observations	73,496	73,496
Adjusted R^2	0.653	0.649

Table 5

Shifts in inventor-firm property rights and patent disclosure delays, inventor tenure

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers, interacted with inventor tenure with the firm. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
	(1)	(2)
Affected by Alcatel v. Brown	-0.242***	-0.065***
	[0.048]	[0.012]
Affected by Alcatel v. Brown×Tenure	0.022***	0.005***
	[0.005]	[0.001]
ln(*Days to Latest Possible Disclosure*)	0.604***	
	[0.012]	
Inventor-Firm HQ in Same State	-0.049	0.000
	[0.231]	[0.067]
Personal Tax Rate	-0.365	0.146
	[0.743]	[0.241]
Corporate Income Tax Rates	1.338	-0.995
	[6.104]	[1.704]
R&D Tax Credit	-3.740	-0.745
	[2.292]	[0.635]
Fixed Effects:		
Firm×Inventor	Yes	Yes
Firm×Year	Yes	Yes
Inventor Location	Yes	Yes
Inventor-Firm Same State	Yes	Yes
State Controls	Yes	Yes
Observations	73,496	73,496
Adjusted R^2	0.653	0.650

Table 6

Shifts in inventor-firm property rights, patent disclosure delays, and inventor mobility

This Table presents OLS regressions of future inventor mobility as a function of a shift in the property rights around successful innovation from inventors to their corporate employers and patent disclosure decisions. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	*Inventor Changes Employers* (1)	*Inventor Changes Employers* (2)	*Inventor Changes Employers* (3)
Affected by Alcatel v. Brown	-0.018**	-0.019**	-0.019**
	[0.008]	[0.008]	[0.008]
ln(*Days to Actual Disclosure*)		-0.001	
		[0.001]	
Percentage Disclosure Delay			-0.005*
			[0.003]
ln(*Days to Latest Possible Disclosure*)		0.003**	
		[0.001]	
Inventor-Firm HQ in Same State	-0.042*	-0.042*	-0.043*
	[0.025]	[0.025]	[0.025]
Personal Tax Rate	-0.021	-0.019	-0.020
	[0.131]	[0.131]	[0.131]
Corporate Income Tax Rates	-1.045	-1.039	-1.049
	[1.762]	[1.760]	[1.762]
R&D Tax Credit	0.140	0.137	0.137
	[0.119]	[0.119]	[0.119]
Fixed Effects:			
Firm×Inventor	Yes	Yes	Yes
Firm×Year	Yes	Yes	Yes
Inventor Location	Yes	Yes	Yes
Inventor-Firm Same State	Yes	Yes	Yes
State Controls	Yes	Yes	Yes
Observations	79,401	73,496	73,496
Adjusted R^2	0.854	0.653	0.649

Table 7

Shifts in inventor-firm property rights and patent disclosure delays, including inventors located in Texas

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers, including those inventors located in Texas. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*) (1)	*Percentage Disclosure Delay* (2)	ln(*Days to Actual Disclosure*) (3)	*Percentage Disclosure Delay* (4)	ln(*Days to Actual Disclosure*) (5)	*Percentage Disclosure Delay* (6)
Affected by Alcatel v. Brown	-0.072**	-0.023***	-0.072**	-0.023***	-0.075**	-0.025***
	[0.030]	[0.008]	[0.030]	[0.008]	[0.030]	[0.008]
ln(*Days to Latest Possible Disclosure*)	0.599***		0.599***		0.603***	
	[0.012]		[0.012]		[0.012]	
Inventor-Firm HQ in Same State			-0.182	-0.016	-0.108	-0.016
			[0.154]	[0.052]	[0.203]	[0.062]
Personal Tax Rate					-0.395	0.125
					[0.721]	[0.234]
Corporate Income Tax Rates					1.353	-0.966
					[6.142]	[1.722]
R&D Tax Credit					-3.590	-0.708
					[2.284]	[0.632]
Fixed Effects:						
Firm×Inventor	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year	Yes	Yes	Yes	Yes	Yes	Yes
Inventor Location	Yes	Yes	Yes	Yes	Yes	Yes
Observations	83,108	83,108	83,108	83,108	80,512	80,512
Adjusted R^2	0.651	0.645	0.651	0.645	0.650	0.644

Table 8

Shifts in inventor-firm property rights and patent disclosure delays, including patent class-year fixed effects

This Table presents OLS regressions of patent disclosure choices as a function of a shift in the property rights around successful innovation from inventors to their corporate employers. We include patent-class year fixed effects in all columns. All variables are as defined in Appendix A. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 levels (two–tail). Sample descriptive characteristics are found in Table 1.

Variable:	ln(*Days to Actual Disclosure*) (1)	*Percentage Disclosure Delay* (2)	ln(*Days to Actual Disclosure*) (3)	*Percentage Disclosure Delay* (4)	ln(*Days to Actual Disclosure*) (5)	*Percentage Disclosure Delay* (6)
Affected by Alcatel v. Brown	-0.057*	-0.016*	-0.057*	-0.016*	-0.059*	-0.017**
	[0.033]	[0.008]	[0.033]	[0.008]	[0.033]	[0.008]
ln(*Days to Latest Possible Disclosure*)	0.667***		0.667***		0.671***	
	[0.012]		[0.012]		[0.013]	
Inventor-Firm HQ in Same State			-0.098	0.004	-0.067	-0.017
			[0.172]	[0.061]	[0.245]	[0.074]
Personal Tax Rate					-0.342	0.118
					[0.763]	[0.248]
Corporate Income Tax Rates					0.798	-1.376
					[7.317]	[2.077]
R&D Tax Credit					-2.433	-0.454
					[2.325]	[0.656]
Fixed Effects:						
Firm×Inventor	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year	Yes	Yes	Yes	Yes	Yes	Yes
Inventor Location	Yes	Yes	Yes	Yes	Yes	Yes
Patent Class×Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	72,006	72,006	72,006	72,006	69,552	69,552
Adjusted R^2	0.669	0.673	0.669	0.673	0.668	0.672