ONLINE APPENDIX

How innovating firms manage knowledge leakage: A natural experiment on the threat of worker departure

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A *Application v. Hunter*

A.1 Litigation timeline

California is known for its strong public policy against the enforcement of restrictive covenants in employment, including the enforcement of voluntarily entered non-competes (we use the term "non-competes" to refer to non-compete clauses/agreements). The most relevant statute is California Business & Professional Code Section 16600 ("Section 16600"), which states that "except as provided in this chapter, every contract by which anyone is restrained from engaging in a lawful profession, trade, or business of any kind is to that extent void."

Since the 1872 enactment of Section 16600, California has consistently refused to enforce *in-state* non-competes, that is, non-compete agreements between a California employer and employee. However, *out-of-state* non-competes, which are signed by an employer and employee *outside* of California, have been construed as enforceable under California law (for a review, see Wu, 2003).

Application Group, Inc. v. Hunter Group, Inc., 61 Cal. App. 4th 881 (1998)—henceforth, *Application v. Hunter*—was the first legal case to establish that out-of-state non-competes are also not enforceable in California, even with the presence of a "choice-of-law" provision in which the contracting parties specify that any dispute arising under the contract shall be determined under the law of a particular jurisdiction (for a detailed review of this case, see Kahn, 1999).

In 1992, Dianne Pike, a consultant in computerized human resources management systems, resigned from Hunter Group Inc. ("Hunter") to take a position at a competing firm in California, known as Application Group, Inc. ("AGI"). Pike had signed a non-compete agreement with Hunter prohibiting her from working for a competing firm for one year after the termination of her employment. Their contract also included a "choice-of-law" provision, which specifically stated that the contract should be "governed by and construed in accordance with the laws of the State of Maryland." As such, this provision allowed Hunter to contend that legal disputes on the contract, including its non-compete agreement, must be decided by a court in Maryland, a state where non-competes are enforceable.

Both firms took instant but separate actions after Pike resigned from Hunter to join AGI. In 1992, Hunter sued both Pike and AGI in the Maryland Circuit Court for a breach of contract and unlawful interference. AGI, on the other hand, filed a complaint to California courts for a

declaratory judgement, arguing that California's Section 16600 rather than Maryland law should be applied to this case. The Maryland Circuit Court favored AGI in its decision, noting that Hunter did not provide enough evidence to claim damages. This decision allowed California courts to proceed with their requests with AGI's declaratory relief, which was pending Maryland Court's decision.

In January 1995, the case proceeded to California trial courts. In trial court, Judge Norman originally issued a statement of decision that denied AGI's claims for declaratory relief (January 30, 1995). However, in response to AGI's objections, Judge Norman issued a revised statement of decision that, for the most part, ruled that California law applies to AGI's hiring of Hunter employees (April 5, 1995). On June 15, 1995, the trial court's judgment was entered that California law should indeed apply to the hiring of Pike. The final decision was made by the California Courts of Appeal in February 1998. The decision affirmed the trial court's decision that enforcing out-of-state non-competes in California would violate the state's public policy, even if the contract was signed between a Maryland firm and a Maryland resident and included a choice of law provision (*Application v. Hunter*, 1998).

A.2 *Application v. Hunter* as a strong legal precedent

It is essential to establish that *Application Group, Inc. v. Hunter Group, Inc.*, 61 Cal. App. 4th 881 (1998) ("*Application v. Hunter*") was a truly precedent setting. We conduct an in-depth legal analysis to verify that *Application v. Hunter* set a strong precedent for future courts, and that it substantially increased the threat of worker departure and knowledge leakage faced by noncompete-enforcing firms. We find both quantitative and qualitative evidence that future courts, practitioners, and legal scholars frequently cite this decision as a seminal case regarding the enforceability of *out-of-state* noncompetes in California.

Quantitative citation analysis

One of the most straightforward ways to examine the significance of a court decision is to examine the number of times a case is cited (forward citations) in subsequent court decisions and other legal sources, including law reviews, law practitioner's guidelines, etc. We used Lexis+, a leading provider of legal research tools, to compare the number of times that Application v. Hunter was cited to the number of times that all other noncompete-related court decisions made in the same

year (392 cases) were cited. Table A.1. summarizes the procedure (in notes) and results of this analysis.

Table A.1. Quantitative citation analysis of *Application v. Hunter* and other decisions made in 1998

	Application v. Hunter	Other decisions in 1998 (*N*=392)		
		Mean	Median	S.D.
Cited by court decisions	**165**	17.9	4	83.5
Cited by other sources	**604**	20.7	5	51.9
Total	**769**	38.6	10	121.8

Notes. Data was collected around January 15, 2021 from Lexis+, a well-established, extensive, legal research tool widely used by legal researchers and practitioners. As a comparison group, we searched for all decisions containing the words *non competition, covenant not to compete, non compete, non compete clause, non compete covenant* (including all possible combinations with hyphens) in their document. We found 393 such cases and excluded the *Application v. Hunter* case from this category.

Application vs Hunter was cited 769 times by 165 court decisions and 604 times in other legal documents (476 court documents, 70 law reviews, 46 treatises, 9 other citations, and 3 statutes). This number is significantly higher than that of other court decisions, suggesting that *Application v. Hunter* indeed had a very strong influence on future court decisions, legal scholarship, and law practices. In fact, *Application v. Hunter* is the third-most-cited decision in this group (out of 393), exceeded only by two court decisions unrelated to *inter-state* enforceability of noncompetes.[1]

Qualitative citation analysis

We also qualitatively analyzed the content of the 165 court decisions that cite *Application v. Hunter* to understand how *Application v. Hunter* affected future court decisions. *Application v. Hunter* set a strong precedent that California courts can apply California law to determine the enforceability of noncompetes in an "agreement between an employee who is not a resident of California and an employer whose business is based outside of California, when a California-based employer seeks to recruit or hire the nonresident for employment in California" (*Application v. Hunter*, 1998), even when there is a choice-of-law provision suggesting otherwise (i.e., "to be governed by and construed in accordance with the laws of the State of Maryland," *Application v. Hunter*, 1998).

Our qualitative analysis of 165 cases reveals that many later courts adopted this precise logic set by *Application v. Hunter* to invalidate noncompete agreements of non-California

[1] The two other cases that are cited more than *Application v. Hunter* are *McDonald's Corporation v. Robertson*, 147 F.3d 1301 (1,969 times) and *Kolani v. Gluska*, 64 Cal. App. 4th 402 (880 times). These cases are not related to the enforceability of out-of-state noncompetes.

employers. To illustrate, we summarize five (nonexhaustive) cases in Table A.2. These cases have three key features in common: (1) the key issue of litigation is the enforceability of a noncompete agreement signed between an employer based outside of California and its former employee(s) who sought to move to a new position in California; (2) the noncompete agreements have a choice-of-law provision that a non-California state law shall govern; and (3) the court decided to invalidate the noncompete, despite the choice-of-law provision, citing the logic established by *Application v. Hunter*.

For example, in *Stryker Sales Corp v. Zimmer Biomet, Inc.* (2017), a California court invalidated a noncompete agreement between a Michigan employer (Stryker) and a former employee (Mr. Siroonian) with a choice-of-law provision that Michigan law shall govern. Like Dianne Pike in *Application v. Hunter*, Mr. Siroonian resigned from Stryker and joined a California corporation. Citing *Application v. Hunter*, the court concluded that the Michigan choice-of-law would be ignored because "California's interests are materially greater than those of Michigan and that California would be more seriously impaired if its laws were not applied." Please see Table A.2 for other examples; important quotations are highlighted.

In other cases, courts also cite *Application v. Hunter* in a broader context to support the logic that California courts can apply California law to various agreements (not necessarily noncompetes), despite choice-of-law provisions that designate a non-California state.

(End of page. Please see next page for Table A.2.)

Table A.2. Selected court decisions citing *Application v. Hunter*

Title	Summary of Litigation	Court's Decision	How the courts cite *Application v. Hunter* (direct quotes)
Stryker Sales Corp. v. Zimmer Biomet, Inc. [U.S. District Court for the Eastern District of California (2017)]	Stryker, a Michigan-based medical manufacturer, and Siroonian, a former employee, signed an agreement containing a noncompete clause with a choice-of-law provision that *Michigan law* shall govern. Siroonian resigned from Stryker to join a competitor in California (Tragus). Stryker filed a complaint against Tragus for unfair competition and interference of contract. Tragus moved to dismiss the complaint.	The court concluded the Michigan choice-of-law provision in Stryker's agreement will be ignored with respect to the non-solicitation and noncompetition provisions of those agreements, to the extent they govern Siroonian's post-employment conduct.	"California would have a materially greater interest in ensuring that employees located in California are not restricted from freely pursuing their professions, and that California-based third parties such as Tragus are not deterred from freely competing with companies doing business in the state. See Application Grp., 61 Cal. App. 4th at 900 … The court therefore concludes that in this case, California's interests are materially greater than those of Michigan."
Signature MD, Inc. v. MDVIP, Inc. [U.S. District Court for the Central District of California (2015)]	Signature MD is a California corporation that offers concierge medicine services. MDVIP is a competitor headquartered in Florida but national in scope. Signature MD alleges that MDVIP engages in anticompetitive behavior by using noncompete clauses to restrict their physicians from joining competitors. MDVIP asserts that its noncompete clauses contain a *Florida choice-of-law* provision, and that California law therefore does not apply and moves to dismiss the case.	The court found that California law should apply to both the issues of competition and misappropriation. MDVIP's motion to dismiss was denied.	"Signature MD has adequately pleaded a violation of Section 16600. MDVIP asserts that its contracts contain a Florida choice-of-law provision, and that California law therefore does not apply. … When a covenant not to compete contains a choice-of-law provision, well established California choice-of-law principles apply such that California will likely be found to have a materially greater interest in enforcing its strong public policy, as reflected in Section 16600, of maintaining employment mobility See Application Grp. v. Hunter Grp., 61 Cal. App. 4th 881, 896-97, 899-902, 72 Cal. Rptr. 2d 73 (1998)."
Arkley, et al. v. Aon Risk Services Companies, Inc. [U.S. District Court for the Central District of California (2012)]	Arkley et al. are former employees of Aon, an insurance brokerage headquartered in Illinois. The two parties signed an employment agreement that contains a noncompete clause and a choice-of-law provision that *Illinois law* shall govern. Arkley et al. left Aon to join a competitor who conducts business primarily in California. Arkley et al. moved for a partial summary judgment, seeking a declaration that California law controls the covenants not to compete and that the noncompetes were void.	The court concluded that the noncompetes were void and unenforceable. Arkley et al.'s, motion was granted.	"Such covenants are specifically unenforceable under California Business and Professions Code § 16600. It is beyond dispute that the policy underlying § 16600 is considered "fundamental." See, e.g., Application Grp., Inc. v. Hunter Grp., Inc., 61 Cal. App. 4th 881, 900 (1998) …. California's interest in enforcing its own law is 'materially greater' than that of Illinois. Under California law, '[t]he interests of the employee in his own mobility and betterment are deemed paramount to the competitive business interests of the employers.' Application Grp., 61 Cal. App. 4th"
Davis v. Advanced Care Techs., Inc [U.S. District Court for the Eastern District of California (2007)]	Davis was a former employee of Advanced Care Techs., a pharmaceutical company whose principal place of business is in Connecticut. The two parties signed an employment agreement with a choice-of-law provision that *Connecticut law shall govern.* Davis resigned from Advanced Care Techs and joined a competitor (IsoRay) for a position in California. Davis moved for summary judgment on the grounds that the noncompete was void.	The court concluded that California law is applicable to this dispute and that the noncompete agreement is invalid and unenforceable as a matter of law. The court granted Davis's motion.	"With respect to whether Connecticut law is contrary to a fundamental public policy of California in the determination of the particular issue (i.e., validity of the Non-Competition Agreement), the court must begin its analysis by determining whether Connecticut law is in conflict with California law and whether both have a significant interest in having its law applied. See Application Group, 61 Cal. App. 4th at 899-900. … [cites Hunter multiple times] … For these reasons, the court concludes, on balance, that California has a 'materially greater interest' in the outcome of this case."
Jett v. Eco-Air Prods. [U.S. District Court for the Central District of California (2007)]	Jett et al. are former employees of Eco-Air Products, a corporation in the air filtration industry (subsidiary of Flanders Corp). The two parties signed an agreement containing a noncompete clause with a choice-of-law provision that *Florida* law shall govern. Jett et al. expressed a desire to resign. In response, Eco-Air threatened to enforce the noncompete provisions that they previously signed. Jett et al. claimed that the noncompetes were void and that California law, not Florida law, should apply.	The court decided that California law applies, and that the covenant was void and unenforceable. The application of Jett et al. was granted.	"Plaintiffs [Jett et al.] are also correct that a federal court in California with diversity jurisdiction over a dispute involving an employment agreement containing a covenant not to compete that violates Section 16600 applies California law to invalidate that provision, even if the agreement also contains, a choice of law clause providing for the application of another state's law under which the covenant would be valid. … [cites cases including] The Application Group v. The Hunter Group, 61 Cal. App. 4th 881, 72 Cal.Rptr. 2d 73 (Ct. App. 1998)"

We further analyzed 604 citations in other legal documents: 476 court documents, 70 law reviews, 46 treatises, 9 other citations, and 3 statutes. We highlight two findings. First, the importance of *Application v. Hunter* was widely understood not only by judges and courts but also by employers, workers, and law practitioners. Plaintiffs and defendants frequently cite *Application v. Hunter* to bolster their argument that out-of-state noncompetes cannot be enforced in California (despite choice-of-law provisions). To illustrate, we summarize three examples in Table A.3 (important quotations are highlighted).

Table A.3. Selected motions and briefs by employers and employees citing *Application v. Hunter*

Document Type	Summary	How employers and employees cite *Application v. Hunter* (direct quotes)
Brief by Veeva (2019)	In this brief, Veeva appeals that the trial court—where it sued its competitors for using noncompetes to prevent employee departure to California—was mistaken. Veeva requests the appeal court to reverse the trial court's decision. The appeal court reversed trial court's decision (see *Veeva Sys. v. Quintiles IMS 2019*).	"This Division of this Court has held for more than 20 years that California law gives California-based employers the right to recruit and employ nonresident employees for employment in California, even when those employees have signed a restrictive covenant. Application Group, Inc. v. Hunter Group, Inc. (1998) 61 Cal.App.4th 881 ("Hunter"). The Hunter court also held that nonresidents can be employed "in California" within the meaning of California law even when they do not reside in California."
Motion by e.Digital (2007)	In this motion, e.Digital, a California corporation, argues that the noncompetes of its competitor, a Washington corporation, are invalid in California, despite the choice-of-law provision that Washington law will govern. The court concludes that California law should be applied and that the agreement's noncompete clauses are void (see *digEcor, Inc. v. e.Digital Corp. 2009*).	"More importantly, there is clear authority stating that California's interest in enforcing its policies against noncompete agreements is very strong. For example, in Application Group, Inc., v. Hunter Group, Inc., a California Court of Appeal evaluated a non-compete contract created in Maryland. Despite the overwhelming relationship the agreement had with Maryland, including an explicit Maryland choice-of-law provision and the parties' residence in Maryland, the Court determined that California law must apply where the employee left to work for a California company."
Motion by Arminak (2006)	In this motion, Helga Arminak, a president of a California corporation, argues that her noncompete with Airspray, a Florida corporation, should be void under California law. The court granted Arminak's motion.	"In Application Group, Inc. v. Hunter Group, Inc., 61 Cal. App. 4th 881, 902, 72 Cal. Rptr. 2d 73 (1998), the court applied California law over Maryland law despite a Maryland choice-of-law provision. … For these reasons, the Court should apply California law to this case and hold the non-compete to be void. Because the non-compete is void under applicable California law, Airspray cannot establish a likelihood of success on the merits. Accordingly, Airspray's motion for an injunction must be denied."

Importantly, the decision has changed the *beliefs* held by employers (and workers) in their ability to prevent worker departure and subsequent knowledge leakage.[2] *Application v. Hunter* was the first court decision to determine that a California court can apply California law to invalidate noncompete agreements of non-California employers. Prior to this decision, it was generally expected that non-California employers could enforce noncompetes when their workers move to California, especially when a choice-of-law provision was present. With this view in mind, the plaintiff, Hunter Inc., argued that the court should decide "under Maryland law *in accordance with the contractual choice-of-law provision* in the employment agreements" (*Application v. Hunter*, 1998). In contrast to such expectations, the court decided that California law should govern.

Furthermore, our readings reveal that many scholars and practitioners view *Application v. Hunter* as a seminal decision that demonstrates California's strong policy of favoring worker moves. Law scholars cite *Application v. Hunter* as a key decision that exhibits why noncompetes are likely to be void in California despite a choice-of-law provision that a non-California state law shall govern. Similarly, practitioners use *Application v. Hunter* as an important reference point when providing legal advice that out-of-state noncompetes are void in California. Treaties and annotated statutes also cite *Application v. Hunter* in the same manner. We summarize four such cases in Table A.4 (important quotations are highlighted).

Table A.4. Selected law reviews and periodicals citing *Application v. Hunter*

Title (Year)	Author	Purpose	How other sources cite ***Application v. Hunter*** **(direct quotes)**
Comment: Protecting an employer's human capital: Covenants not to compete and the changing business environment (2000)	Michael R. Kirschbaum (Attorney; retired)	A law review on California's strong public policy of invalidating (out-of-state) noncompetes	"California courts have concluded that §16600 represents a "strong public policy" of the state of California. The law of other states is not allowed to defeat California law on this issue. One of the more recent cases dealing with this issue was Application Group, Inc. v. Hunter Group, Inc. … The court concluded that 'California has a materially greater interest than does Maryland in the application of its law to the parties' dispute, and that California's interests would be more seriously impaired if its policy were subordinated to the policy of Maryland.' The federal courts, when dealing with similar issues, have tended to follow the logic outlined in the decisions of the California state courts."
Feature: Have noncompete clauses become enforceable in California?	Chiara F. Orsini (Attorney specializing in intellectual	A law review on why noncompetes are void in California.	"For years people have presented contracts with noncompete clauses to me and have asked if the company can really stop them from getting a job in California with a competing company, even if they were involuntarily separated. ... My advice to employees not to worry received additional support when a state court decided that the public

[2] We do not mean that it will always be the case that incoming workers to California will absolutely win the case. Employers and workers may also understand that a future case may overturn *Application v. Hunter* with non-zero possibility.

(2000)	property)		policy against covenants not to compete was so strong that it outweighed the choice of law provision of an out-of-state company's contract, even as it applied to employees outside California who chose to come to work in California (Application Group, Inc. v. Hunter Group, Inc., 61 Cal.App.4th 881, 902 (1998)).”
New light on contract theory. *Cardozo L. Rev.* 31 (2009): 1475.	Geoffrey Parsons Miller (Professor of Law; NYU)	Research article that compares New York and California choice-of-law provisions	“California is substantially less permissive towards choice-of-law clauses. ... Application Group, Inc. v. Hunter Group, Inc., 284 a 1998 case from the First District Court of Appeal, illustrates California's approach to choice-of-law clauses. A California corporation recruited and hired an employee of a Maryland competitor in clear violation of a covenant not to compete. ... But citing to the importance of California's policy favoring free competition in employment relationships, the court held that California had a materially greater interest in applying its law to the dispute; it further held that California's interests would be the more seriously impaired if its policy were subordinated to the policy of Maryland. Hence the court rejected the choice-of-law clause, applied California law, and invalidated the noncompete clause.”
Choice of Law and Covenants Not To Compete: United States: Choice of Law And Employee Restrictive Covenants: An American Perspective (2010)	Gillian Lester (Professor of Law, Berkeley Law School) and Elizabeth Ryan (Harvard Law School, J.D.)	Article on choice-of-law provisions and non-competes	“If the court concludes that a state other than the chosen state has a materially greater interest, then it must determine whether application of the chosen law would offend the public policy of that other state….Courts in California, another state with a strong public policy against non-compete agreements, have taken a similar position. The seminal case is Application Group v. Hunter, in which a Maryland employer sought to enforce a restrictive covenant containing a Maryland choice of law clause against a former employee who had departed to work for a California employer and yet was not, and had never been, a resident of California.”

Overall, our quantitative and qualitative analyses demonstrate that *Application v. Hunter* set a milestone precedent for future cases and substantially increased the threat of worker departure and knowledge leakage faced by employers that use noncompetes.

A.3 Comparison to other important cases

California Labor Code Section 925 in 2017 (henceforth, Section 925) and *Advanced Bionics Corp. v. Medtronic, Inc.*, 29 Cal. 4th 697 in 2002 (henceforth, *Advanced Bionics v. Medtronic*) also deal with interstate noncompete issues. Based on our careful examination of the two cases, we are convinced that *Application v. Hunter* was a decision that set a strong precedent for future courts regarding the enforceability of *out-of-state* noncompetes in California (i.e., by non-California employers), and that Section 925 and *Advanced Bionics v. Medtronic* do not threaten the validity of our research design. Here, we elaborate on our argument by briefly explaining the two cases and by comparing them with *Application v. Hunter*.

Advanced Bionics v. Medtronic

Although *Advanced Bionics v. Medtronic* is a noncompete case that also involves two states, it does not rebuff our argument or the validity of our research design. Most importantly, the foci of the two cases are different. *Application v. Hunter* is about whether California courts can nullify noncompetes signed in other states, despite a choice-of-law provision specifying a state other than California. *Advanced Bionics v. Medtronic*, on the other hand, is concerned with whether California courts can prohibit non-California employers from proceeding with litigations *outside California.* The latter case thus concerns whether California courts have even stronger authority—preventing litigation in other states—than nullifying out-of-state noncompetes in California.

Briefly summarized, in *Advanced Bionics v. Medtronic* a former employee of a Minnesota corporation sought to move to a California competitor. A unique aspect of this case is that there were parallel litigations in two different courts on the same claim as new and previous employers filed actions in California and Minnesota courts, respectively. The key issue arose when the California employer asked the California court to grant a temporary restraining order to prohibit the Minnesota employer from taking any further steps *in the Minnesota courts*. The California Supreme Court (2002) decided that "while California did have a strong public policy against enforcing noncompetition agreements, it was not so strong as to warrant enjoining an employer from seeking relief in another forum."

In *Advanced Bionics v. Medtronic*, it was not contested whether California courts could nullify out-of-state noncompetes in California (a point which was already made clear in *Application v. Hunter*). The issue was whether California courts can prohibit Minnesota employers from taking any further steps in the Minnesota courts. Legal scholars and experts make it clear that *Advanced Bionics v. Medtronic* neither weakens nor overrules *Application v. Hunter*:

> *The decision of the California Supreme court in Advanced Bionics did not overrule the Application Group case and similar cases. Thus, Application Group remains a good example of how California courts would resolve a conflict between California's policy against non-compete covenants and the countervailing policy of the first employment state, when there is no pending litigation in the other state (Symeonides, 2003; p. 59)*

Our legal analyses (which include cases shown in Tables A.2, A.3, and A.4 in our response to the

editor's comments) also confirm that courts and other legal documents continue to cite *Application v. Hunter* to nullify out-of-state noncompetes, even after *Advanced Bionics v. Medtronic* in 2002. Further, *Application v. Hunter* is a much more impactful case (cited 168 times by later court decisions, 773 total times as of March 17, 2021) than *Advanced Bionics v. Medtronic* (cited 54 times by later court decisions; 347 times total).

We acknowledge that *Advanced Bionics v. Medtronic* may have (erroneously) affected the beliefs of employers and workers regarding the enforceability of out-of-state noncompetes, regardless of its actual legal implications. We use a five-year window pre-and post-treatment (1993–2003), which helps circumvent the potential influence of this decision, which was made in December 2002.

California Labor Code Section 925

In January 2017, California added a new statute, Section 925, to the California Labor Code. The key objective of this amendment is to establish a statute that restricts the use of choice-of-law and forum selection clauses by California firms with workers who primarily reside and work in California, in addition to existing restrictions on in-state non-competes (California Business and Professions Code Section 16600: "Code 16600").

The target population and objective of Section 925 are different from those of *Application v. Hunter*. The enactment of Section 925 attempts to prevent an employer from requiring "an employee who primarily resides and works in California … to adjudicate outside of California a claim arising in California" (Cal. Lab. Code §925.a.1) and "to deprive the employee of the substantive protection of California law with respect to a controversy arising in California" (Cal. Lab. Code §925.a.2).

Section 925 pertains to *California residents* (and not to non-California residents) who are at risk of being judged by courts outside California. *Application v. Hunter*, in contrast, affects *non-California residents* who seek to move to California and to be judged by California courts. Our empirical strategy precisely exploits the fact that *Application v. Hunter* affected *non-California residents* (like Dianne Pike) by setting a precedent that they can join California employers without being restricted by their noncompetes with their prior employers.

Based on our read of legal documents, we are also convinced that the motivation behind Section 925 was not to clear up any ambiguity surrounding *Application v. Hunter*. Rather, Section

925 was enacted to prevent employers from signing noncompete agreements with *California residents* by using a loophole in the law.[3] For example, before Section 925, some non-California employers sought to enforce noncompetes with their employees who resided in California (e.g., their salespeople in California) by including a forum-selection clause so that the enforceability of their noncompete agreements would be determined by a court *outside* California. Section 925 seeks to protect California residents by preventing such practices.

More practically, Section 925 went into effect on January 1, 2017. Thus, it should not affect our estimations using data from 1993–2003.

A.4 The uniqueness of *Application v. Hunter* compared to existing studies

Studies have examined different changes in law and policy that are appropriate for their research questions and contexts. While our study builds upon their insights, findings, and contributions, we believe that *Application vs. Hunter* is the best research setting to answer our research question, for several reasons.

First, the variation in *Application v. Hunter* is via a court decision rather than via a legislative change. Court decisions are more attractive than legislative changes in our setting because they are generally unpredictable and firms or individuals (other than the plaintiffs and defendants in the case) can exert little influence on the decisions (Ewens & Marx, 2018). More importantly, this court decision applies both retrospectively and prospectively. That is, *Application v. Hunter* immediately affects all workers with noncompete agreements in their contracts, including those who signed contracts before the court decision in 1998. Because of its retrospective application, our research setting can study an immediate and significant threat of worker departure faced by employers.

This feature differs from the Michigan Antitrust Reform Act (MARA), which affects contracts written after the effective date specified in the legislation—i.e., applies prospectively but not retrospectively. MARA is well-suited for studying the post-amendment mobility patterns of new or potential workers. To answer our research question on the threat of knowledge leakage, however, we need a shock that *immediately* changes the risk of departure of existing workers and thereby increasing the possibility of leakage of existing knowledge that was previously kept secret

[3] California's new Labor Code Section 925: What happens in California stays in California (by Mark A. Konkel, Esq., Kelley Drye & Warren). https://www.kelleydrye.com/KelleyDrye/media/News-Pubs-and-Events-Images/Mark-Konkel-Westlaw-California-Code.pdf.

(embodied in workers). *Application v. Hunter* provides us with this exact opportunity: employers immediately faced a risk of worker departure and knowledge leakage after the decision, thanks to its retrospective application.

Second, *Application v. Hunter* allows us to examine how a court decision in California affects the behaviors of firms *outside* California. This is a unique feature of our setting that further increases the validity of our analysis. That is, even if the California court decision is correlated with legal and business environments within California (such as lobbying), we can circumvent these potentially unknown endogeneity issues by examining firms that are located outside California.

Third, a unique feature of *Application v. Hunter* is that it only affects firms' ability to retain workers (outbound mobility) and not their ability to hire workers (inbound mobility). As changes in firms' hiring abilities can affect their patenting behavior through inbound mobility, this feature is important to ensure the validity of our findings.

Finally, our analyses of legal documents indicate that *Application v. Hunter* is a seminal decision regarding how California courts interpret choice-of-law provisions. Many future courts and legal scholars have discussed the importance and representativeness of this case. Given the importance of *Application v. Hunter*, we believe we can contribute to the strategy literature by studying how this seminal court decision affected firms' knowledge protection strategies.

B Non-compete enforceability indices: Garmaise (2011) and Starr (2018)

Garmaise (2011) developed an index that quantifies the state-level enforceability of non-competes. Across twelve dimensions of enforceability, Garmaise assigns 1 point for each dimension if the state's enforcement of non-competes in that dimension exceeds a given threshold. A possible value for the index ranges from 0 to 12 with a higher point indicating stronger enforceability. Building on the work of Bishara (2010), Starr (2019) also developed a state-level non-compete enforceability index. Expanding on Bishara's state-level ranking of seven dimensions of enforceability, Starr further implemented confirmatory factor analysis to reweight different factors and normalized the score to take the standard normal distribution.

Each index has its advantages and disadvantages. To determine the enforceability of state-level non-competes, we use both the Garmaise (2011) and Starr (2019) indices. We create a state-level indicator, $Enforce_s$, that equals one if a state's enforceability is above the mean score in both indices ("strong enforcement") and zero if it is below the mean score in both indices ("weak enforcement"). This approach is doubly robust, because the two independent indices consistently assigned a high (higher than or equal to 5 for Garmaise *and* higher than or equal to 0 for Starr) or low score for a state. We exclude states where Garmaise and Starr indices are conflicting ("unclear"). Table B.1 compares the three—Garmaise, Starr, and ours—indexes.

Table B.1. Three indices of non-compete enforceability

State	Garmaise (score as of 1997)	Starr (score as of 1991)	Combined indicator ($Enforce_s$)
Alabama	5	0.36	Strong enforcement
Alaska	3	–0.98	Weak enforcement[a]
Arizona	3	0.15	Unclear
Arkansas	5	–0.58	Unclear
California	0	–3.79	Weak enforcement[a]
Colorado	2	0.38	Unclear
Connecticut	3	1.26	Unclear
Delaware	6	0.52	Strong enforcement
District of Columbia	7	0.12	Strong enforcement
Florida	9	1.60	Strong enforcement[a]
Georgia	5	0.02	Strong enforcement
Hawaii	3	–0.17	Weak enforcement[a]
Iowa	6	1.01	Strong enforcement
Idaho	6	0.77	Strong enforcement
Illinois	5	0.95	Strong enforcement
Indiana	5	0.70	Strong enforcement

Kansas	6	1.21	Strong enforcement
Kentucky	6	0.85	Strong enforcement
Louisiana	4	0.50	Unclear[a]
Massachusetts	6	0.48	Strong enforcement
Maryland	5	0.60	Strong enforcement
Maine	4	0.41	Unclear
Michigan	5	0.46	Strong enforcement
Minnesota	5	–0.07	Unclear
Missouri	7	1.08	Strong enforcement
Mississippi	4	0.04	Unclear
Montana	2	–0.65	Weak enforcement
North Carolina	4	0.18	Unclear
North Dakota	0	–4.23	Weak enforcement
Nebraska	4	–0.13	Weak enforcement
New Hampshire	2	0.26	Unclear
New Jersey	4	0.90	Unclear
New Mexico	2	0.74	Unclear
Nevada	5	0.03	Strong enforcement
New York	3	–1.15	Weak enforcement
Ohio	5	0.08	Strong enforcement
Oklahoma	1	–0.94	Weak enforcement
Oregon	6	0.14	Strong enforcement
Pennsylvania	6	0.14	Strong enforcement
Rhode Island	3	–0.33	Weak enforcement
South Carolina	5	–0.27	Unclear
South Dakota	5	1.02	Strong enforcement
Tennessee	7	0.45	Strong enforcement
Texas	3	–0.28	Weak enforcement[a]
Utah	6	1.00	Strong enforcement
Virginia	3	–0.29	Weak enforcement
Vermont	5	0.60	Strong enforcement
Washington	5	0.34	Strong enforcement
Wisconsin	3	–0.09	Weak enforcement
West Virginia	2	–0.80	Weak enforcement
Wyoming	4	0.23	Unclear

[a] We exclude assignee firms in three states that underwent significant changes in the enforceability of non-competes during our sample period: Florida (1996), Louisiana (2001, 2003), and Texas (1994) (Garmaise, 2011; Kang & Fleming, 2020). Assignee firms in Alaska and Hawaii also have been omitted to account for geographic barriers that restrict interstate mobility.

C Analysis of realized worker moves

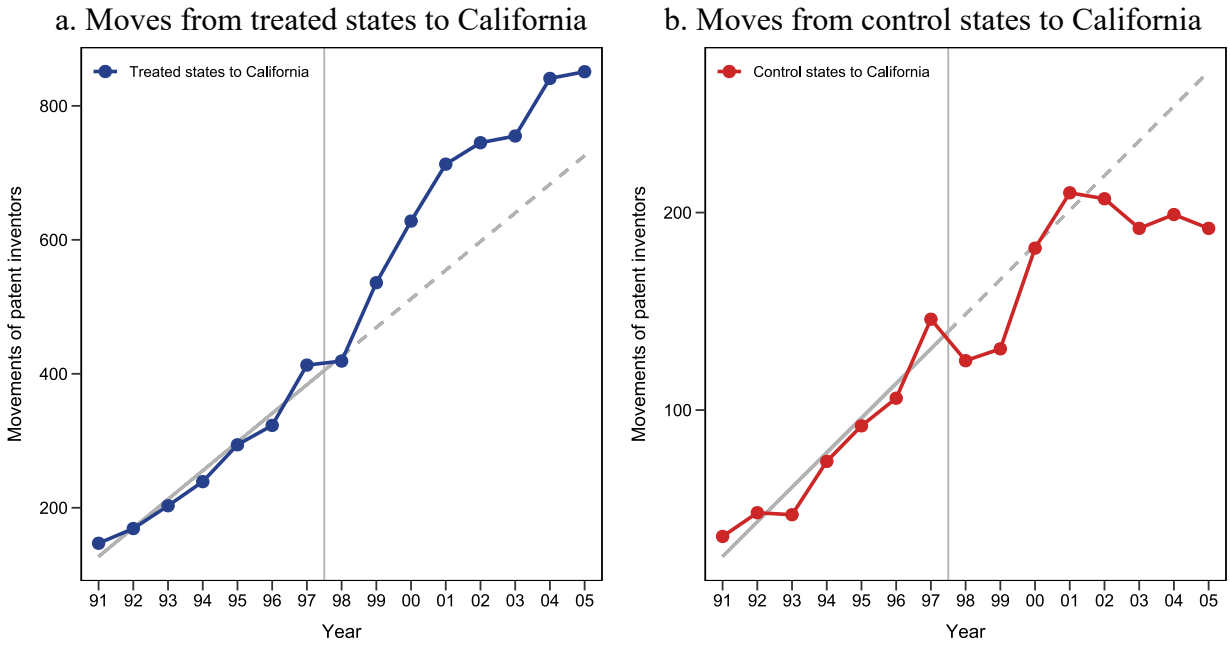
C.1 Realized worker moves

We analyze the realized moves of inventors using patent data. We identified inventor moves by finding inventors who filed a patent with a new employer in a new state and marked the year the patent was filed as the year of movement.

First, we graphically represent the realized moves by comparing two different groups: (a) moves from treated states to California; (b) moves from control states to California. To guide our comparisons, we also provide a linear fitted line derived from pretreatment (1991–1997) data in the figures.

Figure C.1 shows that moves from treated states to California increased significantly after 1998, whereas moves from control states did not increase compared as shown by the fitted line derived from pre-1998 trends. Further, we observe that the increase in moves from treated states to California persists for a long time after *Application v. Hunter*.

Figure C.1. Moves of patent inventors to California, 1991–2005



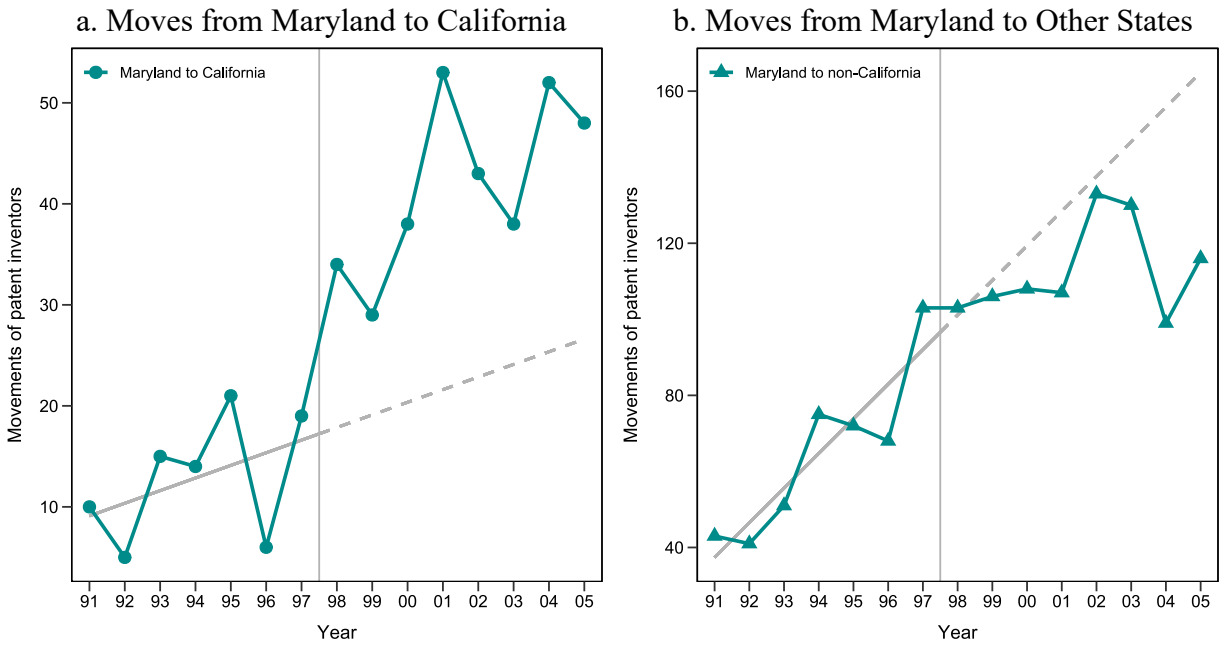
Notes. Blue/red lines: count of inventor relocations. Solid gray line: fitted line with data from 1991–1997. Dashed gray line: predicted line with data from 1991–1997.

We also examine moves to California from *Maryland*, where Hunter Group Inc. is headquartered.

In Figure C.2a, we find that moves from Maryland to California increased after 1998, compared to the fitted line derived from pre-1998 trends.

This result is striking when compared to realized moves to *other states* from Maryland (Figure C.2b). The moves to other states do not increase, and even decrease, after 1998 compared to the fitted line based on pre-1998 trends. This provides further evidence that increased moves to California from Maryland are not driven by confounders (e.g., changes in macroeconomic conditions in Maryland) but by the *Application v. Hunter* decision.

Figure C.2. Moves of patent inventors from Maryland, 1991–2005



We provide more formal comparisons in Table C.1. We run difference-in-differences estimation using moves to California as a dependent variable. We create a balanced panel from 1991–2005 at the state-pre/post level (by averaging the number of moves over years; column 1) and state-year level (column 2). Columns (3) and (4) show the results from the same exercise but focus only on Maryland as the treated state.

We find that the inventor moves from treated states to California are on average 39.5% to 46.2% higher than those from control states to California, after the 1998 decision (Table C.1, columns 1 and 2). The estimates are larger when we focus on the moves from Maryland, where Hunter Group, Inc. and Dianne Pike were located (columns 3 and 4).

Table C.1. Effects of the threat of worker departure on realized moves to California

	Dependent variable (log): Inventor-moves to California			
	From All States		From Maryland	
	(1) State-pre/post level	(2) State-year level	(3) State-pre/post level	(3) State-year level
Enforce×Post	0.395	0.462	0.619	0.677
	(0.123)	(0.087)	(0.095)	(0.216)
	[0.003]	[0.001]	[0.001]	[0.002]
State FE	Y	Y	Y	Y
Year FE	–	Y	–	Y
R^2	0.979	0.905	0.989	0.913
Adjusted R^2	0.956	0.895	0.975	0.898
Observations	70	490	24	168

Notes. Robust standard errors are provided in parentheses. *p*-values are provided in brackets.

We want to note that our (natural) experiment does not require workers to actually move to California. Workers may or may not move to California, depending on their (re)negotiations with the current employer. We argue that *Application v. Hunter* increases the *threat* of worker departure faced by employers and, consequently, their incentives to file a patent for their existing (and future) inventions that have been kept as a secret. Nonetheless, we believe that the interstate migration patterns that we find are consistent with our argument that *Application v. Hunter* was an important shock that affected many employers.

There are other sources of migration data. The Current Population Survey (CPS) March Supplement is available for our sample period. However, the CPS data is not ideal for tracking the relocation of workers in our study. First, the CPS covers only 60,000 or 0.059% of a probability-selected sample of households in the United States (as of December 31, 1998, there were 102.53 million households in the United States). Second, we can only track the movement of households for two consecutive years because the surveyed sample keeps changing over time (a repeated cross-sectional data). Third, as Saks and Wozniak (2011) note, there are several critical issues with the CPS, which affect our analyses. The years 1990 and 1995 are missing because the CPS did not ask respondents where they were living in the previous year. The Census Bureau's methodology for imputing migration is also said to artificially boost migration rates in certain years, but the imputation flag is only available from 1996. Last, the CPS survey is conducted at the household level, which may fail to accurately capture individual-level moves. Overall, our results show that the number of relocations is small and highly variable across years, which is consistent with Saks

& Wozniak's (2011) findings. Other data, including the American Community Survey (ACS), Job-to-Job Flows (J2J), and LEHD Origin-Destination Employment Statistics (LODES), are not available for our sample period.

C.2 A case example of worker departure and patent filings by the outbound firm

In this part, we provide a case example of *Agere Systems Guardian Corp.* ("Agere") in Florida (the state that most strongly enforces noncompetes), as evidence that links departing inventors to the patent filings of the outbound firm.

1. Agere includes noncompetes in their employment contracts and enforces them. We confirmed from Agere's 10-K annual report filings to the US Securities and Exchange Commission that the firm actively used noncompete agreements in their employment contracts. For example, in their employment contracts with Mark T. Greenquist (dated December 15, 2000) and Ronald B. Black (dated February 28, 2001), the company specified[4]:

> *NON-COMPETITION: The Supplemental Pension Plan, the Deferred Compensation Plan and the Executive Life Insurance Plan are subject to non-competition constraints.*

Agere also enforced noncompetes by taking legal action in the courts. For example, in 2000, its parent company (Lucent Technologies, Inc.) sought a preliminary injunction in an attempt to enforce its noncompetition and nondisclosure agreements with ten former employee defendants. (Lucent Techs., Inc. v. Tymann, 106 F. Supp. 2d 189)

2. Agere's inventors moved to competitors in California, after *Application v. Hunter*.[5] We identified inventor move dates based on the inventors' first patent filing with their new employer.

- 1990–1998: No moves of inventors to California.
- 1999: One inventor moved to *Intel Corporation* (Santa Clara, CA).

[4] Greenquist's contact is available at https://www.sec.gov/Archives/edgar/data/0001129446/000095012301509126/y55437ex10-23.txt. Black's contract is available at https://www.sec.gov/Archives/edgar/data/0001129446/000095012301509126/y55437ex10-24.txt

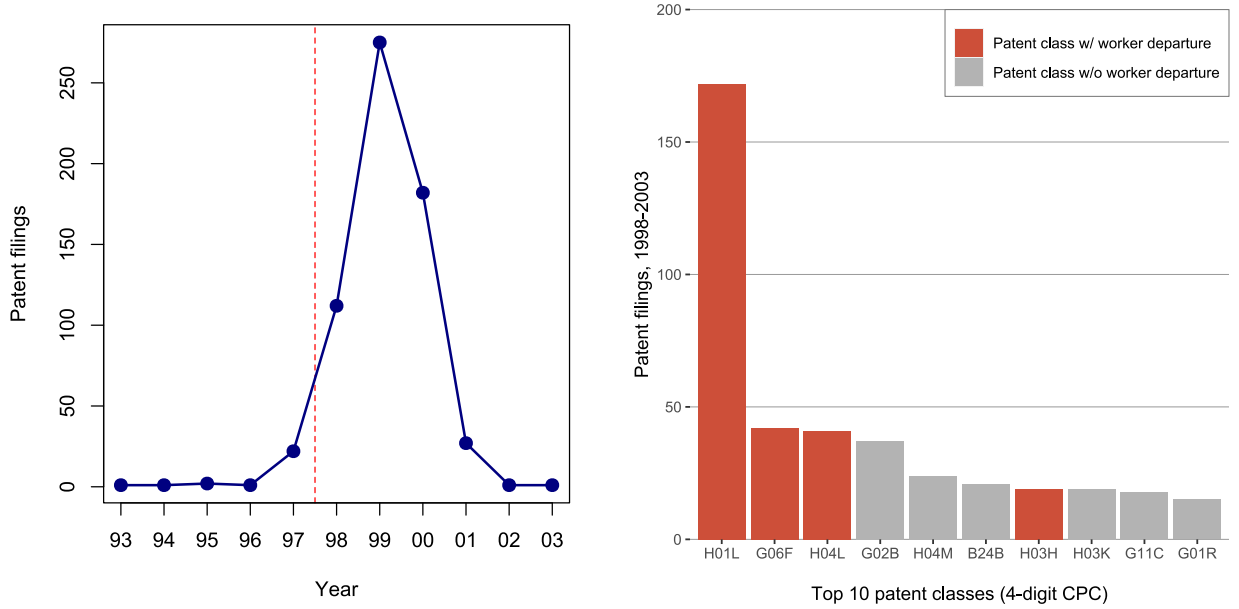
[5] This analysis is based on the patents filed by *Agere Systems Guardian Corp.*, *Agere Systems Guardian Corporation*, *Agere Systems Guardian Corp*, *Agere System Guardian Corp.*, *Agere Systems Guardian*, and *Agere Systems Guardin Corp*.

- 2000: Two inventors moved, one to *Mobilink Telecom Co., Ltd* (Santa Clara, CA) and one to *TMC Enterprises*, a division of *Tasco Industries, Inc.* (Diamond Bar, CA).
- 2002: One inventor moved to *Aeluros, Inc.* (Mountain View, CA).
- 2003: Two inventors moved, one to *Broadcom Corp.* (Irvine, CA) and one to *Intel Corporation* (Santa Clara, CA).

3. Agere increased its patent filings significantly on and after 1998 as shown in Figure C.3(a). Importantly, most of the increased patenting was in the departed inventors' areas of expertise. Figure C.3(b) shows the patent filings from 1998–2003 by technology class (four-digit CPC). Red bars represent the technology fields that the departed inventors patented in while they were at Agere. We find that Agere filed significantly more patents in the exact areas of the expertise of the departed workers, even when using granular 4-digit patent classes.

Figure C.3. The threat of worker departure and Agere's patent filings

(a). Agere's patent filings (1993–2003) (b). Agere's patent filings by class (1998–2003)



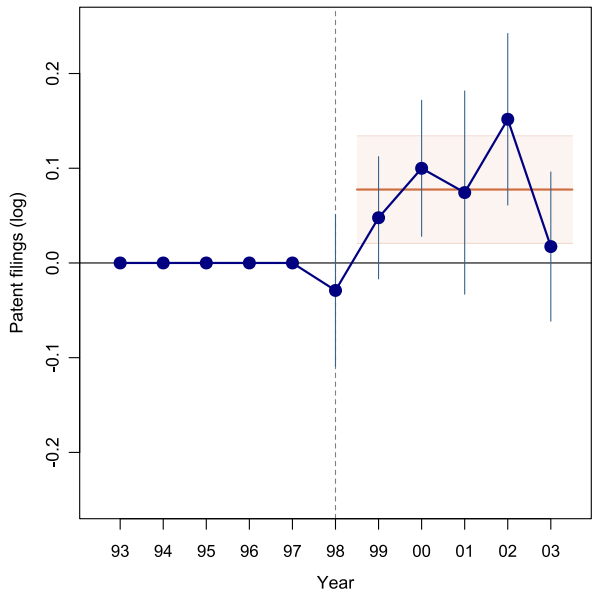
The Agere case illustrates how a firm that enforces noncompetes against its workers disproportionately increased its patent filings when its high-skilled inventors moved to its competitors in California, after *Application v. Hunter*. However, we want to note that our interests are not confined to these types of firms that experienced realized moves of high-skilled workers. Our research question and research setting more broadly focus on how an increased threat of worker departure affects firms' knowledge-protection strategies.

D Dealing with preexisting trends

In the main analyses reported in the paper, we find a parallel trend in patent filings before the year of decision, 1998. In this section, we additionally conduct an analysis that allows the pre-1998 outcome variable to affect the post-1998 outcome variable. That is, we include interaction terms between each firm's outcome variable (in logs) in each pre-1998 year and a full set of year dummies. By absorbing all the pre-1998 differences in patent filings and some of the post-1998 differences, this analysis makes the post-1998 comparisons close to ceteris paribus (for more details on this analysis, see Cantoni, Dittmar, & Yuchtman, 2018).

Figure D.1 illustrates the results for patent filings and R&D expenditures. By design, there are no pre-1998 differences in trends between the treatment and control groups in this specification. We again confirm from this strict specification that the firms in the treatment group increased their patent filing by about 7.8% (SE = 0.029, *p*-value = 0.012) after the 1998 decision.

Figure D.1. Effects of worker mobility on patent filings:
Absorbing pre-trends in an event study approach



E The qualitative characteristics of patents

We test the qualitative characteristics of patents to see whether firms begin to patent a different set of inventions in response to the threat of worker departure. In Table E.1, columns 1 through 3, we do not find a meaningful change in the number of backward citations, in-text citations (which are quite different from "front page" backward citations and better capture knowledge flow; Bryan, Ozcan, and Sampat, 2020), and forward citations (which are said to be highly correlated with patent quality or the market value of an innovation; Hall, Jaffe, & Trajtenberg, 2005; Lampe & Moser, 2016; Trajtenberg, 1990; Kuhn and Thompson, 2019). In addition, we analyzed the ratio of *triadic* patents. Triadic patents belong to patent families in which their members have filed for patent protection in all three major patent offices: US (USPTO), Europe (EPO), and Japan (JPO). Triadic patents are often used as an indicator for more important patents (Nagaoka and Walsh, 2009; Bryan, Ozcan, and Sampat, 2020). In column 4, we do not find evidence that the ratio of triadic patents had been changed around 1998. Further, the number of patent claims, the number of inventors per patent, and the length of patent examination did not change around the 1998 decision, as shown in Table E.1, columns 5, 7, and 8.

The number of words used in the first claim decreased by 3.3%, or 5.3 words, in Table E.1, column 6 (p-value = 0.062). This measure effectively captures the breadth of patent scope (Kuhn and Thompson, 2019) because fewer words mean fewer restrictions and a broader scope. That is, firms pursued a broader range of protection for a given patent after *Application v. Hunter*. This result is consistent with our theoretical account that firms increased their patent filings to protect their knowledge against the heightened risk of worker departure. Other than the scope of patents, we do not find evidence that firms changed the qualitative characteristics of the patents they filed.

Table E.1. Comparison of Qualitative Characteristics of Patents

	Dependent variables (log):							
	Backward citations	In-text citations	Forward citations	Triadic patents	Number of claims	Number of words in the first claim	Number of inventors	Examination length (days)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Enforce×Post	0.011	–0.000	–0.015	0.014	0.011	–0.035	0.009	0.025
	(0.036)	(0.010)	(0.044)	(0.009)	(0.036)	(0.018)	(0.010)	(0.018)
	[0.752]	[0.976]	[0.736]	[0.124]	[0.767]	[0.062]	[0.407]	[0.177]
Unit FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Time FE	Year	Year	Year	Year	Year	Year	Year	Year
R^2	0.674	0.832	0.726	0.821	0.671	0.698	0.688	0.609
Adjusted R^2	0.445	0.715	0.535	0.696	0.440	0.488	0.470	0.335
Observations	64,246	64,246	64,246	64,246	64,244	64,244	64,246	64,242

Notes. This table reports regression coefficients from seven regressions based on Equation (1). The sample includes all patent assignees that had at least one inventor from 1993 to 1997. The dependent variable consists of the average number of backward citations made (column 1), the average number of in-text citations made (column 2), the average number of forward citations received (column 3), the number of triadic patents (column 4), the average number of claims per patent (column 5), the average number of words used in the first claim (column 6), the average number of inventors per patent (column 7), and the average length of patent examination (i.e., the days between patent filing and registration; column 8). Standard errors, clustered at the state level, are provided in parentheses. *p*-values are provided in brackets.

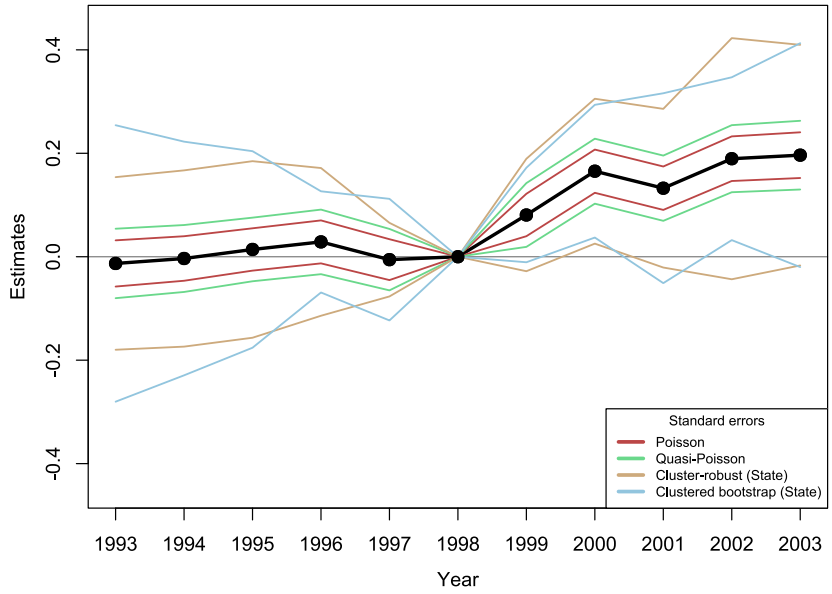
F Poisson Quasi-Maximum Likelihood Estimation

We check whether our results are robust to alternative model choices. The Poisson regression model effectively deals with count data that have an excess number of zero counts. Compared to alternative count models, such as the negative binomial, the Poisson model is more robust to distributional misspecification, even if the data-generating process is misspecified, as long as the conditional mean is correctly specified (Cameron & Trivedi, 2013). The Poisson regression model, however, relies on the assumption that the conditional mean and variance are the same, although in many cases, including our data, the variance is larger than the mean. The Poisson quasi-maximum likelihood estimator (QMLE) relaxes this assumption and estimates the overdispersion parameter (ϕ) from the data.

The Poisson QMLE estimates coefficients that are identical to those obtained via the Poisson model, but the former model leads to *larger* standard errors, because it accounts for the overdispersion parameter when estimating standard errors (i.e., the standard Poisson model underestimates standard errors in the presence of overdispersion). As such, in the Poisson QMLE model, standard errors need to be adjusted for the clusters in which errors are correlated; otherwise, standard errors tend to overstate estimator precision, leading to absurdly small standard errors (Cameron & Miller, 2015). We ran our main analysis using the Poisson QMLE model, instead of an ordinary least squares (OLS) model, to compare different types of standard errors.

Figure F.1 shows the results. We present different standard errors for comparison, including nonparametric clustered bootstrap standard errors based on 10,000 repetitions. We find a statistically significant increase in patenting intensity for the years after *Application v. Hunter* across all types of standard errors. However, standard errors based on Poisson and quasi-Poisson are clearly underestimated (these do not account for correlation within clusters), whereas bootstrapping provides more conservative standard errors. In sum, that loglinear OLS estimation and the Poisson QMLE produce similar results, which assure us that our findings are not sensitive to our model choices.

Figure F.1. Effects of worker mobility on patent filings:
Poisson quasi-Maximum likelihood estimation



Notes. This figure shows difference-in-differences estimates from the Poisson quasi-maximum likelihood estimation. The dispersion parameter for the quasi-Poisson family is 2.26, suggesting the presence of overdispersion in our sample. We provide four different standard errors for comparison. Excluded are the Top 1% outlier firms in terms of their size.

G Analysis of public firms

G.1 Sample comparison: PatentsView versus CRSP/Compustat-Merged data

In this section, we empirically examine how firms changed their innovation input, namely, R&D investments, around *Application vs. Hunter*. Ideally, we would want to examine the R&D investments of all firms in our sample used for our main analysis. However, because information on R&D investments is often considered confidential information that has important strategic value, it is difficult to obtain such data for all patenting firms, especially for private companies. Using the CRSP/Compustat-Merged Data, we focus on all *publicly traded firms* in the United States that are required to disclose such information. Kogan, Papanikolaou, Seru, and Stoffman (2017) provide the *bridge* between Compustat firms (GVKEY) and their patents (patent ID).

Because there is a hugely significant discrepancy about which firms are covered in each data, we first compare the size of firms in 1998, measured by the number of inventor stocks from 1993 to 1997. There clearly exists a huge difference in firm sizes between the two data, as shown in Table G.1. The CRSP/Compustat-Merged data cover a much smaller number of larger firms. The Compustat data cover only 2% of the firms covered by PatentsView. Furthermore, the meaning of a "firm" differs between the two data sets. The assignee firm in the patent data refers to the smallest business unit that files patents under its name, whereas a firm in the CRSP/Compustat-Merged data refers to a company (issue, currency, index) in the CRSP/Compustat file (GVKEY or PERMNO). The latter is generally broader than the former, and a company in the CRSP/Compustat file often holds multiple patent assignee firms. This further complicates the issue because one company could hold patenting assignee firms in different states. Therefore, the high level of aggregation in the CRSP/Compustat data makes these data less desirable for studying state-level outcomes. At a minimum, we note that the results from these two different data sets cannot be compared at the same level, and one should be very careful if linking and interpreting the results.

Table G.1. Comparison of firm sizes in PatentsView and Compustat

Firm size in 1998	Mean	SD	First Quantile	Second quantile	Third quantile	Number of firms
PatentsView (All patenting firms)	8.2	91.0	1.0	2.0	4.0	51,462
CRSP/Compustat-Merged (All patenting *public* firms)	95.5	442.2	6.0	14.0	42.3	848

Note. Firm size is measured by the number of (unique) inventor stock from 1993 to 1997. Sample consists of firms that had at least one inventor in 1993-1997.

G.2 Patent value and R&D expenditures of public firms

We first examine the commercial value of patents by public firms in the Compustat sample. The average commercial value of patents did not change after *Application v. Hunter*, as shown in Table G.2, column 1. With regard to R&D expenditure, in column 2, the point estimate is 0.061 with *p*-value 0.240. We cannot reject the null hypothesis at a significance level of 0.10 that the estimated coefficient is equal to zero.

The negative relationship between the enforceability of noncompetes and R&D expenditure is consistent with the findings of Garmaise (2011). Yet, we want to note that there are several difficulties in estimating firms' response in R&D expenditure. First, the information on R&D expenditures is not available for every firm; only 50.3% of observations have valid information on R&D expenditures. Some firms do not invest in R&D projects and therefore have no information on R&D expenditures. Some firms have missing information for random years.

More importantly, R&D investment (xrd in Compustat) includes expenditures on patent filings. Thus, it is possible that firms are reducing real investments in R&D projects but, simultaneously, spending a significant budget to file and maintain additional patents. Our conversation with patent attorneys in one of the largest multinational companies in Europe (the name of which we cannot disclose due to nondisclosure agreements) suggests that filing a single patent costs from $5,000 to $25,000, not including the maintenance fees and enforcement costs.

Furthermore, Hall and Lerner (2010) note that more than 50% of R&D expenditure is wages paid to research activities. Having more outside options provides workers with more bargaining power. If workers leverage *Application v. Hunter* to demand higher wages and other forms of considerations (Starr, 2019), this may be reflected in a firm's R&D expenditure. Thus, it is possible that firms are reducing investment in R&D projects but, simultaneously, increasing wages and considerations paid to knowledge workers to prevent them from departing.

In sum, we do not find evidence that firms meaningfully increased R&D investment following *Application v. Hunter* and conclude that the increased patent filings indeed come from changes in knowledge protection strategies, not from fundamental R&D activities (Png, 2017a; Png, 2017b).

Table G.2. Additional analyses of the knowledge protection mechanisms

	Dependent variables (log):	
	Patent commercial value	R&D expenditure
	(1)	(2)
Enforce×Post	–0.001	0.061
	(0.046)	(0.052)
	[0.981]	[0.240]
Firm FE	Yes	Yes
Year FE	Yes	Yes
R^2	0.793	0.960
Adjusted R^2	0.760	0.954
Observations	15,567	15,681

Notes. This table reports regression coefficients from the sample of publicly traded firms. *Source*: CRSP/Compustat-Merged data.

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