The Assignment of Intellectual Property Rights and Innovation

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Abstract: We study how the assignment of intellectual property rights for successful innovations between inventors and their employers affect inventor-employer matching, the generality of innovation, and innovation disclosure. To do so, we examine the effect of a major court ruling that significantly shifted the assignment of intellectual property rights from inventors to their employers. Our evidence from within-firm-year analyses show that inventors affected by the ruling are less likely to leave their current employer, more likely to create generalized innovations, and more promptly disclose their innovations, compared to unaffected inventors at the same firm. If affected inventors do leave their employer, they are relatively more likely to choose noncorporate employment. Firms affected by the ruling are more likely to locate their inventors in agglomeration economies, suggesting that strengthened property rights reduce the perceived risk of talent poaching and outgoing knowledge spillovers. We conclude that the assignment of intellectual property rights affects inventor-employer matching, the types of innovations inventors create, and the disclosure of innovation.

Keywords: corporate innovation, disclosure, relationship-specific investment, employee mobility, misappropriation

JEL: J41, J61, O30

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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 inventor-employer matching, the generality of innovation, and innovation disclosure. Corporate innovation is an increasingly important source of economic growth, value creation, and competitive advantage (e.g., Romer, 1990; Jones, 2021; Glaeser and Lang, 2023). However, a first-order concern for most corporate innovators is the risk their employee inventors will take their innovation knowledge to a competitor or use it to found a competitor (Anton and Yao, 1994, 1995; Kang and Lee, 2022).

Preventing employee inventors from misappropriating innovation knowledge is difficult due to the unique nature of innovation assets.[1] Innovating is a risky activity that tends to occur over a long horizon, and, even if successful, will result in outcomes that are impossible to define ahead of time due to the novelty of innovations. Consequently, contracts that govern innovation activities are difficult to specify and necessarily incomplete *ex-ante* (Holmström, 1989; Aghion and Tirole, 1994; Manso, 2011). Further complicating matters, the nonrivalry of innovations means that they are embodied in the inventor's human capital and can travel with the inventor if they leave their current employer (Anand and Galetovic, 2000).

The assignment of intellectual property rights can affect the inventor-employer relationship by altering the ability of inventors and their corporate employers to appropriate the returns to innovation *ex-post*. Stronger employer property rights to innovation outcomes diminish the ability of inventor employees to capture innovation value. Employers can also take deliberate actions to increase their ability to capture returns to innovation *ex-post*. For example, employers can

[1] We follow Glaeser and Lang (2023) and define an innovation as "a novel idea that improves a production process, product, method, or platform."

encourage or force inventors to work on projects that are more likely to yield relationship-specific innovations that are difficult to appropriate. Employers can also withhold or delay disclosure about successful innovation that might otherwise enhance their inventor employees' labor market value and mobility.

Understanding how the assignment of property rights between inventors and their employers affects the inventor-employer relationship is economically important. Private employee inventors make approximately 80% of all inventions in the U.S. and former employees of more established firms found many new competitor firms (Anton and Yao, 1995). Consequently, the inventor-employer relationship may affect the nature and location of innovation in the economy. It is also important to understand how the assignment of property rights between inventors and their employers affects corporate disclosure about innovation. Innovation is the "engine of growth" precisely because of the knowledge spillovers it creates (e.g., Solow, 1957; Romer, 1990). For example, Bloom, Schankerman and Van Reenen (2013) estimate that the social returns to R&D are two to three times larger than are the private returns due to these spillovers (see also Hall, Mairesse and Mohnen, 2010). However, these spillovers do not begin until the innovation is disclosed publicly (Kim and Valentine, 2021; Dyer et al., 2024).

There are at least two challenges that contribute to the current gap in our understanding of how the assignment of intellectual property rights between inventors and their employers influences their employment relationship, innovation production, and innovation disclosure. First, it is difficult, if not impossible, to observe the intellectual property rights of the parties to any specific relationship and 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 greater autonomy). To overcome these challenges,

we examine a legal case that significantly altered the assignment of intellectual property rights between employers and employee inventors: *Alcatel USA, Inc. v. Brown* ("*Alcatel v. Brown*," henceforth).

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 ruling thus allowed employers to claim ownership of their employee inventors' intellectual property by pre-invention assignment agreements, which are typically signed by the inventors as a prerequisite of employment (Allen, 1978; Lobel, 2014).[2] The court's decisions set a persuasive, nationwide precedent that would inform the future decisions of other state and federal courts.[3] Media outlets publicized the appeals court's decision in *Alcatel v. Brown* with various eye-catching headlines, including "We own what you think" and "Who owns your brain?" Moreover, these articles typically chronicled the defendant Evan Brown's legal woes and resulting bankruptcy.[4,5]

An important feature of our research setting is that the court's decision in *Alcatel v. Brown* was plausibly exogenous with respect to firms' and inventors' decisions, 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 rulings from other state and federal courts and are not likely to be influenced by lobbying from labor unions, corporations, or political parties (Klasa et al., 2018). Moreover, even if the Texas judge's decision did endogenously relate to firms' and

[2] Moreover, the ruling also expanded employers' contractual controls over any of their former employees' ideas that were developed while they were employed (e.g., Preston v. Marathon Oil Co. and Mattel, Inc. v. MGA Entertainment, Inc.). These agreements typically include provisions that assign all patents, copyright, and nonpatentable and noncopyrightable ideas developed during the course of the relationship to the employer.
[3] E.g., in *Mattel Inc. v. MGA Entertainment, Inc.*; Lai (2003) and Lobel (2014).
[4] https://www.salon.com/2004/08/18/evan_brown/; retrieved July 11, 2020.
[5] https://www.dmagazine.com/publications/d-magazine/2001/june/street-talk-who-owns-your-brain/; retrieved February 2, 2022.

inventors' decisions through some indirect channel such as lobbying, this endogenous relation would likely be confined to inventors located in Texas. Because we exclude inventors located in Texas from our main analyses, it seems unlikely that any such endogeneity biases our results.[6]

Another important aspect of our research setting is that 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 (IP) assignment disputes. This aspect allows us to compare variation in outcomes for inventors affected by the final *Alcatel v. Brown* decision to variation in outcomes for their unaffected counterparts in these nine states. Thus, our research design uses variation in both which inventors were affected by the final *Alcatel v. Brown* decision and time-series variation in when they were affected.

To further help rule out potential alternative explanations for our findings, we also include a variety of fixed effects. First, 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). Second, we include inventor home ZIP code fixed effects to control for differences across geographic areas (e.g., Silicon Valley). Finally, we include firm-year fixed effects to control for any unmeasured time-varying factors that influence firms' innovation-related disclosure, investment, and employment decisions. Consequently, the resulting empirical specifications compare differences in outcomes for inventors affected by *Alcatel v. Brown* to differences in outcomes for inventors employed at the same firm at the same point in time but who are unaffected by *Alcatel v. Brown*. This within-firm and within-time design allows us to draw a sharp contrast between inventors who work for the same employer simultaneously and are similar along all the dimensions captured by the other controls, but who differ in their property rights to their

[6] In robustness checks, we include inventors located in Texas and find similar results.

innovations due to different exposures to *Alcatel v Brown*.

We also examine how shifting property rights towards employers via the final decision in *Alcatel v. Brown* altered employment relationships. We find that inventors exposed to the final decision became almost 15% less likely to change employers compared to other inventors at the same firm not affected by the court's decision. This evidence suggests the court's decision made inventors less likely to take their ideas to another firm by significantly shifting property rights from inventors to their employers. These results thus also suggest that shifting property rights towards employers can strengthen the existing relationship between inventors and firms. Moreover, we find that inventors previously working at a noncorporate entity, such as a university or government, are less likely to start working for corporate employers affected by *Alcatel v. Brown*. In a similar vein, we also find that inventors working at corporate employers affected by *Alcatel v. Brown* are more likely to switch to noncorporate entities in the next five years than unaffected inventors. These pieces of evidence suggest that inventors prefer to work for employers where they have stronger property rights to innovation outcomes.

We also examine how *Alcatel v. Brown* affected where firms and inventors form employment matches. Glaeser, Glaeser and Labro (2022) show that public firms appear to avoid locating inventors in inventor agglomeration economies on average, suggesting that the cost of knowledge spill-outs is greater than the benefit of knowledge spill-ins. However, Anand and Galetovic (2000) predict that when property rights are strong, firms can benefit from local knowledge spillovers because they can use them to complete the R&D projects even when the inventor leaves. Consequently, Anand and Galetovic (2000) suggest that *Alcatel v. Brown* will reduce firms' costs of locating inventors in agglomeration economies. Consistent with this argument we find firms are more likely to locate their inventors in agglomeration economies after

being affected by *Alcatel v. Brown*.

Given that the assignment of property rights between employers and inventors affects the relationship between the two, we next turn to the question of how it affects innovation outcomes. Because *Alcatel v. Brown* made inventors less attractive to external employers and reduced their mobility, the ruling may have made employers more willing to allow their inventor employees to work on generalizable investments that would be broadly useful outside the firm. Consistent with this possibility, we find that firms' inventors affected by *Alcatel v. Brown* were more likely to develop patented innovations that cite other firms' patents, as well as patents in other classes, cities, and states. Similarly, we find that other firms' patents as well as patents from other subclasses and cities are more likely to cite patents developed by inventors affected by *Alcatel v. Brown*. Overall, these results suggest that the threat of holdup causes inventors to work on more general, and hence less firm-specific, innovations.

Finally, we examine how *Alcatel v. Brown* affected patent disclosures. All patent applications filed with the USPTO must be disclosed on the USPTO website no later than a specific deadline. Although the precise deadline varies (see Section 2.2 for details), the average deadline in our sample is 1,060 days. However, applicants can—and often do—choose to have their application disclosed prior to the deadline (on average, applicants in our sample disclose after 403 days).[7] We therefore study how the final decision in *Alcatel v. Brown* affects the timing of patent disclosure. Because patent disclosures credibly reveal the outcome of the R&D process, which tends to be long-term and opaque, patent disclosures are a valuable source of information to inventors, capital market participants, and competitors.[8] Consequently, the timing of firms' patent

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

[8] E.g., Hedge, Lev and Zhu (2018), Glaeser and Landsman (2021), Kim and Valentine (2021), Griffin, Hong and Ryou (2022), Hedge, Herkenhoff and Zhu (2022), Glaeser et al. (2022), and Dyer et al. (2024),

disclosures will affect the decisions of these, and potentially other, stakeholders. We find that firms accelerate their patent disclosures for innovations created by their inventors affected by the final decision in *Alcatel v. Brown* compared to their contemporaneous patent disclosures for innovations created by their unaffected inventors. This evidence suggests that *Alcatel v. Brown*, which significantly shifted property rights from inventors to their employers, motivated employers to accelerate disclosure so to foster knowledge dissemination and innovation spillovers.

We contribute to the innovation literature by demonstrating how the assignment of property rights between inventors and their employers affects the match between the two and the relationship-specificity of the innovations produced by the match. This evidence also contributes 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 inventor employment and innovation production.[9] We also contribute to the voluntary disclosure literature by documenting how the assignment of intellectual property rights for successful innovations between inventors and their employers affects inventor mobility and the timing of firms' patent disclosures, which prior work shows affects inventor, capital market, and competitor outcomes.[10]

We organize the rest of the paper 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.

[9] 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, DuCharme and Shores, 1995; Dou, Khan and Zou, 2016). Viewing firms as a nexus of interrelated contracts (Alchian 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.

[10] E.g., Hedge et al. (2018), Glaeser and Landsman (2021), Kim and Valentine (2021), and Hedge et al. (2022).

2. Related literature, predictions, and background

2.1. Related literature and predictions

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 secrecy with patenting.[11] We add to this line of research by demonstrating that the appropriability problem may also alter where firms employ inventors and the type of projects they direct or encourage inventors to work on.

Firms concerned about employee inventors misappropriating innovation knowledge may prefer to hire or employ inventors in locations where talent poaching by competitors is more difficult. However, inventors may prefer mobility, and whether their preferences or their employer's preference dominate is an open empirical question. Another open empirical question is whether changes in the assignment of property rights will affect firms' willingness to employ inventors in agglomeration economics, such as California's Silicon Valley. Glaeser et al. (2022) find that public firms avoid locating their inventors in agglomeration economies, suggesting that

[11] 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, Zhang and Zhu (2021) study holdup and innovation in supply chain relationships.

the cost of knowledge spill-outs are greater than the benefits of knowledge spill-ins. However, when firms' innovation property rights are strong, they may benefit more from agglomeration economies (Anand and Galetovic, 2000). Consequently, firms may be more willing to employ or hire inventors in agglomeration economies when their innovation property rights are stronger.

The strength of firms' innovation property rights may also affect the type of innovations they direct or encourage their inventors to work on and when they allow the disclosure of these innovations. When firms' innovation property rights are weaker, they may direct their inventors towards firm-specific projects that are less likely to yield benefits to competitors due to fears about misappropriation. However, when firms' innovation property rights are stronger, they may be more willing to allow their inventors to work on generalizable innovations because they are less concerned that inventors will misappropriate these innovations. Similarly, firms may be more willing to allow the disclosure of innovation when their property rights are stronger, as they are less concerned about signaling their inventor employees' innovation successes to competitors.

By examining how the assignment of property rights between inventors and employers affects innovation disclosure decisions, we also build on the literature that examines how employee mobility affects firms' disclosure practices. Aobdia (2018) and Li, Lin and Zhang (2018) find that reductions in employee mobility caused by regulations lead 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 created 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.

Our focus on the disclosure of inventors' innovations also allows us to contribute to the literature on career concerns and disclosure. Ali, Li and Zhang (2019) find that the Inevitable Disclosure 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, Zhang and Zhang (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.[12] We build on this literature by documenting how shifts in the assignment of property rights from inventors to their employers affect the timeliness of innovation disclosure. Consequently, we study how employees' labor market concerns affect their manager's disclosure decisions, rather than how the managers' labor market concerns influence the manager's disclosure decisions. Moreover, we consider 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, Hedge et al. (2018), Hedge et al. (2022), and Kim and Valentine (2021) find that prompter patent disclosures result in increased efficiency of price discovery and knowledge spillovers in innovation. Kim and Valentine (2021) also show that prompter patent disclosure causes greater inventor mobility. Glaeser, Michels and Verrecchia (2020) show that shorter-horizon managers are more likely to patent than rely on trade 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

[12] See also Bova, Dou and Hope (2015), who find that firms with unionized employees are more likely to miss analyst forecasts to reduce the bargaining power of the union.

Landsman (2021) 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 disclosures to avoid revealing enabling information to technological rivals. In total, this literature concludes that patent disclosure timeliness has real effects and is an important firm disclosure 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 detailed disclosure of how to independently recreate their innovation.[13] 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 (Hedge

[13] 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.

et al., 2018; Kim and Valentine, 2021). Prompter disclosure can also affect the allocation of capital because of information asymmetry around innovation (Aboody and Lev, 2000; Hedge et al., 2022). Finally, patent disclosures are a highly credible public signal about inventors' innovative successes.

Recognizing the value of prompt disclosure, the USPTO requires the publication of patent disclosures on the USPTO website by a deadline.[14] This deadline is the earlier of 18 months after foreign filing and the decision date for applications also filed in foreign jurisdictions and the decision date for all others ("domestic-only applications"). 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 the legal framework and the case of Alcatel USA, Inc. v. Brown

The state courts generally follow common law rules and federal precedents regarding the property rights over employee inventors' inventions. Briefly put, the common law states that employers can claim ownership of employee inventors' inventions if employment contracts include IP agreements or, in the absence of IP agreements, if inventors are specifically employed to work on the invention. Employers also have an implied nonexclusive license to develop and use employee inventors' ideas if the employees used their employer's resources to create the inventions. Nine states in the U.S. have enacted employee invention legislation that protects employee inventors' inventions if the inventions are unrelated to their employers' businesses. In the other states, the case of *Alcatel v. Brown* set a persuasive precedent that would inform

[14] 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.

employer-inventor litigation over innovation property rights.

The Brown in *Alcatel v. Brown* is Evan Brown, a software developer from Texas. He 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 so that he could pursue the 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 the invention. In 2004, the Texas Appeals Court turned down Brown's appeal of the 2002 decision.

The Appeals Court decision generated significant public and academic interest.[15] Many articles discussed Brown's bankruptcy and difficulty complying with the court's requirements that he disclose his invention in full and pay Alcatel's $332,000 attorneys' fees. Moreover, while the Appeals Court decision did not set a formal legal precedent outside of Texas, it arguably established a 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

[15] 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/.

extend to nine states that explicitly limited the enforceability of IP 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 the final decision in *Alcatel v. Brown* did not affect them, as the following passages illustrate:[16]

> "*The famous case of Alcatel vs. Evan Brown is something of an object lesson for employees everywhere to keep their mouths closed if they have a brilliant idea... When he went to his company to negotiate an agreement to share the profits, they refused and demanded the code. Brown said no, so they fired him and sued him in short order for his 'invention'. A Texas appeals court agreed with the employer; Brown was eventually forced to pay the legal costs and share the code*."

> "*However, 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*."

3. Research design

3.1. Inventor mobility measures

We examine four dimensions of inventor mobility. First, we examine whether inventors move from one corporate employer to another. To measure this dimension, we use an indicator equal to one if the inventor changes employer in the next five years (*Inventor Changes Employer*). Second and third, we examine whether inventors on a given patent switched from noncorporate

[16] https://jaxenter.com/github-intellectual-property-employees-132562.html; retrieved July 11, 2020.

employers to corporate employers, or vice versa. We define noncorporate employment as employment by universities or government institutes, as well as self-employment. To measure these dimensions, we use the number of inventors on a given patent that switched from noncorporate employers to corporate employers in the past five years (*Inventors Moved from Noncorporate*). We also use the number of inventors on a given patent that switched from corporate employers to noncorporate employers in the next five years (*Inventors Moved to Noncorporate*). Finally, we examine whether firms locate their newly hired inventors in agglomeration economies. In this respect, we consider a state an agglomeration state if the change in the number of inventors or inventing firms located in a state relative to the previous year is greater than the sample-year median. We then create forty-nine observations for each new inventor hire-year (i.e., excluding Texas) and examine as the dependent variable an indicator that is equal to one if the firm hired the inventor in a given state (*Hired in State*).[17]

3.2. Innovation measures

To examine the nature of innovation, we examine backward citations (i.e., references to prior patents) and forward citations (i.e., cites from subsequent patents). First, we examine whether firms make more backward citations to, and/or receive more forward citations from, other firms. We compute the ratio of both backward and forward citations to the firm's own backward or forwards citations (*%Backward Citations to Other Firms* and *%Forward Citations from Other Firms*, respectively). Second, to examine other aspects of the generality of innovation, we examine whether firms make more references to and/or are cited by more patents from other subclasses, cities, and states. Here, we compute ratios against citations from within the same subclass, city, or state. We label the backward citations variants of these variables *%Backward Citations to Other*

[17] We find that our inferences are similar if we include Texas observations (see Section 5.8 for details).

Subclasses, *%Backward Citations to Other Cities*, and *%Backward Citations to Other States*, respectively. We label the forward citations variants analogously.

3.3. Disclosure measures

Following Glaeser and Landsman (2021), 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. Therefore, 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 as a control the natural logarithm of the number of days between the patent filing date and when the applicant must disclose their application (ln(*Days to Latest Possible Disclosure*)) when using ln(*Days to Actual Disclosure*) as the dependent variable.[18] We remove observations where *Days to Actual* disclosure

[18] 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-

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.

3.4. Baseline regression models

We use our measures of inventor mobility, innovation, and disclosure delays as dependent variables in the following difference-in-differences specification:

$$\begin{aligned}[Outcome\ Variable_{i,j,t}] = {} & \beta_0 + \beta_1 \cdot Affected\ by\ Alcatel\ v.\ Brown_{i,t} \\ & + \beta_2 \cdot Inventor\text{-}Firm\ HQ\ in\ Same\ State_{i,f,t} + \gamma' X_{s,t} \\ & + Firm \times InventorFE + Firm \times YearFE \\ & + Inventor\ LocationFE + \varepsilon_{i,j,t}, \end{aligned} \quad (1),$$

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 *Affected 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.[19] Consequently, we compare the difference in inventor mobility, innovation, and firms' disclosure decisions for innovations created by inventors affected by *Alcatel v. Brown* after the final decision to the difference in inventor mobility, innovation, and disclosure decisions for innovations created by unaffected inventors after the final decision.

resources/electronic-data-products/patent-examination-research-dataset-public-pair; https://www.uspto.gov/learning-and-resources/ip-policy/economic-research/research-datasets.

[19] In Table 9, we report results including Texas and find that our inferences are unchanged.

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 an indicator equal to one 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., 2022). *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; Glaeser et al., 2022). *Corporate Income Tax Rate* is the top statutory income tax rate, which may affect corporate risk-taking and where corporations locate inventors because their wages are tax-deductible (Ljungqvist, Zhang and Zuo, 2017; Langenmayr and Lester, 2018; Glaeser et al., 2022). *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.[20]

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. *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 (Glaeser and Landsman, 2021; Glaeser et al., 2022). Consequently, we compare inventor mobility, innovation, and firms' disclosure decisions 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 StateFE* are fixed effects for the inventor's home state that

[20] We collect data on state research and development tax credits and statutory carrybacks and carryforward periods from Wilson (2009) and state tax websites.

control for time-invariant aspects of the inventor's home state.[21] 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.

In Section 5.3, we examine whether firms locate newly hired inventors in agglomeration economies. We consider a state an agglomeration economy if the change in the number of inventors or inventing firms located in a state relative to the previous year is greater than the sample-year median (*Inventor Agglomeration State* and *Firm Agglomeration State*). We then create forty-nine observations for each new inventor hire-year (i.e., excluding Texas) and use *Hired in State* as the outcome variable, which is an indicator that is equal to one if the firm hires the inventor in a particular state:

$$\begin{aligned} \textit{Hired in State}_{i,j,t} = {} & \beta_0 + \beta_1 \cdot \textit{Affected by Alcatel v. Brown}_{i,t} \times [\textit{Agglomeration}_{s,t}] \\ & + \beta_2 \cdot \textit{Affected by Alcatel v. Brown}_{i,t} + \beta_3 \cdot [\textit{Agglomeration}_{s,t}] \\ & + \beta_4 \cdot \textit{Inventor-Firm HQ in Same State}_{i,f,t} + \gamma' X_{s,t} \\ & + \textit{Firm} \times \textit{InventorFE} + \textit{Firm} \times \textit{YearFE} \\ & + \textit{StateFE} + \varepsilon_{i,j,t}, \end{aligned} \tag{2}$$

where [$\textit{Agglomeration}_{s,t}$] is *Inventor Agglomeration State* or *Firm Agglomeration State*. Controls are unchanged from Eq. (1). In Eq. (2), we replace *Inventor StateFE* with general state fixed effects, *StateFE*. Finally, in this analysis, we cluster standard errors by inventor and hiring year to address potential time-series dependence within inventors and cross-sectional dependence within hiring years.

4. Sample and summary statistics

4.1. Sample

[21] Available at https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/5F1RRI. We thank Li et al. (2014) for making the data publicly available.

We follow prior studies and define an inventor as an individual who patents (e.g., Akcigit, Baslandze and Stantcheva, 2016; Moretti and Wilson, 2017; Bell et al., 2019). We identify inventors, their location, and their successful patent applications using the United States Patent and Trademark Office (USPTO) patent database (Li et al., 2014). We match inventors to their employers using patent assignee data from the NBER patent database (Hall, Jaffe and Trajtenberg, 2001).[22] 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 the final decision in *Alcatel v. Brown*. Following Glaeser and Landsman (2021), 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 82,336 patent applications filed between January 1, 2003 and December 31, 2006.

We limit the sample to 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.[23]

4.2. Summary statistics

[22] Available at Noah Stoffman's website: http://iu.box.com/patents. We thank the authors of Kogan et al. (2017) and Stoffman, Woeppel and Yavuz (2022) for making the data publicly available.
[23] E.g., Hirschey, Skiba and Wintoki (2012), Kogan et al. (2017), Glaeser and Landsman (2021), and Kim and Valentine (2021).

Table 1 presents sample summary statistics. The average disclosure deadline is 1,060 days after filing. On average, applicants disclose 403 days after filing. The average of *Percentage Disclosure Delay* of 40% suggests most applicants voluntarily disclose about halfway through the application process, although the standard deviation of *Percentage Disclosure Delay* suggests significant variation in this choice. 20% of sample observations are affected by the final decision in *Alcatel v. Brown*. (Recall that none are affected prior to 2005.) 9.2% of investors change employers in the next five years. Consistent with prior work, about half of inventors live in their employers' headquarters state (Glaeser et al., 2022).

We present the frequency histogram of *Days to Actual Disclosure* in Figure 1. The two most frequent disclosure decisions 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. 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 the considerable variation in disclosure decisions.

5. Results

5.1. Shifts in inventor-firm property rights and inventor mobility

We begin the empirical analysis by examining whether inventors affected by the final decision in *Alcatel v. Brown* become less mobile, and whether prompter patent disclosure associates with greater inventor mobility. To do so, we estimate Eq. (1) using *Inventor Changes Employer* as the dependent variable and after including our measures of patent disclosure timeliness as independent variables. We present the results in Table 2. The results suggest that

inventors affected by the final decision in *Alcatel v. Brown* are 1.6 percentage points less likely to switch employers in the next five years. These magnitudes are quite large, as the baseline rate of mobility is 12.8% (consequently, *Alcatel v. Brown* reduced affected inventors' mobility by almost 15%). We also find some evidence that prompter patent disclosure associates with greater inventor mobility when using *Days to Latest Possible Disclosure* to measure patent disclosure timeliness in Column (2).[24]

5.2. Shifts in inventor-firm property rights and inventor mobility—moves related to noncorporate

Next, we examine whether inventors previously working at a noncorporate entity are less likely to subsequently work for firms affected by *Alcatel v. Brown*. We also examine whether inventors working at a corporate entity affected by *Alcatel v. Brown* are more likely to subsequently work for a noncorporate entity. To do so, we estimate Eq. (1) using $\sinh^{-1}$(*Inventors Moved from Noncorporate*) and $\sinh^{-1}$(*Inventors Moved to Noncorporate*) as dependent variables, where $\sinh^{-1}(\cdot)$ refers to the inverse hyperbolic sine of the respective variable.[25] We also include the inverse hyperbolic sine of the number of inventors on the patent ($\sinh^{-1}$(*Number of Inventors*)) to control for the number of potential movers.

We present the results of estimating the modified Eq. (1) in Table 3. The results in Table 3 Panel A suggest that inventors previously working at a noncorporate entity are approximately 2.8% less likely to switch to corporate employers affected by *Alcatel v. Brown*. In a similar vein, the results in Table 3 Panel B suggest that inventors working at corporate employers affected by *Alcatel v. Brown* are approximately 0.5% more likely to switch to noncorporate entities. Combined,

[24] We note these latter results are associations and should be interpreted as such. Kim and Valentine (2021) present causal evidence that prompter patent disclosure increases inventor mobility using a difference-in-differences design.
[25] We take the inverse hyperbolic sine because this transformation is defined for the observations where the outcome variable equals zero, whereas the natural logarithm would be undefined (Johnson, 1949; Burbidge et al., 1988). In untabulated analyses, we find our inferences are unchanged if we use the natural logarithm plus one instead.

this evidence suggests that inventors prefer to work for employers—or for themselves—where they have stronger property rights to innovation outcomes.

5.3. Shifts in inventor-firm property rights and access to agglomeration economies

In this section, we examine whether firms hire new inventors in agglomeration economies. To do so, we estimate Eq. (2) and present the results in Table 4. The results suggest that firms are more likely to locate their inventors in agglomeration economies when affected by *Alcatel v. Brown*, as indicated by positive coefficients on the interaction between *Affected by Alcatel v. Brown* and both [*Agglomeration*] variables. In particular, the results suggest that firms are 0.7 to 1.5 percentage points more likely to hire inventors in agglomeration economies when protected by *Alcatel v. Brown*. These results thus suggest that *Alcatel v. Brown* reduces firms' costs of locating inventors in agglomeration economies, as predicted by Anand and Galetovic (2000).

5.4. Shifts in inventor-firm property rights and the nature of innovation

Given that the assignment of property rights between employers and inventors affects the relationship between the two, we next turn to the question of how the assignment affects innovation outcomes. To do so, we estimate Eq. (1) using the backward and forward citations properties as dependent variables (see Section 3.2 for details). We present the results in Table 5, with the two panels presenting results for backward and forward citations properties, respectively. The results in Table 5 Panel A suggest that inventors affected by *Alcatel v. Brown* are more likely to develop innovations that cite other firms' innovations as well as patents from other subclasses, cities, and states—suggesting that greater employer innovation property rights cause firms to allow or direct their affected inventors to work on more general innovations. In terms of magnitudes, the results suggest that inventors affected by *Alcatel v. Brown* become 2.4 percentage points more likely to cite other firms' patents, which is a 9.1% increase on the mean.

Similarly, the results in Table 5 Panel B suggest that other firms' patents as well as patents from other subclasses and cities are more likely to cite patents whose inventors were affected by *Alcatel v. Brown*—corroborating the idea that these inventors began to work on more general innovations. We do not find that these forward citations travel beyond firms' states, however, which may speak to the limits of agglomeration economies. Overall, these results suggest that the threat of holdup can affect the types of projects firms and inventors pursue. In terms of magnitudes, the results suggest that inventors affected by *Alcatel v. Brown* become 2 percentage points more likely to receive citations from other firms' subsequent patents, which is a 10.6% increase on the mean.

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

In the subsections that follow, we examine how the *Alcatel v. Brown* decision affected patent disclosures. To do so, we estimate Eq. (1) and use ln(*Days to Actual Disclosure*) and *Percentage Disclosure Delay* as dependent variables. We present the results in Table 6, with Column (1) presenting results for ln(*Days to Actual Disclosure*) and Column (2) presenting results for *Percentage Disclosure Delay*. The results in Column (1) suggest that the final decision in *Alcatel v. Brown* resulted in an 7.2% decrease in the time until disclosure.[26] The results in Column (2) suggest that the final decision in *Alcatel v. Brown* resulted in a 2.4 percentage point decrease in the time until disclosure. Together, the results in Table 6 suggest that the final decision in *Alcatel v. Brown*, which significantly shifted property rights from inventors to their employers, accelerated the disclosure of innovation.

5.6. Shifts in inventor-firm property rights and patent disclosure delays—superstar inventors

We extend our main disclosure results by examining whether the final decision in *Alcatel*

[26] From the median of *Days to Actual Disclosure*, this translates into prompter disclosure by 29 days.

v. Brown differentially affects superstar inventors. We focus on our disclosure results because we have clear predictions about how *Alcatel v. Brown* will differentially affect superstars. Because superstars are prolific, the labor market likely has a strong prior that their ability is high. Consequently, firms likely do not worry about providing additional signals about superstars' ability. Consequently, *Alcatel v. Brown* should have less of an effect on the 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*, and interact that indicator with *Affected by Alcatel v. Brown*. 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., 2022).

We present the results of estimating the modified Eq. (1) in Table 7. The coefficients on *Affected by Alcatel v. Brown* × *Superstar* are about the same magnitude as the coefficients on *Affected by Alcatel v. Brown* and opposite in sign. Consequently, these results suggest that firms do not alter their disclosures about innovations created by superstar inventors affected by *Alcatel v. Brown* relative to disclosures about innovation created by their other, non-superstar inventors affected by *Alcatel v. Brown*. In total, the results in Table 8 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*.

5.7. Shifts in inventor-firm property rights and patent disclosure delays—firm-specific tenure

We extend our main results by examining whether inventors with stronger firm-specific relationships are differentially affected by the final decision in *Alcatel v. Brown*. We again focus on disclosure because we have clear predictions. Prior research suggests that firm-specific relationships substitute for formal property rights. For example, stronger past relationships between two contractual parties can mitigate the possibility of holdup when there are no formal

property rights (Klein, Crawford and Alchian, 1978; Dyer and Singh, 1998; Dasgupta et al., 2021). 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 in *Alcatel v. Brown*. To test this prediction, we follow prior research and measure the strength of the inventor's firm-specific relationships as the length of the inventor's tenure with the firm in years, or *Tenure*, and modify Eq. (1) to include *Tenure* and its interaction with *Affected by Alcatel v. Brown* (Cirillo, Brusoni and Valentini, 2014; Conti, Gambardella and Mariani, 2014).

We present the results of estimating the modified Eq. (1) in Table 8. The coefficients on *Affected by Alcatel v. Brown* × *Tenure* are the opposite sign of the coefficients on *Affected by Alcatel v. Brown*. We find that the magnitude of the marginal effect of *Affected by Alcatel v. Brown* decreases by approximately 60% as *Tenure* increases from the 25th percentile to the 75th percentile. Consequently, these results suggest that *Alcatel v. Brown* affected firms' disclosures about innovations created by inventors with strong firm-specific relationships affected by *Alcatel v. Brown* by about 40% to 50% less than they do their disclosures about innovations created by their other inventors affected by *Alcatel v. Brown*. In total, the results in Table 8 suggest that disclosures about innovations created by inventors with stronger firm-specific relationships, whose tenures substitute for the role of formal property rights, are less affected by *Alcatel v. Brown*.

5.8. Shifts in inventor-firm property rights after including inventors located in Texas

In our main specifications, we remove inventors living in Texas, whose judiciary decided *Alcatel v. Brown* and Brown's appeal, to avoid any potential endogeneity (e.g., if the Texas judge's decision did endogenously relate to firms' and inventors' decisions through some indirect channel such as lobbying). In Table 9, we repeat all preceding analyses including inventors located in Texas. Specifically, we repeat the analyses from Tables 2 through 6 and continue to find similar results.

We conclude that our results are robust to including inventors located in Texas, whose judiciary decided *Alcatel v. Brown*.

6. Conclusion

We study how *Alcatel v. Brown*, which shifted property rights for innovations from inventors to their employers, affected the disclosure of innovation, inventor mobility, and the generality of innovations. We find that firms accelerate their patent disclosures for innovations created by their inventors affected by *Alcatel v. Brown*, relative to their patent disclosures for innovations created by their unaffected inventors. These findings suggest that disclosure is one margin of response that firms use to mitigate potential hold-up problems with inventor employees. Affected inventors are also much less likely to switch firms and to produce firm-specific innovations. 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 innovation production functions and disclosures.

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Appendix A. Variable definitions

Variable	Description
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 processing delays.
Percentage Disclosure Delay	The number of days until the disclosure of the patent filing, divided by the number of days until the latest possible disclosure.
%Backward Citations to Other Firms	The ratio of backward citations of (i.e., references to) other firms' patents to own firm patents.
%Backward Citations to Other Subclasses	The ratio of backward citations of (i.e., references to) patents from different subclasses to same subclasses.
%Backward Citations to Other Cities	The ratio of backward citations of (i.e., references to) patents from different cities to same cities.
%Backward Citations to Other States	The ratio of backward citations of (i.e., references to) patents from different states to same states.
%Forward Citations from Other Firms	The ratio of forward citations of (i.e., cites by) other firms' patents to own firm patents.
%Forward Citations from Other Subclasses	The ratio of forward citations of (i.e., cites by) patents from different subclasses to same subclasses.
%Forward Citations from Other Cities	The ratio of forward citations of (i.e., cites by) patents from different cities to same cities.
%Forward Citations from Other States	The ratio of forward citations of (i.e., cites by) patents from different states to same states.
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 inventor's home state.
R&D Tax Credit	The statutory rate at which firms may claim a state R&D tax credit in the inventor's home state.

(continued on next page)

Appendix A. Variable definitions (continued)

Variable	Description
Inventor variables	
Affected by Alcatel v. Brown	Our differences-in-difference estimator, which reflects whether the lead inventor on the patent application is affected by the final decision in *Alcatel v. Brown*. An indicator that takes the value one after 2004 if the inventor does not live in any of the nine states that use employee invention legislation to limit the enforceability of IP assignment agreements. The nine states are California, Delaware, Illinois, Kansas, Minnesota, North Carolina, Nevada, Utah, and Washington.
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.
Inventor Changes Employer	An indicator that is equal to one if the inventor changes employer in the next five years.
Inventors Moved from Noncorporate	The number of inventors on a given patent that switched from noncorporate employers to corporate employers in the past five years.
Inventors Moved to Noncorporate	The number of inventors on a given patent that switched from corporate employers to noncorporate employers in the next five years.
Number of Inventors	The number of inventors listed on a given patent.
Inventor Agglomeration	The change in the number of inventors located in a state relative to the previous year. In our regression analysis, we create an indicator that is equal to one if the change is greater than the sample-year median (i.e., *Inventor Agglomeration State*).
Firm Agglomeration	The change in the number of inventing firms located in a state relative to the previous year. In our regression analysis, we create an indicator that is equal to one if the change is greater than the sample-year median (i.e., *Firm Agglomeration State*).
Superstar	An indicator that is equal to one if the inventor is in the top 10% of total 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 1985 for this calculation.

Figure 1. Frequency of actual disclosure

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

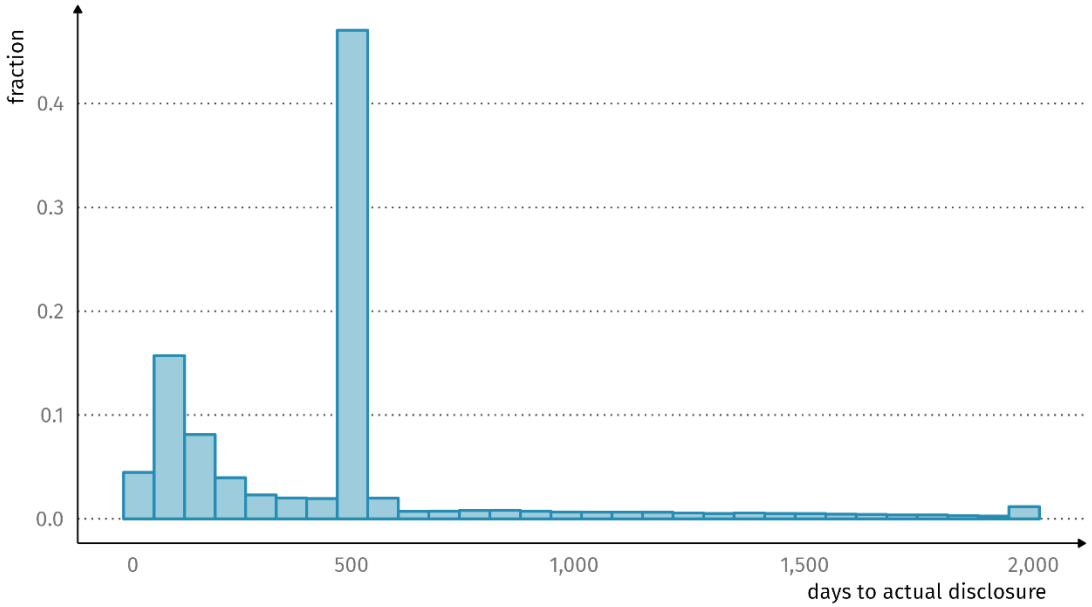

Figure 2. Frequency of days to latest possible disclosure

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

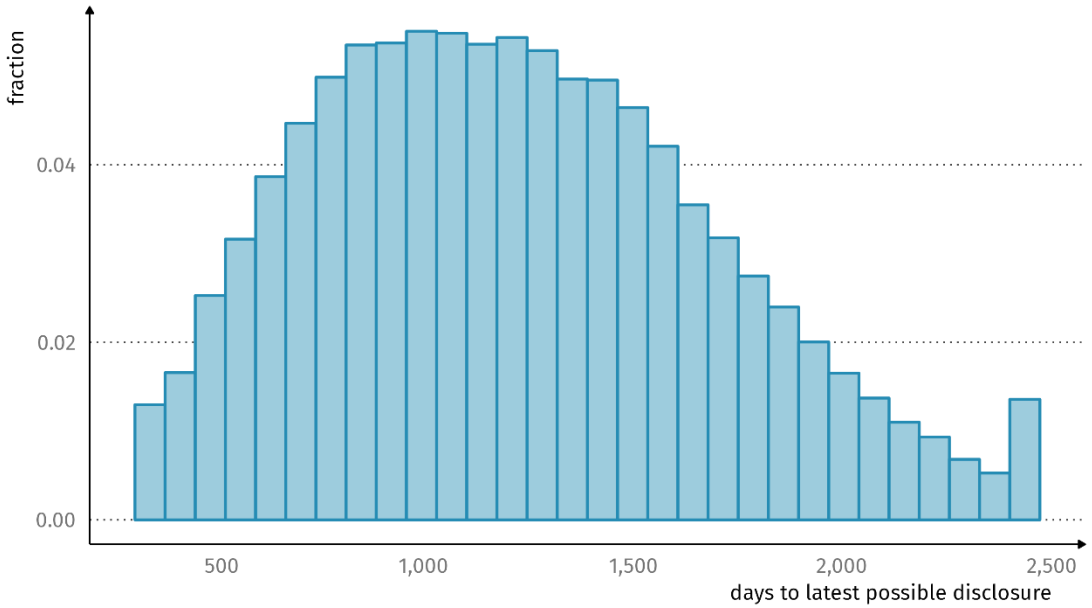

Figure 3. Frequency of percentage disclosure delay

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

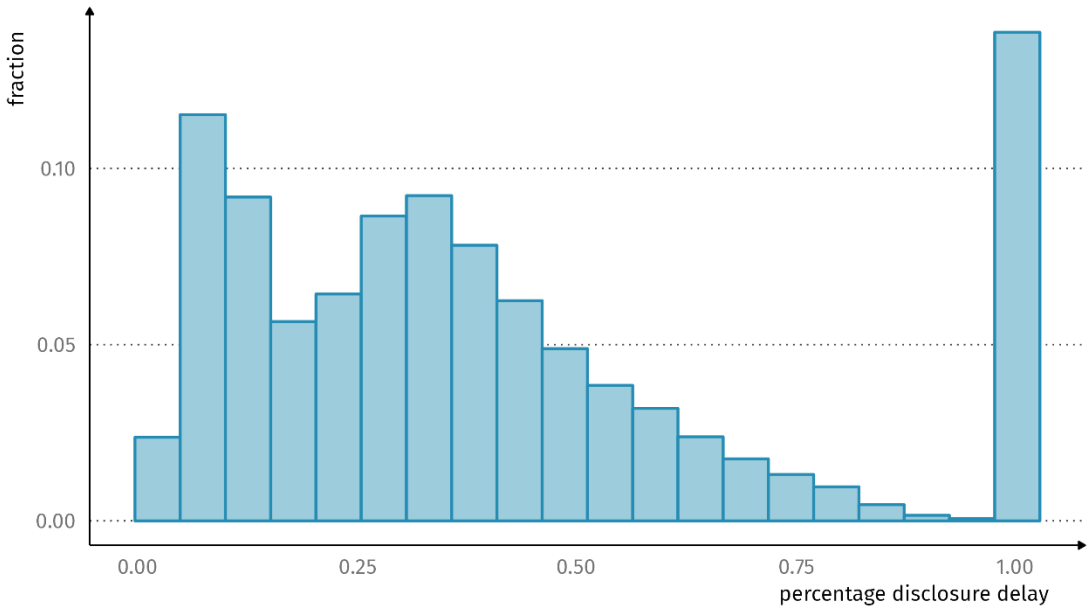

Table 1. Summary statistics

This table presents summary statistics for our sample. Our final sample consists of 82,336 patent applications filed between January 1, 2003 and December 31, 2006.

	Mean	Std. Dev.	25th	50th	75th
Patent variables					
Days to Latest Possible Disclosure	1,060.000	426.051	735.000	1,020.000	1,340.000
ln(*Days to Latest Possible Disclosure*)	6.880	0.434	6.601	6.920	7.200
Days to Actual Disclosure	403.000	345.403	112.000	450.000	456.000
ln(*Days to Actual Disclosure*)	5.580	1.038	4.727	6.110	6.120
Percentage Disclosure Delay	0.405	0.313	0.135	0.337	0.564
%Backward Citations to Other Firms	0.264	0.404	0.000	0.000	0.648
%Backward Citations to Other Subclasses	0.312	0.445	0.000	0.000	0.919
%Backward Citations to Other Cities	0.323	0.450	0.000	0.000	0.933
%Backward Citations to Other States	0.232	0.371	0.000	0.000	0.493
%Forward Citations from Other Firms	0.188	0.373	0.000	0.000	0.000
%Forward Citations from Other Subclasses	0.222	0.407	0.000	0.000	0.000
%Forward Citations from Other Cities	0.224	0.403	0.000	0.000	0.000
%Forward Citations from Other States	0.179	0.360	0.000	0.000	0.000
State variables					
Personal Tax Rate	0.382	0.011	0.375	0.385	0.393
Corporate Income Tax Rate	0.074	0.026	0.070	0.088	0.088
R&D Tax Credit	0.081	0.059	0.025	0.065	0.150
Inventor variables					
Affected by Alcatel v. Brown	0.204	0.403			
Inventor-Firm HQ in Same State	0.556	0.497			
Inventor Changes Employer	0.128	0.334			
$\sinh^{-1}$(*Inventors Moved from Noncorporate*)	0.302	0.507	0.000	0.000	0.881
$\sinh^{-1}$(*Inventors Moved to Noncorporate*)	0.009	0.091	0.000	0.000	0.000
$\sinh^{-1}$(*Number of Inventors*)	1.620	0.553	1.444	1.444	2.090
Inventor Agglomeration	–17.000	234.896	–50.000	–4.000	22.000
Firm Agglomeration	–6.830	11.425	–12.000	–5.000	1.000
Superstar	0.157	0.364			
Tenure	5.180	4.400	1.000	4.000	8.000

Table 2. Shifts in inventor-firm property rights 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 of patent disclosure decisions. All variables are as defined in Appendix A and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
		Dependent variable:	
Variable:		*Inventor Changes Employer*	
Affected by Alcatel v. Brown	–0.016**	–0.016**	–0.016**
	(0.008)	(0.008)	(0.008)
ln(*Days to Actual Disclosure*)		0.001	
		(0.001)	
Percentage Disclosure Delay			0.001
			(0.002)
ln(*Days to Latest Possible Disclosure*)		0.002*	
		(0.001)	
Inventor-Firm HQ in Same State	0.020	0.020	0.020
	(0.013)	(0.013)	(0.013)
Personal Tax Rate	6.324*	6.286*	6.325*
	(3.634)	(3.628)	(3.633)
Corporate Income Tax Rates	–3.913	–3.937	–3.920
	(3.306)	(3.310)	(3.309)
R&D Tax Credit	0.658	0.685	0.657
	(1.191)	(1.193)	(1.192)
Fixed effects:			
Firm × inventor	yes	yes	yes
Firm × year	yes	yes	yes
Inventor location	yes	yes	yes
Observations	82,336	82,336	82,336
Adjusted R^2	88.394%	88.395%	88.394%

Table 3. Shifts in inventor-firm property rights and inventor mobility—moves from and to noncorporate employers

This table presents OLS regressions of moves from and to noncorporate employers as a function of a shift in the property rights around successful innovation from inventors to their corporate employers and of patent disclosure decisions. Panels A and B present, respectively, results for moves from and to noncorporate employers. All variables are as defined in Appendix A and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Panel A. Moves from noncorporate employers

	(1)	(2)	(3)
	Dependent variable:		
Variable:	$\sinh^{-1}$(*Inventors Moved from Noncorporate*)		
Affected by Alcatel v. Brown	–0.028**	–0.028**	–0.029**
	(0.013)	(0.013)	(0.013)
ln(*Days to Actual Disclosure*)		–0.007***	
		(0.002)	
Percentage Disclosure Delay			–0.014**
			(0.007)
ln(*Days to Latest Possible Disclosure*)		–0.013***	
		(0.004)	
$\sinh^{-1}$(*Number of Inventors*)	0.207***	0.207***	0.207***
	(0.006)	(0.006)	(0.006)
Inventor-Firm HQ in Same State	0.040	0.038	0.040
	(0.044)	(0.044)	(0.044)
Personal Tax Rate	–3.254	–3.013	–3.268
	(3.487)	(3.445)	(3.486)
Corporate Income Tax Rates	0.605	0.762	0.698
	(1.544)	(1.524)	(1.529)
R&D Tax Credit	0.772	0.603	0.796
	(0.965)	(0.970)	(0.966)
Fixed effects:			
Firm × inventor	yes	yes	yes
Firm × year	yes	yes	yes
Inventor location	yes	yes	yes
Observations	82,336	82,336	82,336
Adjusted R^2	68.386%	68.410%	68.389%

Table 3. Shifts in inventor-firm property rights and inventor mobility—moves from and to noncorporate employers (continued)

Panel B. Moves to noncorporate employers

	(1)	(2)	(3)
	Dependent variable:		
Variable:	$\sinh^{-1}$(*Inventors Moved to Noncorporate*)		
Affected by Alcatel v. Brown	0.005**	0.005**	0.005**
	(0.002)	(0.002)	(0.002)
ln(*Days to Actual Disclosure*)		0.000	
		(0.000)	
Percentage Disclosure Delay			0.000
			(0.001)
ln(*Days to Latest Possible Disclosure*)		0.000	
		(0.001)	
$\sinh^{-1}$(*Number of Inventors*)	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)
Inventor-Firm HQ in Same State	0.011	0.011	0.011
	(0.012)	(0.012)	(0.012)
Personal Tax Rate	–2.917	–2.917	–2.917
	(2.087)	(2.088)	(2.086)
Corporate Income Tax Rates	–0.514	–0.521	–0.517
	(0.598)	(0.599)	(0.599)
R&D Tax Credit	0.543	0.543	0.542
	(0.398)	(0.398)	(0.398)
Fixed effects:			
Firm × inventor	yes	yes	yes
Firm × year	yes	yes	yes
Inventor location	yes	yes	yes
Observations	82,336	82,336	82,336
Adjusted R^2	42.044%	42.043%	42.044%

Table 4. Shifts in inventor-firm property rights and access to agglomeration economies

This table presents OLS regressions of employment location decisions as a function of a shift in the property rights around successful innovation from inventors to their corporate employers and of state agglomeration status. The sample includes forty-nine states observations for each new hire-year (i.e., excluding Texas). *Hired in State* is an indicator equal to one if the state is where the new hire is located (i.e., where the firm employs the new inventor). *Inventor Agglomeration State* is an indicator equal to one if the year-over-year change in the number of inventors located in a state is greater than the sample-year median of this value. *Firm Agglomeration State* is an indicator equal to one if the year-over-year change in the number of inventing firms located in a state is greater than the sample-year median of this value. All other variables are as defined in Appendix A and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and hiring year. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

	(1)	(2)
	Dependent variable:	
Variable:	*Hired in State*	
Affected by Alcatel v. Brown × Inventor Agglomeration State	0.015**	
	(0.003)	
Affected by Alcatel v. Brown × Firm Agglomeration State		0.007**
		(0.002)
Affected by Alcatel v. Brown	–0.007**	–0.004**
	(0.002)	(0.001)
Inventor Agglomeration State	–0.002	
	(0.002)	
Firm Agglomeration State		–0.001
		(0.001)
Inventor-Firm HQ in Same State	0.000	0.000
	(0.000)	(0.000)
Personal Tax Rate	–0.063	0.004
	(0.189)	(0.012)
Corporate Income Tax Rates	0.039	0.010
	(0.056)	(0.028)
R&D Tax Credit	–0.047	–0.054
	(0.040)	(0.043)
Fixed effects:		
Firm × inventor	yes	yes
Firm × year	yes	yes
State	yes	yes
Observations	271,852	271,852
Adjusted R^2	13.924%	13.893%

Table 5. Shifts in inventor-firm property rights and the nature of innovation

This table presents OLS regressions of backward and forward patent citation properties as a function of a shift in the property rights around successful innovation from inventors to their corporate employers and of patent disclosure decisions. Panels A and B present, respectively, results for backward and forward patent citation properties. All variables are as defined in Appendix A and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and hiring year. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Panel A. Backward citation properties

	(1)	(2)	(3)	(4)
	Dependent variable:			
	%Backward Citations to …			
Variable:	*… Other Firms*	*… Other Subclasses*	*… Other Cities*	*… Other States*
Affected by Alcatel v. Brown	0.024**	0.028**	0.027**	0.019*
	(0.010)	(0.012)	(0.012)	(0.010)
ln(*Days to Actual Disclosure*)	0.006**	0.007**	0.007***	0.006***
	(0.002)	(0.003)	(0.003)	(0.002)
ln(*Days to Latest Possible Disclosure*)	–0.060***	–0.076***	–0.076***	–0.054***
	(0.010)	(0.012)	(0.012)	(0.009)
Inventor-Firm HQ in Same State	–0.018	–0.013	–0.001	–0.040
	(0.045)	(0.054)	(0.050)	(0.039)
Personal Tax Rate	6.153	3.864	7.407	5.872
	(6.289)	(8.261)	(7.189)	(5.744)
Corporate Income Tax Rates	–6.356*	–8.279*	–8.712*	–2.862
	(3.645)	(4.589)	(4.696)	(3.240)
R&D Tax Credit	1.801	4.293	3.280	0.469
	(2.188)	(2.693)	(2.433)	(1.943)
Fixed effects:				
Firm × inventor	yes	yes	yes	yes
Firm × year	yes	yes	yes	yes
Inventor location	yes	yes	yes	yes
Observations	82,336	82,336	82,336	82,336
Adjusted R^2	22.489%	21.521%	23.477%	23.495%

Table 5. Shifts in inventor-firm property rights and the nature of innovation (continued)

Panel B. Forward citation properties

	(1)	(2)	(3)	(4)
	Dependent variable:			
	%Forward Citations from …			
Variable:	*… Other Firms*	*… Other Subclasses*	*… Other Cities*	*… Other States*
Affected by Alcatel v. Brown	0.020**	0.023**	0.024**	0.006
	(0.010)	(0.010)	(0.010)	(0.010)
ln(*Days to Actual Disclosure*)	0.011***	0.018***	0.016***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
ln(*Days to Latest Possible Disclosure*)	–0.094***	–0.153***	–0.144***	–0.094***
	(0.008)	(0.010)	(0.010)	(0.008)
Inventor-Firm HQ in Same State	0.006	0.002	0.001	–0.059
	(0.044)	(0.049)	(0.047)	(0.044)
Personal Tax Rate	2.186	3.619	–1.745	2.515
	(6.550)	(6.674)	(6.514)	(4.839)
Corporate Income Tax Rates	–4.542	–8.388**	–6.753*	–2.911
	(4.519)	(3.893)	(3.829)	(3.460)
R&D Tax Credit	0.494	2.383	2.985	–0.552
	(2.181)	(2.088)	(2.256)	(1.678)
Fixed effects:				
Firm × inventor	yes	yes	yes	yes
Firm × year	yes	yes	yes	yes
Inventor location	yes	yes	yes	yes
Observations	82,336	82,336	82,336	82,336
Adjusted R^2	14.432%	15.485%	17.133%	13.877%

Table 6. Shifts in inventor-firm property rights and patent disclosure delays

This table presents OLS regressions of patent disclosure decisions 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 and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

	(1)	(2)
	Dependent variable:	
Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
Affected by Alcatel v. Brown	–0.072***	–0.024***
	(0.027)	(0.007)
ln(*Days to Latest Possible Disclosure*)	0.601***	
	(0.012)	
Inventor-Firm HQ in Same State	–0.029	–0.015
	(0.099)	(0.028)
Personal Tax Rate	1.438	–1.002
	(20.675)	(4.066)
Corporate Income Tax Rates	24.664**	6.436
	(12.023)	(4.083)
R&D Tax Credit	0.712	1.712
	(6.329)	(1.347)
Fixed effects:		
Firm × inventor	yes	yes
Firm × year	yes	yes
Inventor location	yes	yes
Observations	82,336	82,336
Adjusted R^2	50.794%	50.121%

Table 7. Shifts in inventor-firm property rights and patent disclosure delays—superstar inventors

This table presents OLS regressions of patent disclosure decisions 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 and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

	(1)	(2)
	Dependent variable:	
Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
Affected by Alcatel v. Brown× Superstar	0.101**	0.029***
	(0.040)	(0.010)
Affected by Alcatel v. Brown	–0.097***	–0.031***
	(0.028)	(0.007)
Superstar	0.012	–0.011
	(0.043)	(0.012)
ln(*Days to Latest Possible Disclosure*)	0.600***	
	(0.012)	
Inventor-Firm HQ in Same State	–0.031	–0.016
	(0.099)	(0.028)
Personal Tax Rate	1.467	–0.968
	(20.656)	(4.053)
Corporate Income Tax Rates	24.585**	6.436
	(12.030)	(4.084)
R&D Tax Credit	0.738	1.705
	(6.334)	(1.348)
Fixed effects:		
Firm × inventor	yes	yes
Firm × year	yes	yes
Inventor location	yes	yes
Observations	82,336	82,336
Adjusted R^2	50.810%	50.134%

Table 8. Shifts in inventor-firm property rights and patent disclosure delays—inventor tenure

This table presents OLS regressions of patent disclosure decisions 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 and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

	(1)	(2)
	Dependent variable:	
Variable:	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
Affected by Alcatel v. Brown× Tenure	0.011***	0.003***
	(0.003)	(0.001)
Affected by Alcatel v. Brown	–0.155***	–0.049***
	(0.036)	(0.009)
Tenure	1.205**	0.126
	(0.535)	(0.147)
ln(*Days to Latest Possible Disclosure*)	0.600***	
	(0.012)	
Inventor-Firm HQ in Same State	–0.031	–0.016
	(0.099)	(0.028)
Personal Tax Rate	–12.821	–2.422
	(19.946)	(4.281)
Corporate Income Tax Rates	13.471	5.237
	(14.903)	(5.196)
R&D Tax Credit	5.941	2.254
	(7.375)	(1.812)
Fixed effects:		
Firm × inventor	yes	yes
Firm × year	yes	yes
Inventor location	yes	yes
Observations	82,336	82,336
Adjusted R^2	50.812%	50.139%

Table 9. Shifts in inventor-firm property rights after including inventors located in Texas

This table presents OLS regressions that repeat the analyses in Tables 2 through 6, after including inventors located in Texas. Panels A and B present, respectively, results for Tables 2 and 3 and Tables 4 through 6. All variables are as defined in Appendix A and sample summary statistics are in Table 1. Standard errors appear in parentheses and are clustered by inventor, firm, and issue date. *, **, and *** denote statistical significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Panel A. Replication of Tables 2 and 3

	(1)	(2)	(3)
Replication of Table:	Table 2	Table 3	
	Dependent variable:	Dependent variable:	
Variable:	*Inventor Changes Employer*	$\sinh^{-1}$(*Inventors Moved from Noncorporate*)	$\sinh^{-1}$(*Inventors Moved to Noncorporate*)
Affected by Alcatel v. Brown	–0.014*	–0.030**	0.004**
	(0.008)	(0.013)	(0.002)
ln(*Days to Actual Disclosure*)	0.001	–0.006***	0.000
	(0.001)	(0.002)	(0.000)
ln(*Days to Latest Possible Disclosure*)	0.002	–0.012***	0.000
	(0.001)	(0.004)	(0.001)
$\sinh^{-1}$(*Number of Inventors*)		0.203***	0.004***
		(0.006)	(0.001)
Inventor-Firm HQ in Same State	0.014	0.029	0.010
	(0.011)	(0.038)	(0.010)
Personal Tax Rate	4.261	0.022	–2.537
	(3.695)	(3.775)	(1.835)
Corporate Income Tax Rates	–4.756	0.804	–0.501
	(3.554)	(1.295)	(0.540)
R&D Tax Credit	1.155	0.194	0.491
	(1.283)	(0.959)	(0.357)
Fixed effects:			
Firm × inventor	yes	yes	yes
Firm × year	yes	yes	yes
Inventor location	yes	yes	yes
Observations	89,801	89,801	89,801
Adjusted R^2	88.076%	68.453%	41.966%

Table 9. Shifts in inventor-firm property rights after including inventors located in Texas (continued)

Panel B. Replication of Tables 4 through 6

Replication of Table:	(1)	(2)	(3)	(4)	(5)	(6)
	Table 4		Table 5		Table 6	
	Dependent variable:		Dependent variable:		Dependent variable:	
Variable:	*Hired in State*		*%Backward Citations to Other Firms*	*%Forward Citations from Other Firms*	ln(*Days to Actual Disclosure*)	*Percentage Disclosure Delay*
Affected by Alcatel v. Brown	–0.008*	–0.002*	0.024**	0.021**	–0.054**	–0.020***
	(0.003)	(0.001)	(0.010)	(0.009)	(0.026)	(0.007)
Affected by Alcatel v. Brown × *Inventor Agglomeration State*	0.017*					
	(0.006)					
Affected by Alcatel v. Brown × *Firm Agglomeration State*		0.004*				
		(0.001)				
ln(*Days to Actual Disclosure*)			0.006***	0.011***		
			(0.002)	(0.002)		
ln(*Days to Latest Possible Disclosure*)			–0.060***	–0.096***	0.598***	
			(0.010)	(0.008)	(0.012)	
Inventor Agglomeration State	–0.003					
	(0.003)					
Firm Agglomeration State		0.000				
		(0.001)				
Inventor-Firm HQ in Same State	0.000	0.000	–0.032	0.039	–0.107	–0.021
	(0.000)	(0.000)	(0.040)	(0.041)	(0.089)	(0.025)
Personal Tax Rate	–0.076	–0.077	0.865	1.320	18.520	0.826
	(0.188)	(0.039)	(7.390)	(5.996)	(25.904)	(4.288)
Corporate Income Tax Rates	0.040	0.010	–8.252*	–4.987	27.762*	6.566
	(0.062)	(0.021)	(4.230)	(4.847)	(14.462)	(4.509)
R&D Tax Credit	–0.040	–0.055	2.991	0.909	–2.404	1.464
	(0.044)	(0.033)	(2.560)	(2.328)	(7.248)	(1.524)
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	303,700	303,700	89,801	89,801	89,801	89,801
Adjusted R^2	11.748%	11.700%	22.674%	14.438%	50.652%	49.670%