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Protection of trade secrets and capital structure decisions☆

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ABSTRACT

Firms strategically choose more conservative capital structures when they face greater competitive threats stemming from the potential loss of their trade secrets to rivals. Following the recognition of the Inevitable Disclosure Doctrine by US state courts, which exogenously increases the protection of a firm's trade secrets by reducing the mobility of its workers who know its secrets to rivals, the firm increases its leverage relative to unaffected rivals. The effect is stronger for firms with a greater risk of losing key employees to rivals, for those facing financially stronger rivals, and for those in industries where competition is more intense.

1. Introduction

Financial economists generally agree that risks stemming from a firm's competitive environment, such as the risk of predation by rivals, new entry, or competitors improving their products, can lead the firm to choose its capital structure strategically, i.e., taking into account how its financial decisions affect rival firms' future moves and its ability to react to these moves. Surprisingly, little is known about the relevance for capital structure choices of

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competitive threats that originate from a firm's inability to fully protect its intellectual property from appropriation by opportunistic rivals. Yet, intellectual property, which accounts for roughly one-third of the aggregate market equity value of US publicly traded firms, is among the critical revenue-generating assets that determine a firm's competitive advantages and performance in its product market (Shapiro and Hassett, 2005).

We study how a firm's capital structure decisions are affected by the ex-ante risk that its industry rivals could try to obtain its intellectual property in the form of trade secrets and hurt its competitive position. These secrets consist of sensitive information that is not easily ascertainable by outside parties, such as detailed information about a firm's customers, price lists, cost information, information about future business plans (e.g., future products and services), and also formulas, practices, processes, or designs. Trade secrets are pervasive in all industry sectors and are very valuable because they provide firms with competitive advantages over their industry rivals.[1] In line with the prior survey evidence in Cohen et al. (2000) and Arundel (2001), a recent survey by Marsh and Liberty Underwriters reports that trade secrets are firms' most important form of revenue-generating intellectual property, followed by trademarks and patents.[2]

Trade secrets are an important source of risk because the divulgence of such secrets can erode a firm's competitive advantages over its rivals and cause the firm significant economic harm. Highlighting the importance of this risk, a survey sponsored by the US Chamber of Commerce estimates that firms lose over $50 billion annually due to the divulgence of their trade secrets. It also reports that the most common types of trade secrets lost to rivals are secrets related to a firm's customers, strategic plans, and financial data.[3] Likewise, underscoring the economic importance of trade secrets, prior work shows that trade secrets are the most litigated form of intellectual property (Lerner, 2006) and that litigation of trade secrets is on the rise in both state and federal courts (Almeling et al., 2010, 2011).

Our main hypothesis follows from prior work that highlights the strategic value of financial flexibility in the face of intense competition (e.g., Telser, 1966; Poitevin, 1989; Bolton and Scharfstein, 1990), the value of preserving unused debt capacity to meet unexpected future funding needs (DeAngelo and DeAngelo, 2007; DeAngelo et al., 2011), and that competitive threats lead to more conservative financial policies (e.g., Haushalter et al., 2007; Frésard, 2010; Valta, 2012; Hoberg et al., 2014). We argue that unused debt capacity is particularly valuable for a firm facing a high risk that its rivals would try to obtain its trade secrets for two reasons. First, it allows the firm to raise the funds needed to aggressively protect its competitive position when its trade secrets are divulged to rivals (e.g., by increasing capital investment, research and development (R&D), advertising, or hiring, or by engaging in costly litigation). Second, it credibly signals to its rivals that the firm has the financial ability to respond aggressively to the appropriation of its trade secrets, which in turn reduces rivals' incentives to obtain these secrets. Hence, we hypothesize that a greater risk that a firm's rivals could seek to obtain its trade secrets and harm its business increases the firm's strategic benefit of maintaining unused debt capacity, and thus leads to a lower debt ratio.

The challenge in estimating the causal effect of a higher risk of losing trade secrets to rivals on a firm's capital structure decisions is to identify exogenous variation in this risk. To this end, we focus on the mobility of employees with knowledge of trade secrets, which is the main channel through which firms lose trade secrets to rivals. In the survey sponsored by the US Chamber of Commerce noted earlier, chief executive officers (CEOs) report that former employees are the greatest source of risk associated with the loss of proprietary information. Also, Almeling et al. (2011) report that in most legal cases involving trade secrets, the misappropriator of a firm's trade secrets is a former employee. Importantly, the legal environment surrounding the mobility of key employees and protection of firms' trade secrets differs across states and within a state over time. This allows us to use a novel empirical setting for identification.

Our difference-in-differences tests use the staggered adoption, and in a few cases the subsequent rejection, of the Inevitable Disclosure Doctrine (IDD) by US state courts over the 1977–2011 period to gauge changes in the legal protection of firms' trade secrets. The IDD is a legal doctrine that states that a firm's former employee can be prevented from working for a rival firm if this would "inevitably" lead the employee to divulge the firm's trade secrets to the rival. It is applicable even if the employee did not sign a noncompete or nondisclosure agreement with the firm, if there is no evidence of bad faith or actual wrongdoing, or if the rival is located in another state. Hence, by increasing a firm's ability to prevent employees who know its trade secrets from working for rivals, the recognition of the IDD in the firm's state reduces the risk that rivals will obtain its trade secrets.

We show that the recognition of the IDD in a given state significantly reduces the mobility to rival firms of workers in managerial and related occupations (which entail access to a firm's trade secrets) relative to the mobility to rival firms of workers in other occupations. The variation in the protection of firms' trade secrets associated with this legal event is arguably exogenous, and thus a potentially useful source of identification that can aid finance research. Specifically, the legal background surrounding state courts' recognition of the IDD (discussed in Section 4.1) suggests that the occurrence of this event is unlikely to be systematically associated with changes in business or political conditions in a state, lobbying, or to be anticipated by firms. Empirically, we find that a state's labor laws or adoption of the Uniform Trade Secrets Act,

[1] For example, Hall et al. (2012) estimate an average value of $6.3 million per trade secret based on the ruling by a federal court in Virginia in September 2011 that Kolon Industries Inc. was liable to paying DuPont Co. $919.9 million for the theft of 149 trade secrets related to DuPont's Kevlar business.

[2] See Marsh and Liberty International Underwriters, "The 2011 Intellectual Property Survey Report", 2011.

[3] See "Trends in Proprietary Information Loss," ASIS International, September 2002.

worker characteristics, and economic or political conditions do not affect state courts' decisions to adopt the IDD.

Our key result is that the recognition of the IDD leads to increases of about 14%–19% in the net book and market leverage ratios of firms headquartered in recognizing states relative to those of their industry rivals in nonaffected states. Consistent with the validity of the parallel trends assumption that is central to a causal interpretation of our results, we show that the pretreatment trends in the leverage of treated and control firms are statistically indistinguishable, i.e., the increases in the financial leverage of treated firms relative to control firms occur after the adoption of the IDD, but not before. These results suggest that a decrease in their risk of losing trade secrets to rivals causes firms to increase their leverage.

As in any difference-in-differences setup, an additional concern is whether posttreatment trends would have remained parallel had it not been for the legal change. Specifically, the worry is that omitted variables correlated with both the adoption of the IDD and capital structure decisions could drive the results by affecting posttreatment trends in debt ratios. Our empirical tests mitigate this concern: our results hold after the inclusion of standard controls used in capital structure tests, controls for the economic and political conditions prevailing in a state and for the enforcement of covenants not to compete by the courts in a state, firm fixed effects that control for time-invariant firm-level factors, and industry-year fixed effects that control for time-varying industry heterogeneity.

Admittedly, we cannot entirely rule out that other omitted variables might drive the results through channels other than the protection of firms' trade secrets. For example, we cannot control for unobservable state-level changes in investment opportunities that coincide with the recognition of the IDD and require debt financing. However, inconsistent with omitted variables driving our results, the recognition of the IDD has a larger impact on the net leverage of firms that face a greater ex-ante risk of losing employees who know their trade secrets to rivals. Further, supporting the economic mechanism behind our main hypothesis, the recognition of the IDD has a larger effect on net leverage for financially weak firms that face financially strong rivals, and for firms that face heightened competitive threats due to higher asset specificity or lower barriers to entry in their industry. It also has a smaller effect for firms with more differentiated products, and thus stronger competitive positions relative to their industry rivals. Overall, these results highlight the strategic value of maintaining unused debt capacity for firms that face competitive threats associated with the risk of losing trade secrets to rivals, as implied by our hypothesis.

We provide evidence inconsistent with other (nonstrategic) explanations of our main results. First, the recognition of the IDD might lead firms to lever up by raising their future profitability and the tax benefits of debt financing. But our results hold controlling for future profitability, and the recognition of the IDD does not affect firms' future profitability or have a stronger effect on the leverage of firms with higher expected tax benefits of debt financing. Second, the recognition of the IDD could cause firms to lever up by reducing general cash flow uncertainty. However, our results hold controlling for contemporaneous changes in general cash flow uncertainty and the recognition of the IDD does not impact measures for this uncertainty. Finally, the recognition of the IDD might lead firms to lever up to finance increased spending in the development of trade secrets (e.g., R&D, capital, or advertising expenditures). However, the recognition of the IDD does not affect such expenditures.

We also examine the association between firms' net leverage ratios and two firm-level indicators for whether a firm reports that it faces a significant risk of losing trade secrets to its competitors that are based on textual analyses of firms' 10-K filings. One uses the approach in Eisfeldt and Papanikolaou (2013), and the other follows the approach in Hoberg and Maksimovic (2015). Consistent with our hypothesis and with our results based on the recognition of the IDD, we find a statistically and economically significant negative association between both of these indicators and net financial leverage.

Further tests show that affected firms earn positive abnormal returns over the days surrounding a state court's final decision to recognize the IDD, and that following this recognition their cost of bank debt decreases. These results further support the notion that the recognition of the IDD reduces the competitive risk these firms face. Lastly, the recognition of the IDD is unrelated to changes in the product fluidity measure of Hoberg et al. (2014) and in other firm-level measures of competitive risk, suggesting that the IDD rulings capture a distinct aspect of competitive risk.

Our paper brings attention to important changes in the competitive landscape over the last 50 years. As reported in Almeling (2012), firms are increasingly reliant on their intellectual capital, in particular trade secrets, as a source of competitive advantage over their rivals, and are concerned with the protection of this capital. Also, employees who know trade secrets are ever more mobile and less attached to their current employers, and rivals have incentives to poach them to gain access to those trade secrets. Hence, competitive threats stemming from labor markets are increasingly important and worth studying.

Closely related work examines how competitive threats related to firms' output (products and services) affect a firm's financial policies (e.g., MacKay and Phillips, 2005; Lyandres, 2006; Haushalter et al., 2007; Frésard, 2010; Valta, 2012; Hoberg et al., 2014). Our contribution is to highlight the increasing importance of threats related to a scarce key input, namely, the firm's intellectual property. Specifically, losing trade secrets to rivals is a major competitive threat that leads firms to choose their capital structures strategically.

Our paper is also related to recent work on how labor market frictions affect debt ratios (e.g., Matsa, 2010; Agrawal and Matsa, 2013; Simintzi et al., 2015). These studies show that when firms are concerned with their labor costs, debt ratios depend on labor unions' bargaining power, employee unemployment risk, and the rigidity of labor costs. Because workers who know trade secrets typically account for a small fraction of a firm's total labor costs, they are unlikely to affect capital structure through these cost-related mechanisms. Still, we find that the mobility of such workers can have a large impact on a firm's

capital structure by affecting the protection of its valuable trade secrets.

Lastly, our paper is related to prior work on the use of noncompete agreements to protect trade secrets and the effect of these agreements on labor mobility, investment in human capital, and innovation (e.g., Marx et al., 2009; Garmaise, 2011; Samila and Sorenson, 2011). Although we focus on strategic capital structure issues and a broader legal doctrine affecting trade secret protection, both these papers and ours highlight the interplay between labor mobility, trade secret protection, and corporate outcomes.

The rest of the paper is organized as follows. Section 2 develops our hypothesis and predictions. Section 3 discusses the IDD. Section 4 discusses identification. Section 5 reports our key results. Section 6 reports further investigations. Section 7 concludes.

2. Conceptual framework and empirical predictions

Theoretical research relating capital structure choices and product market competition emphasizes that a firm's financial situation can affect its conduct as well as that of its rivals, and ultimately its competitive position in its product market. The deep pockets argument, put forward in Telser (1966) and formalized in Poitevin (1989) and Bolton and Scharfstein (1990), highlights the importance of maintaining financial flexibility for a firm facing large competitive threats. In Bolton and Scharfstein (1990), the optimal debt contract balances the benefits of deterring predation by reducing a firm's financial constraints against the cost of exacerbating managerial incentive problems. In Poitevin (1989), a high quality entrant must finance with debt to separate itself from a low quality entrant, while an incumbent who finances with equity can exploit the entrant's financial weakness to drive it into bankruptcy. A key insight from Poitevin (1989) and Bolton and Scharfstein (1990) is that when a firm holds more debt, this increases opportunistic rivals' incentives to launch competitive attacks on the firm, and that firms' capital structure decisions take such strategic issues into account.[4]

The theory suggests that unused debt capacity is strategically valuable because it allows a firm to aggressively respond to competitive attacks by its rivals, e.g., by increasing capital investment, advertising, R&D spending, or employee recruiting and retention efforts. It can also help a firm to deter such attacks by signaling to its rivals that the firm has the resources to retaliate if attacked, which reduces the expected benefit to its rivals of engaging in such tactics. Consistent with this notion, the empirical evidence shows that the financial flexibility provided by lower financial leverage (relative to rivals' leverage) allows firms to react to opportunistic behavior by their rivals (e.g., Phillips, 1995; Chevalier, 1995; Kovenock and Phillips, 1997; Zingales, 1998; Campello, 2003, 2006; Khanna and Tice, 2000, 2005). Further, it suggests that firms will strategically take into account the competitive threats they face when deciding on their financial policies (e.g., Mackay and Phillips, 2005; Haushalter et al., 2007; Frésard, 2010; Valta, 2012; Hoberg et al., 2014).

The novelty of our paper is to focus on how capital structure choices are affected by competition among firms with regard to the access to trade secrets, a key form of revenue-generating intellectual capital, that can give the proprietor of the trade secrets important competitive advantages over its rivals. Our key insight is that the risk of losing trade secrets to rivals is a key competitive threat that, by increasing the strategic value of maintaining financial flexibility to react when these threats materialize or to deter them ex ante, can affect a firm's capital structure choices.

The conceptual framework behind our empirical analyses builds on prior work that brings to light the strategic value of having unused debt capacity in the face of intense competition (e.g., Telser, 1966; Poitevin, 1989; Bolton and Scharfstein, 1990), the value of preserving unused debt capacity to meet unexpected future funding needs (DeAngelo and DeAngelo, 2007; DeAngelo et al., 2011), and that larger competitive threats lead to more conservative financial policies (e.g., Haushalter et al., 2007; Frésard, 2010; Valta, 2012; Hoberg et al., 2014). Specifically, we draw attention to two roles of unused debt capacity.

First, unused debt capacity is strategically valuable for a firm that faces a larger risk of losing trade secrets because by maintaining a firm's ability to borrow in the future, a lower debt ratio allows the firm to raise funds and swiftly take actions to protect its competitive position in the event that its trade secrets are divulged to rivals. For instance, if the lost trade secrets were related to a firm's future products, the firm could make additional investments in product development to further differentiate its products from those of its rivals. The firm could also raise funds to ensure that, regardless of any adverse consequences from the loss of its trade secrets, it can continue to fully invest in its growth opportunities and make its payments to creditors and suppliers. Further, the firm could also respond to the loss of its trade secrets by entering into costly litigation against rivals.

Second, unused debt capacity is also strategically valuable because it could deter a firm's rivals from actively seeking to obtain and commercially exploit its trade secrets. Maintaining unused debt capacity increases the firm's ex-ante ability to aggressively retaliate to protect its competitive position against such attempts, for example, by increasing investment or by entering into costly litigation, and it credibly conveys this ability to its rivals. This directly reduces rivals' expected benefit of opportunistically seeking to obtain the firm's trade secrets.

These two arguments imply that if a firm faces competitive threats associated with the risk of its rivals obtaining its trade secrets, its optimal capital structure choice trades off the strategic benefits of unused debt capacity discussed above against the costs of less borrowing (e.g., forgone tax shields). Hence, ceteris paribus, the firm's optimal debt ratio is higher when it faces less such threats. This leads to our main hypothesis: a decrease in the risk that a firm's rivals could obtain its trade secrets and harm its competitive position reduces its strategic benefit of keeping un-

[4] See also Maurer (1999) and Faure-Grimaud (2000) for additional theoretical support for the notion that when a firm increases its outstanding debt, this can weaken its competitive position in its product market.

used debt capacity, and thus leads the firm to optimally increase its debt ratio. The empirical assessment of this hypothesis benefits from a clear identification of the mechanism through which a firm might lose trade secrets to rivals.

As noted in our introduction, the main source of the risk that a firm's trade secrets will be divulged to its rivals is the mobility of its employees with knowledge of its trade secrets. Anecdotal evidence further suggests that the poaching of employees with access to a rival's trade secrets is a key element of firms' competitive strategies. For example, in early 2016, XPO Logistics sued its competitor YRC Worldwide on the basis that YRC deliberately "targeted and raided" XPO employees in key executive and sales roles as a means to access the carrier's "most valuable trade secrets."[5] Further, in the spirit of Telser's (1966) deep pockets argument, Kim (2014) shows theoretically that financially strong firms can engage in "predatory poaching" against a financially weaker rival, i.e., offer higher wages to poach a rival's employees who know its trade secrets and deprive the rival of its competitive advantage. Hence, our empirical tests aim to gauge how changes in a firm's risk of losing trade secrets to rivals through the employee mobility channel affect its capital structure.

As we explain in Section 3, in our tests we rely on exogenous changes in the legal protection of trade secrets that reduce the mobility of employees with knowledge of trade secrets to rival firms. Intuitively, an increase in the protection of a firm's trade secrets increases the cost to rivals of obtaining the firm's trade secrets, and thus reduces the competitive threats the firm faces. Hence, the optimal adjustment of the firm's capital structure following an increase in the protection of its trade secrets could lead the firm to transit from one product market equilibrium with high competitive threats (high benefit of unused debt capacity) and low leverage to another with lower competitive threats (lower benefit of unused debt capacity) and higher leverage.

Importantly, our empirical tests need to isolate the strategic effect underlying our main hypothesis from other potential nonstrategic effects that could confound the inferences. In particular, within the standard tradeoff theory, an increase in the legal protection of a firm's trade secrets could lead the firm to lever up simply by increasing its future profits, and thus the tax benefits of debt financing or by reducing uncertainty about the firm's future profitability. Alternatively, in dynamic models of leverage, higher expected future profitability can make a firm conserve debt capacity to ensure it is able to finance good investment projects that could arrive in the future (e.g., DeAngelo et al., 2011). Thus, if increased protection of trade secrets were to increase affected firms' expected profits, this could lead these firms to decrease their financial leverage. Further, another potential confounding effect is that increased protection of their trade secrets could lead firms to lever up to finance increased spending in the development of trade secrets.

The general empirical prediction generated by our hypothesis is that an increase in the legal protection of a firm's trade secrets from appropriation by its rivals leads the firm to lever up relative to all other firms whose protection is unaffected. There are also testable implications of our hypothesis that help to isolate the strategic effect from other effects.

First, the theoretical and empirical work previously discussed that relates capital structure choices and product market competition suggests that a firm should lower its debt ratio relative to that of its rivals when it faces a higher risk that these rivals will launch competitive attacks on it. Consequently, if there is heterogeneity in the changes in the legal protection of trade secrets across firms in an industry, the strategic view implies that firms that experience increased legal protection of their secrets should lever up relative to their rivals that do not experience this.

Second, the strategic benefit of unused debt capacity is greater for a firm with limited access to external capital that faces financially strong rivals. The reason is that such rivals could more aggressively seek and exploit trade secrets obtained from the firm and inflict greater damage on its competitive position. Moreover, they are more likely to do so when they perceive that the firm has a limited financial ability to respond to competitive attacks. It is worth noting that in their 10-Ks, firms often report that because their rivals are financially stronger than they are, they face a higher risk of losing trade secrets to rivals, their rivals could significantly exploit their trade secrets if they obtained these secrets, and that they could be unable to adequately respond to the acquisition of their trade secrets by rivals if this requires significant financial resources.[6] This suggests that changes in the legal protection of a firm's trade secrets should have a larger impact on its capital structure when it has limited access to external capital and it faces financially stronger rivals.

Third, the strategic benefit of unused debt capacity is larger in industries with more specific assets. Firms in such industries face heightened competitive threats since they find it more difficult to sell assets to raise funds to meet unexpected financing needs (Valta, 2012; Ortiz-Molina and Phillips, 2014), for example if they lose trade secrets to rivals. Asset specificity is also a barrier to exit for the less productive firms in the industry, leading to excess capacity and more aggressive behavior by incumbents (Porter, 2008). Hence, changes in the legal protection of a firm's trade secrets are likely to have a larger impact on the firm's capital structure in industries with higher asset specificity.

Fourth, a key threat a firm faces is that the divulgence of its trade secrets could facilitate the entry of new firms into its product market and the erosion of its competitive position. However, barriers to entry make it difficult for new firms to enter the industry even if they gain access to the incumbent firms' trade secrets, and thus re-

[5] See the article "XPO Logistics Sues Trucker YRC, Charging Rival 'Poached' Executives, Trade Secrets" by Loretta Chao in the Wall Street Journal online published on February 5, 2016 for more detail.

[6] For instance, see Vanguard Minerals' 2012 10-K and Oragenics' 2014 10-K.

duce such threats.[7] Hence, the strategic benefit of keeping unused debt capacity is smaller in industries with higher barriers to entry, and thus changes in the legal protection of a firm's trade secrets should have a smaller impact on firms' leverage in industries with higher barriers to entry.

Finally, prior work argues and shows that firms use R&D and advertising to differentiate their products from those of their competitors, and that when a firm increases these expenditures it experiences reductions in competition (e.g., Hoberg and Phillips, 2016). As a result, the strategic benefit of maintaining unused debt capacity is smaller for firms for whom these expenditures are high relative to those of their industry rivals, and consequently changes in the legal protection of a firm's trade secrets should have a smaller impact on the leverage ratios of such firms.

3. The Inevitable Disclosure Doctrine and construction of the IDD indicator

3.1. Origin and application of the IDD

The protection of trade secrets is largely governed by state law. The Uniform Trade Secrets Act (UTSA) defines a trade secret as any information that (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by other persons who can obtain economic value from its disclosure or use, and (ii) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy. Misappropriation occurs when the trade secret is acquired by (i) improper means (e.g., theft or breach of a duty to maintain secrecy), or (ii) disclosure without express or implied consent by a person who acquired the trade secret under circumstances, giving rise to a duty to maintain its secrecy or limit its use.

The key legal concept in understanding the applicability of the IDD is "threatened misappropriation," which occurs when an employee who has knowledge of a firm's trade secrets goes to work for a direct competitor in a similar position. The IDD is a legal doctrine based on a strong interpretation of the concept of threatened misappropriation that does not immediately follow from the general principles in trade secrets law (e.g., as codified in the UTSA). It maintains that if the new employment would inevitably lead to the disclosure of the firm's trade secrets to a competitor and cause the firm irreparable harm, then upon the firm's request state courts can prevent the employee from working for the firm's competitor or can allow it, but limit the responsibilities the worker can undertake.

The adoption of the IDD by a state court enhances the protection of trade secrets for firms located in the state by reducing the risk that departing employees who know their firm's trade secrets will reveal them to rival companies (in any state), or use them to start a rival company. Under the IDD, a firm's suit can rest on the mere threat of irreparable harm. To obtain an injunction, the firm must only establish that (i) the employee had access to its trade secrets, (ii) the employee's duties at the new employer would be so similar to those she had at the firm that in performing them she will inevitably use or disclose the trade secrets, and (iii) the disclosure of the trade secrets would produce irreparable economic harm to its business. However, the firm need not establish actual wrongdoing by the employee or disclose the actual details of the underlying trade secrets in the lawsuit.[8]

It is worth noting that lawsuits related to employment contracts are filed in the context of employment law, and thus the relevant jurisdiction for a lawsuit seeking to protect a firm's trade secrets when employees switch employers is typically the state where the former employee worked (Malsberger, 2004; Garmaise, 2011).[9] As a result, the IDD protects a firm's trade secrets even if the new employer of a firm's former worker is in another state whose courts have not adopted the IDD.

3.2. Nondisclosure and noncompete clauses in employment contracts

Employment contracts sometimes contain a nondisclosure agreement (NDA) and/or a covenant not to compete (CNC). Both are designed to protect the firm's trade secrets in cases in which employees wish to switch jobs or start competing firms, and it allows the firm to bolster its suit by including a claim of breach of contract.

The protection offered by NDAs is somewhat limited because violations must be detected and proved before the firm can initiate legal action against a former employee. Furthermore, even if the firm can prove that an employee violated an NDA, by that time the harm has already been done. As noted by Garmaise (2011), CNCs are most effective when workers seek to switch jobs within a state. CNCs are much less effective when workers try to switch to a new job in another state because the geographical area where a firm's former employee may not compete is typically limited to a state or a part of a state (Malsberger, 2004).

The IDD provides significant additional protection of a firm's trade secrets even if the firm's employees sign NDAs and/or CNCs. First, it does not entail specific geographic restrictions, and thus it is more far reaching than CNCs. Second, it increases the enforceability of NDAs and CNCs. For instance, it allows courts to prohibit an individual's employment at a rival firm if this would inevitably lead to a future violation of an NDA, i.e., before an actual violation is detected. The IDD is also a powerful means to establish a key element in any legal action to enforce a CNC, i.e., a significant likelihood of irreparable harm to the firm if the employee is allowed to work for the rival. Finally, the IDD allows courts to grant an injunction even if the employee did not sign an NDA or CNC with the former employer, i.e.,

[7] Barriers to entry also soften competition leading to higher profits and survival rates. Thus, the financial distress a firm would suffer from losing its trade secrets can be less severe in industries with higher barriers to entry.

[8] In the online Appendix, we discuss two legal cases that illustrate how state courts apply the IDD.

[9] The former or new employer's state of incorporation (even if different from the state where the employer's main operations are located) or the employee's state of residence do not play a role in the application of the IDD.

Table 1
Precedent-setting legal cases adopting or rejecting the Inevitable Disclosure Doctrine.
The table lists the precedent-setting legal cases in which state courts adopted the Inevitable Disclosure Doctrine (IDD) or rejected it after adopting it. The states omitted from the table did not consider or considered but rejected the IDD. The text of all court decisions is available from Google Scholar.

State	Precedent-setting case(s)	Date	Decision
AR	*Southwestern Energy Co. v. Eickenhorst*, 955 F. Supp. 1078 (W.D. Ark. 1997)	3/18/1997	Adopt
CT	*Branson Ultrasonics Corp. v. Stratman*, 921 F. Supp. 909 (D. Conn. 1996)	2/28/1996	Adopt
DE	*E.I. duPont de Nemours & Co. v. American Potash & Chem. Corp.*, 200 A.2d 428 (Del. Ch. 1964)	5/5/1964	Adopt
FL	*Fountain v. Hudson Cush-N-Foam Corp.*, 122 So. 2d 232 (Fla. Dist. Ct. App. 1960)	7/11/1960	Adopt
	Del Monte Fresh Produce Co. v. Dole Food Co. Inc., 148 F. Supp. 2d 1326 (S.D. Fla. 2001)	5/21/2001	Reject
GA	*Essex Group Inc. v. Southwire Co.*, 501 S.E.2d 501 (Ga. 1998)	6/29/1998	Adopt
IL	*Teradyne Inc. v. Clear Communications Corp.*, 707 F. Supp. 353 (N.D. 111. 1989)	2/9/1989	Adopt
IN	*Ackerman v. Kimball Int'l Inc.*, 652 N.E.2d 507 (Ind. 1995)	7/12/1995	Adopt
IA	*Uncle B's Bakery v. O'Rourke*, 920 F. Supp. 1405 (N.D. Iowa 1996)	4/1/1996	Adopt
KS	*Bradbury Co. v. Teissier-duCros*, 413 F. Supp. 2d 1203 (D. Kans. 2006)	2/2/2006	Adopt
MA	*Bard v. Intoccia*, 1994 U.S. Dist. LEXIS 15,368 (D. Mass. 1994)	10/13/1994	Adopt
MI	*Allis-Chalmers Manuf. Co. v. Continental Aviation & Eng. Corp.*, 255 F. Supp. 645 (E.D. Mich. 1966)	2/17/1966	Adopt
	CMI Int'l, Inc. v. Intermet Int'l Corp., 649 N.W.2d 808 (Mich. Ct. App. 2002)	4/30/2002	Reject
MN	*Surgidev Corp. v. Eye Technology Inc.*, 648 F. Supp. 661 (D. Minn. 1986)	10/10/1986	Adopt
MO	*H&R Block Eastern Tax Servs. Inc. v. Enchura*, 122 F. Supp. 2d 1067 (W.D. Mo. 2000)	11/2/2000	Adopt
NJ	*Nat'l Starch & Chem. Corp. v. Parker Chem. Corp.*, 530 A.2d 31 (N.J. Super. Ct. 1987)	4/27/1987	Adopt
NY	*Eastman Kodak Co. v. Powers Film Prod.*, 189 A.D. 556 (N.Y.A.D. 1919)	12/5/1919	Adopt
NC	*Travenol Laboratories Inc. v. Turner*, 228 S.E.2d 478 (N.C. Ct. App. 1976)	6/17/1976	Adopt
OH	*Procter & Gamble Co. v. Stoneham*, 747 N.E.2d 268 (Ohio Ct. App. 2000)	9/29/2000	Adopt
PA	*Air Products & Chemical Inc. v. Johnson*, 442 A.2d 1114 (Pa. Super. Ct. 1982)	2/19/1982	Adopt
TX	*Rugen v. Interactive Business Systems Inc.*, 864 S.W.2d 548 (Tex. App. 1993)	5/28/1993	Adopt
	Cardinal Health Staffing Network Inc. v. Bowen, 106 S.W.3d 230 (Tex. App. 2003)	4/3/2003	Reject
UT	*Novell Inc. v. Timpanogos Research Group Inc.*, 46 U.S.P.Q.2d 1197 (Utah D.C. 1998)	1/30/1998	Adopt
WA	*Solutec Corp. Inc. v. Agnew*, 88 Wash. App. 1067 (Wash. Ct. App. 1997)	12/30/1997	Adopt

solely on the basis that disclosure of the trade secrets is inevitable.

3.3. Adoption/rejection of the IDD by state courts, and construction of the IDD indicator

To create the IDD indicator variable we use in our empirical tests, we first create a list of the main legal cases addressing the IDD in each state based on historical accounts in prior legal studies (Kahnke et al., 2008; Waldref, 2012; Wiesner, 2012; Malsberger, 2011). We then read all court rulings and identify the precedent-setting case adopting the IDD as the earliest case in which the court's decision (i) acknowledges that the IDD can be used to prevent a firm's former employee from working at a rival firm and (ii) does not justify the use of the IDD by referring to an earlier case in the same state that used the IDD.[10] To identify the precedent-setting cases rejecting the IDD in a state that had previously adopted it, we examine the legal cases that the studies above flag as reversals of courts' prior adoptions of the IDD, and confirm that (i) the IDD was indeed rejected in these cases and (ii) the case decision entails the first rejection of the IDD in the state.

Table 1 lists the 21 precedent-setting cases in which state courts adopt the IDD, and the three cases in which state courts later reject it. The earliest adoption was in New York in 1919, followed by three adoptions in the 1960s, one in the 1970s, four in the 1980s, nine in the 1990s, and three in the 2000s. Three states (Florida in 2001, Michigan in 2002, and Texas in 2003) reject the IDD after recognizing it in prior years.

A precedent-setting case becomes case law, and courts in the state will subsequently follow its ruling on the applicability of the IDD. Hence, we use the dates of these cases to construct our indicator for whether state courts recognize the IDD in any given year. For the 21 states whose courts adopted the IDD, we set the IDD indicator equal to zero in all years preceding the date of the precedent-setting case, and equal to one the year of the case and afterwards. We allow the value of the IDD indicator to revert to zero in the three cases in which a subsequent court decision reverses the state's position regarding the IDD and explicitly rejects the IDD. For the 29 states whose case law did not explicitly consider or considered but rejected the IDD, we set the IDD indicator equal to zero in every year.

4. Identification strategy

4.1. Approach and conceptual discussion

We use a difference-in-differences approach to examine how the recognition of the IDD affects the capital structure of firms in affected states. As already noted, the relevant jurisdiction for the application of the IDD is the state where the employee works. Firms often employ workers in different states, but data restrictions only allow us to identify a firm's state of headquarters. But within our concep-

[10] Some of the cases do not explicitly refer to the Inevitable Disclosure Doctrine, but as in prior legal work we interpret them as adoptions of the IDD because the rulings are based on identical principles. We also note that in some of the cases the court rulings explicitly recognized the general applicability of the IDD, but did not use it due to special circumstances (e.g., the plaintiff failed to establish the existence of a trade secret).

tual framework, only the employment location of workers who know trade secrets matters for capital structure decisions. Hence, our tests assume that workers who know trade secrets are higher-level employees who are employed for the most part at firms' headquarters (see the online Appendix for robustness tests).

Our pooled ordinary least squares (OLS) regression models use net financial leverage as the dependent variable and the indicator for if courts recognize the IDD in the firm's state of headquarters (*IDD*) as the key independent variable. In all models, we include firm fixed effects and industry-year fixed effects. We cluster standard errors by state of headquarters because IDD is a state-level variable. We report specifications with and without control variables, because some of these variables could be affected by the recognition of the IDD (i.e., be endogenous) and bias our estimates. The coefficient on IDD gauges the effect of changes in state courts' position on the IDD on a firm's leverage relative to the leverage of *rival* firms in unaffected states.

The recognition of the IDD protects a firm's trade secrets as long as its employees who know these secrets have signed employment contracts under the labor laws in the firm's state. To illustrate what our difference-in-differences estimates capture, consider the adoption of the IDD in state X, but not in state Y. A firm in state X becomes more protected from the risk of losing trade secrets to rivals both in state X and in state Y. Hence, the firm in state X faces a lower benefit of maintaining unused debt capacity to respond in case it loses trade secrets to rivals.[11] In contrast, for a firm in state Y the risk of losing trade secrets to rivals, and thus the benefit of maintaining unused debt capacity to respond to such events, is unaffected. This implies that the adoption of the IDD in state X should lead firms in state X to lever up relative to rivals in state Y, and this is what the estimated coefficient of IDD captures in the specification with firm fixed effects and industry-year fixed effects.

The crucial assumption behind the identification strategy described above is that changes in state courts' positions regarding the IDD over time provide an exogenous source of variation in the protection of firms' trade secrets in the context of our capital structure tests. Below we provide several reasons why this assumption is likely to be valid.

First, in changing their views on the applicability of the IDD, state courts do not directly aim to affect firms' capital structure choices. Instead, the judicial decisions in the precedent-setting cases involving the IDD are mainly aimed at striking a balance between employers' interests in protecting their trade secrets and public policy concerns related to employee mobility and freedom of employment (see Godfrey, 2004; Harris, 2000).

Second, we note that our natural experiment is not based on state laws whose passage could be influenced by the lobbying of affected parties with political clout in the state, such as organizations representing workers or companies. Instead, the experiment is based on judicial decisions that are typically driven only by the merits of the specific case. The reason for this is that the judges serving in state courts are deemed to be independent of both the state and federal government, and thus largely immune to political pressure.

Third, changes in courts' positions regarding the IDD are unlikely to be anticipated by corporations. In the context of state courts' decisions on legal cases related to the protection of trade secrets, a court's issuance of a new precedent is typically an idiosyncratic function of the particular case and the disposition of the justices. Also, because the loss of trade secrets can cause significant harm to a firm, courts' decisions in these cases are often rendered quickly, which further makes it difficult for firms to anticipate their outcomes.

Nevertheless, in the online Appendix Table A1, we examine whether state-level factors affect the likelihood that a state court will adopt the IDD. We consider state-level variables related to labor and trade secrets laws, labor unionization, characteristics of the workforce, local economic and political conditions, and local shocks to growth opportunities. Not surprisingly, we find that the adoption of the IDD is more likely in states with stronger enforcement of covenants not to compete, but no other variable affects the likelihood that state courts will adopt the IDD. This evidence supports the notion that the adoption of the IDD by a state court is a plausibly exogenous event.

4.2. The recognition of the IDD and the mobility of workers who know trade secrets

The key to our identification strategy is that by restricting the mobility of a firm's workers who know its trade secrets to rival firms, the recognition of the IDD in a firm's state increases the protection of its trade secrets. In this section, we show that the recognition of the IDD significantly reduces the mobility of a firm's workers who know its secrets to rival firms using data from the Census Bureau's Survey of Income and Program Participation (SIPP). The SIPP is a nationally representative sample of individuals interviewed over 8–16 consecutive periods that are in most cases four months apart. The data identifies a worker's employer, the employer's three-digit Census Industry Classification (CIC), and the Integrated Public Use Microdata Series (IPUMS) code for the worker's occupation. We exclude individuals who are less than 18 years old, those observed in less than five survey periods, and those employed in the financial or utility industries. We identify individuals who left their firms to work for rival (nonrival) firms as those who switched between employers in the same (different) three-digit CIC industry from the prior to the current survey period. Our monthly data spans the 1983–2011 period and contains 799,533 observations.

In Table 2, we use linear probability models and a difference-in-difference-in-differences approach to study whether the recognition of the IDD affects the mobility of individuals in managerial and related occupations (who have access to trade secrets) relative to that of individuals in other occupations (with less likely access to trade

[11] The firm in state X is also less likely to obtain secrets from its rivals in state X. Hence, it might also face a lower benefit of maintaining unused debt capacity to be able to exploit trade secrets obtained from rivals.

Table 2
Recognition of the IDD and labor mobility of workers with knowledge of trade secrets.
This table reports results from linear probability models that estimate the impact of the recognition of the IDD on the mobility of individuals in managerial and related occupations (with access to trade secrets) relative to that of individuals in other occupations (who are less likely to have access to trade secrets). The sample comes from the Census' Survey of Income and Program Participation and spans the period 1983–2011. The sample includes individuals who are 18 + years old who are observed at least five times during the sample period and are not employed in the financial or utility industries. Managerial and related occupations correspond to the Integrated Public Use Microdata Series occupation codes 3–37, and the set of other occupations includes all other occupation codes except for scientific and engineering occupations codes (workers in science and engineering occupations could know some technical trade secrets). The binary indicators that identify job switches take a value of one if the individual has left her employer recorded in the preceding survey period to join a new employer in the current survey period (survey periods are 4 months apart in the vast majority of cases, but the time between surveys varies between 1 and 24 months), and zero otherwise. Employers are rivals if they operate in the same three-digit Census Industry Classification industry. In Models 1 and 2, the sample size is 799,533 observations and includes workers who move to rival employers located in any state (in the same state or in another state) and those who remain with their current employers. In Models 3 and 4, the sample size is 771,300 observations and includes workers who move to rival employers located in another state and those who remain with their current employers. In Models 5 and 6, the sample size is 799,019 observations and includes workers who move to rival employers located in the same state and those who remain with their current employers. In Models 7 and 8, the sample size is 820,866 observations and includes workers who move to nonrival employers and those who remain with their current employers. The key independent variables are as follows: *IDD* is equal to one if the individual is employed in a state that recognizes the IDD, and zero otherwise; *Mgr&Rel* is equal to one if the individual is employed in a "management and related occupation," and zero otherwise. The control variables are: Log(*Income*), the natural logarithm of the individual's average monthly income recorded in the previous survey (in $); Log(*Hours*), the natural logarithm of the average number of weekly hours the individual works recorded in the previous survey; *InSchool*, an indicator equal to one if the individual attended school during the prior four months, and zero otherwise; *Strength of CNCs*, an index of the strength of the enforcement of covenants not to compete (CNCs) by courts in a state from Bird and Knopf (2015) (higher values imply stronger enforcement); *State GDP growth*, the annual GDP growth rate in the state; *Political balance*, the fraction of a state's Congress members representing their state in the US House of Representatives that belong to the Democratic Party. We also include 24 indicator variables for whether the current and the prior survey records for an individual are 1,2,...,24 months apart. Dollar values are expressed in 2009 dollars. Each model includes individual fixed effects and year-month fixed effects. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Mobility to rival firms				Mobility to nonrival firms			
	In any state		In other states		In same state		In any state	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IDD	−0.003	−0.003	−0.002*	−0.002*	−0.002	−0.001	−0.003	−0.003
	(1.06)	(1.02)	(1.71)	(1.76)	(0.61)	(0.56)	(1.17)	(1.10)
Mgr&Rel	−0.004	−0.003	0.002**	0.001**	−0.005*	−0.005*	−0.026***	−0.024***
	(1.42)	(1.29)	(2.44)	(2.40)	(1.94)	(1.80)	(5.94)	(5.57)
IDD × Mgr&Rel	−0.007**	−0.007**	−0.003***	−0.003***	−0.005*	−0.005*	−0.002	−0.002
	(2.30)	(2.28)	(2.78)	(2.76)	(1.71)	(1.69)	(0.39)	(0.35)
Log(Income)		−0.005***		0.000		−0.005***		−0.017***
		(6.46)		(0.99)		(6.76)		(14.13)
Log(Hours)		−0.004***		−0.000		−0.004***		−0.024***
		(3.96)		(0.53)		(3.92)		(14.16)
InSchool		−0.013***		−0.001***		−0.012***		−0.015***
		(5.88)		(2.91)		(5.52)		(6.19)
Strength of CNCs		−0.000		−0.000		0.000		0.001
		(0.07)		(0.34)		(0.02)		(0.34)
State GDP growth		0.011		0.008**		0.006		0.019
		(0.55)		(2.13)		(0.33)		(0.99)
Political balance		−0.007*		−0.001		−0.005		−0.007
		(1.68)		(0.86)		(1.29)		(1.38)
Year × Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	799,533	799,533	771,300	771,300	799,019	799,019	820,866	820,866
Adjusted R^2	0.241	0.241	0.067	0.067	0.239	0.239	0.191	0.193

secrets).[12] The dependent variables are binary indicators for whether an individual leaves her former employer to join a rival employer in any state (Models 1 and 2), a rival employer in another state (Models 3 and 4), a rival employer in the same state (Models 5 and 6), or a nonrival employer in any state (Models 7 and 8). The key independent variables are *IDD, Mgr&Rel* (an indicator equal to one for individuals in managerial and related occupations, and zero otherwise), and *IDD* × *Mgr&Rel*. All models include individual fixed effects, year-month fixed effects, and indicators for the number of months between the current and past survey interviews. Also, in Models 2, 4, 6, and 8, we include an individual's average monthly income and hours worked per week during the prior interview period (in logs), an indicator for whether the individual attended school during the interview period, and the following state-level control variables, *Strength of CNCs*, an index for the enforcement in a state of covenants not to compete, *State GDP growth*, the one-year growth rate of state GDP, and *Political balance*, the fraction of a state's Congress members in the US House of Representatives that belong to the Democratic Party, which captures the political leaning in the state. The standard errors are clustered by state.

The coefficient on *IDD* × *Mgr&Rel* gauges the difference-in-difference-in-differences estimate of the impact of the recognition of the IDD in a state on the mobility of indi-

[12] We exclude workers in engineering and scientific occupations from the set of other occupations because these employees could know some technical trade secrets.

viduals in managerial and related occupations relative to its impact on the mobility to rival firms of individuals in other occupations. Our key tests, reported in Models 1 and 2, study how the recognition of the IDD affects the mobility of workers to industry rivals in any state. The coefficients on *IDD* × *Mgr&Rel* are negative and statistically significant. Hence, the recognition of the IDD reduces the mobility to rival firms of individuals in managerial and related occupations relative to that of individuals in other occupations. The coefficient on *IDD* is insignificant, indicating that the recognition of the IDD does not affect the mobility to rival firms of individuals in other occupations who are less likely to know trade secrets. The coefficients on *IDD* and *IDD* × *Mgr&Rel* imply that after the recognition of the IDD in a state, the probability that individuals employed in managerial and related occupations will become employed at a rival firm decreases by 0.7 percentage points. Relative to the 2.8% of workers in managerial and related occupations in our sample that are employed in states that have not adopted the IDD and move to rival firms between survey interviews, this represents a 25% decrease in the mobility of workers who are likely to know trade secrets.

The recognition of the IDD in a state should reduce the mobility of workers in that state who know trade secrets to rival firms in any state. Nevertheless, we separately study how the recognition of the IDD affects the mobility of workers to rival firms in other states (Models 3 and 4) and to rivals in the same state (Models 5 and 6). The coefficient estimates for *IDD* × *Mgr&Rel* indicate that the recognition of the IDD reduces the mobility of workers in managerial and related occupations relative to that for workers in other occupations both to rivals in other states and to rivals in the same state. Hence, the IDD has a far reaching effect on the mobility of workers who know trade secrets.

In Models 7 and 8, we conduct a falsification test, i.e., we examine if the recognition of the IDD reduces the mobility to nonrival firms of individuals in managerial and related occupations. By design, the recognition of the IDD cannot restrict the mobility of workers who know trade secrets to nonrival firms. We find that the recognition of the IDD does not reduce the mobility to nonrival firms of individuals in managerial and related occupations relative to that of individuals in other occupations. Thus, the effect of the recognition of the IDD on the mobility of workers who know trade secrets to rival firms that we show in Models 1–6 is not driven by general trends in labor mobility. Overall, Table 2 results provide further support for our identification strategy and also highlight the mechanism through which the recognition of the IDD increases the protection of a firm's trade secrets.

5. Recognition of the IDD and capital structure

5.1. Data and sample selection

Our sample consists of all firms in the merged CRSP/Compustat database (excluding utilities and financials) headquartered in the US for which we can construct the variables used in our main capital structure tests. The sample period is 1977–2011, and it starts five years before Pennsylvania adopts the IDD in 1982 and ends five years after Kansas adopts the IDD in 2006. Over this period, courts in 16 states adopt the IDD and courts in three states reject the IDD they had previously adopted. Our sample period excludes the events associated with the adoption of the IDD by a few states in earlier years because the coverage of these years in Compustat is sparser, and earlier recognition events thus do not affect many firms and have little power for identification. The final sample has 125,895 firm-year observations. Our data looks similar to that used in prior capital structure research. The online Appendix Table A2 reports summary statistics for the variables used in our main tests.

5.2. Main results

Table 3 reports the difference-in-differences estimates of the impact of the recognition of the IDD by state courts on the capital structures of firms in affected states. The estimates reflect the adoption of the IDD in 16 states and the subsequent rejection of the IDD in three states, but for simplicity we interpret them as the impact of the "recognition" of the IDD on capital structure. Models 1 and 2 (3 and 4) report the results for net book leverage (net market leverage). Focusing on debt net of cash holdings accounts for the financial flexibility from cash holdings. In Models 1 and 3 we include the *IDD* indicator as well as firm and three-digit SIC times year fixed effects.[13] In Models 2 and 4 we add standard control variables in capital structure tests (natural logarithm of book assets, market-to-book assets, return on assets, proportion of assets that are fixed, cash flow volatility, and an indicator for if a firm pays common dividends), as well as *Strength of CNCs*, *State GDP growth*, and *Political balance*.

The recognition of the IDD has a positive and statistically significant impact on the net leverage of firms in an affected state. The results in Models 2 and 4 provide strong support for the key implication of the strategic view of capital structure choices underlying our main hypothesis, namely, that an increase in the legal protection of a firm's trade secrets should lead the firm to lever up relative to its industry rivals whose protection remains unchanged. The estimated coefficients imply that after the recognition of the IDD, affected firms increase their ratio of total debt (net of cash holdings) per dollar of book (market) assets by 1.3 (1.2) cents relative to that of their industry rivals in nonaffected states. This represents a 19.1% (14.6%) increase relative to the sample mean for net book (market) leverage of 0.068 (0.082).[14] These magnitudes are economically significant and comparable to the 23% decrease in net book

[13] All results in the paper are similar if we use year fixed effects instead of industry-year fixed effects. The online Appendix Table A3 reports results analogous to those in Table 3, but using year fixed effects.

[14] The recognition of the IDD does not affect a firm's cash holdings, so our net leverage results are driven by changes in debt financing. An explanation for this is that due to agency problems, uncertainty about future cash flows, or costly external financing, cash is not negative debt (Jensen, 1986; Acharya, Almeida, and Campello, 2007; Gamba and Triantis, 2008). Frésard (2010) discusses this issue in the context of product market competition and argues that it is likely that cash and debt play distinct roles in influencing competitive outcomes.

Table 3
Recognition of the IDD and capital structure.
This table reports results from OLS regressions of financial leverage on the indicator for the recognition of the IDD. The sample spans the 1977–2011 period and includes 125,895 observations. The dependent variables are *Net book leverage* (Models 1 and 2), *Net market leverage* (Models 3 and 4), *Book leverage* (Models 5 and 6), and *Market leverage* (Models 7 and 8). *Net book leverage* is the book value of long-term debt (*dltt*) plus debt in current liabilities (*dlc*) minus cash holdings (*che*) divided by book value of assets (*at*). *Net market leverage* is the book value of long-term debt (*dltt*) plus debt in current liabilities (*dlc*) minus cash holdings (*che*) divided by market value of assets (*prcc_f*csho + at - ceq*). *Book leverage* and *Market leverage* are analogously defined, except that cash holdings are not subtracted in the numerator. *IDD* is an indicator variable equal to one if the firm is headquartered in a state whose courts recognize the IDD, and zero otherwise. Log *book assets* is the natural logarithm of total assets (*at*). *Market-to-book assets* is the market value of assets (*prcc_f*csho + at - ceq*) divided by the book value of assets (*at*). *Return on assets* is operating income before depreciation (*oibdp*) divided by the book value of assets (*at*). *Fixed assets* is the book value of property, plant, and equipment (*ppent*) divided by the book value of assets (*at*). *Cash flow volatility* is the standard deviation of a firm's *Return on assets* over the previous five years (firms are required to have at least three years of data during the prior five years to enter the sample). *Dividend payer* is an indicator variable equal to one if a firm pays common dividends (*dvc*), and zero otherwise. *Strength of CNCs*, *State GDP growth*, and *Political balance* are defined in Table 2. Dollar values are expressed in 2009 dollars. Industry fixed effects are defined at the three-digit SIC level. Continuous variables, except state-level variables, are winsorized at their 1st and 99th percentiles. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Net book leverage		Net market leverage		Book leverage		Market leverage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IDD	0.011**	0.013**	0.010***	0.012***	0.011***	0.012***	0.007**	0.010***
	(2.38)	(2.54)	(2.73)	(3.09)	(3.07)	(3.17)	(2.34)	(3.02)
Log book assets		0.039***		0.047***		0.031***		0.036***
		(8.87)		(10.84)		(9.03)		(10.48)
Market-to-book assets		−0.012***		0.009***		−0.003***		−0.017***
		(−13.95)		(2.77)		(−3.92)		(−7.93)
Return on assets		−0.181***		−0.099***		−0.160***		−0.126***
		(−16.13)		(−6.25)		(−14.23)		(−8.04)
Fixed assets		0.672***		0.432***		0.236***		0.176***
		(16.43)		(26.78)		(15.79)		(15.02)
Cash flow volatility		0.001		0.003		0.057***		0.013
		(0.04)		(0.26)		(4.83)		(1.59)
Dividend payer		−0.057***		−0.049***		−0.047***		−0.043***
		(−13.04)		(−12.68)		(−12.39)		(−13.94)
Strength of CNCs		0.002		0.002		0.001		0.001
		(0.70)		(0.74)		(0.25)		(0.37)
State GDP growth		−0.021		−0.089**		0.006		−0.086***
		(−0.49)		(−2.55)		(0.24)		(−3.33)
Political balance		−0.012		−0.017*		−0.007		−0.012**
		(−0.88)		(−1.87)		(−0.80)		(−2.11)
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	125,895	125,895	125,895	125,895	125,895	125,895	125,895	125,895
Adjusted R^2	0.701	0.739	0.674	0.707	0.625	0.650	0.665	0.708

leverage following the adoption of the good faith exception to the employment at will doctrine shown by Serfling (2016).

Models 5–8 use the standard measures of book and market leverage (cash holdings are not subtracted from total debt).[15] The estimates in Models 6 and 8 imply that the recognition of the IDD leads to a 5.2% (5.6%) increase in the book (market) leverage ratios of firms in recognizing states relative to their sample means. The magnitudes of these effects are comparable to those reported in prior work on how shocks affect firms' debt ratios. For example, Xu (2012) finds that a two percentage-point increase in an industry's import penetration ratio (a 10% increase over its mean) leads to a 8–9% decrease in firms' leverage; Li et al. (2016) show that the passage of antirecharacterization laws (which increase the value of collateral) leads firms to increase their leverage by 13%, and Heider and Ljungqvist (2015) show that after a rise in state corporate tax rates, firms increase their leverage by almost 6%. Last, Serfling (2016) (discussed above) reports decreases in leverage of 3.6%–6.1% following the shock he considers.

We also separately studied the impact of adoptions and rejections of the IDD on leverage and report the results in the online Appendix Table A5. We find strong and statistically robust evidence that firms raise their leverage when state courts adopt the IDD. As expected, the estimated impact of rejections of the IDD (which reduce the protection of trade secrets) on firms' leverage is negative in most specifications, but it is statistically insignificant (these tests arguably have less statistical power given that there are only three rejection events). Hence, our results are largely driven by the 16 adoptions of the IDD over our sample period.

5.3. Timing of changes in capital structure surrounding adoptions of the IDD

In Table 4, we study the timing of changes in capital structure relative to the timing of adoptions of the IDD. If reverse causality drives our results, we should observe an increasing trend in the leverage of firms in affected states

[15] Table A4 further shows that our results are robust to measuring financial leverage, using only the portion of firms' total debt that is long term at issuance.

Table 4
The timing of changes in firms' capital structures around adoptions of the IDD.
This table reports results from OLS regressions of *Net book leverage* and *Net market leverage* on indicators for the timing of state courts' adoptions of the IDD. The sample spans the 1977–2011 period and includes 125,895 observations. *IDD Adoption*$^{-3}$, *IDD Adoption*$^{-2}$, *IDD Adoption*$^{-1}$, *IDD Adoption*^{0}, *IDD Adoption*$^{+1}$, *IDD Adoption*$^{+2}$, and *IDD Adoption*$^{3+}$ are equal to one if the firm is headquartered in a state that will adopt the IDD in three years, adopts the IDD in two years, adopts the IDD in one year, adopts the IDD in the current year, adopted the IDD one year ago, adopted the IDD two years ago, or adopted the IDD three or more years ago, respectively, and zero otherwise. *IDD Rejection* is an indicator variable set to one beginning the year when the state where the firm is headquartered rejects the previously adopted IDD, and zero otherwise. Control variables are defined in Tables 2 and 3 and include *Log book assets, Market-to-book assets, Return on assets, Fixed assets, Cash flow volatility, Dividend payer, Strength of CNCs, State GDP growth*, and *Political balance*. Industry fixed effects are defined at the three-digit SIC level. Continuous variables, except state-level variables, are winsorized at their 1st and 99th percentiles. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)
IDD Adoption^{-3}	−0.008	−0.005	−0.006	−0.004
	(−1.37)	(−0.85)	(−1.34)	(−0.97)
IDD Adoption^{-2}	0.000	0.004	−0.002	0.000
	(0.00)	(0.76)	(−0.42)	(0.06)
IDD Adoption^{-1}	0.004	0.008	−0.000	0.002
	(0.52)	(1.12)	(−0.00)	(0.38)
IDD Adoption ^{0}	0.006	0.009	0.004	0.006
	(0.88)	(1.32)	(0.68)	(1.01)
IDD Adoption^{+1}	0.018***	0.019***	0.012**	0.013**
	(2.74)	(2.76)	(2.14)	(2.33)
IDD Adoption^{+2}	0.019**	0.020**	0.016***	0.016***
	(2.36)	(2.48)	(2.94)	(2.99)
IDD Adoption $^{3+}$	0.020*	0.020**	0.014*	0.015**
	(1.95)	(2.00)	(1.92)	(2.10)
IDD Rejection	0.005	−0.003	−0.002	−0.008
	(0.58)	(−0.31)	(−0.22)	(−1.06)
Control variables	No	Yes	No	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	125,895	125,895	125,895	125,895
Adjusted R^2	0.702	0.739	0.674	0.707

prior to the adoption of the IDD. Such evidence would cast doubt on the validity of our empirical approach, as it would imply a violation of the parallel trends assumption that the trends in the leverage of treatment firms in adopting states and control firms in nonadopting states are parallel prior to the adoption of the IDD.

The key variables of interest are *IDD Adoption*$^{-3}$, *IDD Adoption*$^{-2}$, *IDD Adoption*$^{-1}$, *IDD Adoption*^{0}, *IDD Adoption*$^{+1}$, *IDD Adoption*$^{+2}$, and *IDD Adoption*$^{3+}$, which are equal to one if the firm is headquartered in a state that will adopt the IDD in three years, will adopt the IDD in two years, will adopt the IDD in one year, adopts the IDD in the current year, adopted the IDD one year ago, adopted the IDD two years ago, or adopted the IDD three or more years ago, respectively, and zero otherwise. We also control for whether the state where a firm is headquartered has rejected the previously adopted IDD by year *t*.

We find that the coefficients on *IDD Adoption*$^{-3}$, *IDD Adoption*$^{-2}$, *IDD Adoption*$^{-1}$, and *IDD Adoption*^{0} are close to zero and statistically insignificant, while the coefficients on *IDD Adoption*$^{+1}$, *IDD Adoption*$^{+2,}$ and *IDD Adoption*$^{3+}$ are positive and significant. In the online Appendix Table A6, we further show that a similar pattern emerges if we extend the window to plus or minus four years around the event. Overall, these results show that firms in adopting states increase their financial leverage relative to that of the control firms only after the adoption of the IDD, but not before. Hence, reverse causality or a violation of the parallel trends assumption do not explain our key result that an increase in the legal protection of a firm's trade secrets leads the firm to increase its financial leverage.

5.4. Cross-sectional variation in the impact of the recognition of the IDD on capital structure

We now augment our main specification and interact *IDD* with variables that affect the strategic value of unused debt capacity. In addition to regressions with firm and industry-year fixed effects, we use a specification with state-year fixed effects instead of industry-year fixed effects. This latter specification ensures that changes in unobservable state-level factors correlated with changes in state courts' positions on the IDD and financing decisions do not spuriously drive our results. These tests of the cross-sectional predictions developed in Section 2 shed further light on the economic mechanism behind our results and underscore the strategic role of financial leverage when firms face competitive threats due to the potential loss of their trade secrets to rivals. The tests also provide further evidence that our main results are causal, i.e., if a variable omitted from our main regression model were to drive the results in Table 3, then such a variable would also have to explain the cross-sectional results we report here.

Table 5
Cross-sectional variation in the effect of the IDD.
This table reports results from OLS regressions of *Net book leverage* and *Net market leverage* on the indicator for the recognition of the IDD. The sample spans the 1977–2011 period in all models except Models 1–4 of Panel B, for which the sample spans the 1985–2011 period. *IDD* is an indicator variable equal to one if the firm is headquartered in a state whose courts recognize the IDD, and zero otherwise. Panel A examines the cross-sectional effect of the ex-ante risk of losing trade secrets to rivals and includes 122,944 observations in Models 1–4 and 120,949 observations in Models 5–8. *% Workers in managerial occupations* is the fraction of workers employed in a "management and related occupation" (as defined by the IPUMS occupation codes 3–37) in the firm's three-digit NAICS industry and state. *Average distance to rivals* is the sales-based weighted average of the number of miles between a firm's headquarters and each of its rivals' headquarters, where rivals are defined by three-digit SIC codes. To compute the distance between the firm and each of its three-digit SIC industry rivals, we first use Compustat to extract each firm's zip code from its headquarters location to identify its longitude and latitude, and then use the "geodist" command in SAS. Panel B examines the effect of the financial strength of rivals and asset specificity and includes 73,417 observations in Models 1–4 and 124,641 observations in Models 5–8. In Models 1–4, the sample includes only unrated firms (firms without a long-term S&P credit rating) and spans the years 1985–2011 (credit rating coverage is incomplete prior to 1985). Credit ratings are assigned a numerical value from 1 to 10, with higher values indicating a stronger credit rating (AAA = 10, AA- to AA+ = 9, A- to A+ = 8, BBB- to BBB+ = 7, BB- to BB+ = 6, B- to B+ = 5, CCC- to CCC+ = 4, CC- to CC+ = 3, C- to C+ = 2, and D or SD = 1). *Asset specificity ind.* is the median ratio of machinery and equipment to total assets in a three-digit SIC industry across all years in our sample. *High asset specificity ind.* is an indicator variable equal to one if *Asset specificity ind.* is above the sample median, and zero otherwise. Panel C examines the effect of industry barriers to entry and within-industry product differentiation and includes 125,895 observations in Models 1–4 and 123,688 observations in Models 5–8. *R&D and advertising ind.* is the median ratio of capitalized R&D and advertising expenses to total assets for all companies in a firm's three-digit SIC industry. *High R&D and advertising ind.* is an indicator variable equal to one if *R&D and advertising ind.* is above the sample median, and zero otherwise. *Relative R&D and advertising* is a firm's ratio of capitalized R&D and advertising expenses to total assets minus the median of this ratio across all of its rival companies in its three-digit SIC industry. *% Workers in managerial occupations, Average distance to rivals, Average rating of rivals*, and *Relative R&D and advertising* are demeaned to ease the interpretation of coefficient estimates on the interaction term. Industry fixed effects are defined at the three-digit SIC level. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: the effect of the ex-ante risk of losing trade secrets to rivals

	Net book leverage		Net market leverage		Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IDD	0.012**		0.011***		0.009**		0.009***	
	(2.53)		(2.82)		(1.96)		(2.61)	
IDD × % Workers in managerial occupations	0.221**	0.162*	0.173***	0.100				
	(2.51)	(1.68)	(2.88)	(1.33)				
% Workers in managerial occupations	0.067	−0.169***	0.045	−0.080				
	(0.56)	(−2.61)	(0.53)	(−1.56)				
IDD × Average distance to rivals					−0.015	−0.027***	−0.008	−0.016**
					(−1.63)	(−3.41)	(−1.18)	(−2.43)
Average distance to rivals					0.006	0.009	0.005	0.003
					(0.79)	(1.24)	(0.99)	(0.46)
Industry × Year fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
State × Year fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	122,944	122,944	122,944	122,944	120,949	120,949	120,949	120,949
Adjusted R^2	0.701	0.693	0.673	0.658	0.702	0.695	0.671	0.657

Panel B: the effect of the financial strength of rivals and asset specificity

	Net book leverage		Net market leverage		Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IDD	0.009		0.011**		0.001		0.005	
	(1.50)		(2.13)		(0.13)		(0.81)	
IDD × Average rating of rivals	0.011***	0.009**	0.005*	0.004				
	(2.61)	(2.02)	(1.66)	(1.06)				
Average rating of rivals		−0.001		0.000				
		(−0.22)		(0.13)				
IDD × High asset specificity ind.					0.021**	0.021***	0.012*	0.012***
					(2.36)	(2.65)	(1.95)	(2.67)
High asset specificity ind.						−0.008		0.002
						(−0.88)		(0.32)
Industry × Year fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
State × Year fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	73,417	73,417	73,417	73,417	124,641	124,641	124,641	124,641
Adjusted R^2	0.699	0.694	0.667	0.658	0.702	0.694	0.674	0.659

(*continued on next page*)

Table 5
(*Continued*)

Panel C: the effect of industry barriers to entry and within-industry product differentiation

	Net book leverage		Net market leverage		Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IDD	0.021***		0.016***		0.011**		0.010***	
	(2.99)		(2.72)		(2.23)		(2.62)	
IDD × High R&D and advertising ind.	−0.019**	−0.017*	−0.011*	−0.011				
	(−2.50)	(−1.65)	(−1.70)	(−1.36)				
High R&D and advertising ind.		0.004		−0.001				
		(0.69)		(−0.13)				
IDD × Relative R&D and advertising					−0.025**	−0.028***	−0.019***	−0.019***
					(−2.54)	(−2.64)	(−3.24)	(−2.81)
Relative R&D and advertising					0.085***	0.079***	0.025***	0.023***
					(12.03)	(9.42)	(5.88)	(3.96)
Industry × Year fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
State × Year fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	125,895	125,895	125,895	125,895	123,688	123,688	123,688	123,688
Adjusted R^2	0.700	0.691	0.672	0.657	0.703	0.695	0.673	0.659

In Panel A of Table 5, we show that the recognition of the IDD leads to a larger increase in the debt ratios of firms with a greater ex-ante risk of losing employees who know their trade secrets to rivals. This risk is greater when a larger fraction of the firm's employees know its trade secrets and when the firm faces geographically close rivals who could more easily poach its workers. Our first proxy for this risk is the fraction of workers in the firm's state and industry that are employed in "managerial & related occupations," which entail access to the firm's trade secrets (*% Workers in managerial occupations).*[16] The second proxy is the weighted-average distance between the firm's headquarters and each of its industry rivals' headquarters (*Average distance to rivals*), with weights based on each rival's sales. We demean both measures before forming the interactions. In five of the eight models in this panel, we find that the recognition of the IDD leads to a significantly greater increase in net financial leverage for firms that face a higher ex-ante risk of losing employees who know trade secrets to rival firms.

In Panel B of Table 5, we provide empirical support for our cross-sectional predictions regarding a firm's financial strength relative to its rivals and the specificity of the assets in its industry. In Models 1–4, we follow Valta (2012) and use credit ratings to identify if financially weak firms face financially strong rivals. Specifically, we focus on the subsample of unrated firms (with no access to public debt markets) and interact *IDD* with the average credit rating of the firm's rated rivals in the same three-digit SIC industry (*Average rating of rivals).* In three of the four models, we find that the recognition of the IDD has a significantly larger effect on financial leverage when a financially weaker firm faces financially stronger rivals. In Models 5–8, we interact *IDD* with an indicator equal to one if a firm's three-digit SIC industry has asset specificity above the sample median, and zero otherwise (*High asset specificity ind.*). As in Acharya et al. (2007) and Valta (2012), we measure asset specificity using the industry median ratio of machinery and equipment to book assets. Supporting our prediction, in all four models we find that the recognition of the IDD leads to a significantly larger increase in financial leverage in industries with higher asset specificity.

In Panel C of Table 5, we show empirical support for our predictions relating to industry barriers to entry and within-industry product differentiation. In Models 1–4, we measure industry barriers to entry using the three-digit SIC industry-median values of capitalized R&D plus advertising expenditures divided by assets as in Valta (2012).[17] This is motivated by Shaked and Sutton (1987) and Sutton (1991) who argue that firms use R&D and advertising to differentiate their products and to make the entry of new competitors into their product markets more difficult, and by Hoberg and Phillips (2016) who further show that firms spending more on R&D and advertising face less competition. We interact *IDD* with an indicator equal to one for firms in industries with capitalized R&D plus advertising expenditures above the sample median, and zero otherwise (*High R&D and advertising ind.).* In three of the four models, we find that the recognition of the IDD has a significantly smaller impact on the net debt ratios of firms in industries with high barriers to entry.

Last, in Models 5–8 of Panel C we interact *IDD* with *Relative R&D and advertising*, defined as the ratio of a firm's capitalized R&D and advertising expenditures to assets minus the median value of this ratio across all firms in the firm's three-digit SIC industry (excluding the firm itself). This is motivated by the research discussed above, which also suggests that firms that have invested more in differentiating their products from their rivals have a stronger competitive position within their industry. For all

[16] The data come from the IPUMS-USA database available for the census years 1980, 1990, and 2000. We use the data from the 1980, 1990, and 2000 censuses for the periods 1977–1985, 1986–1995, and 1996–2011, respectively.

[17] We calculate the capitalized value of R&D as in Peters and Taylor (2017), and we compute the capitalized value of advertising using an analogous approach assuming zero initial value and a depreciation rate of 20%.

four models, we find that the recognition of the IDD has a significantly smaller impact on the net debt ratios of firms with more differentiated products.

5.5. Are there alternative explanations for the study's results?

5.5.1. The profitability and tax benefits of debt channel

The evidence so far supports our hypothesis that the recognition of the IDD leads a firm to increase its leverage because it decreases the firm's ex-ante risk of losing trade secrets to rivals, thereby reducing the competitive risk faced by the firm and the strategic benefit of maintaining unused debt capacity. However, an additional mechanism through which the recognition of the IDD might lead a firm to lever up that follows from static-tradeoff models of capital structure is by increasing the firm's expected future profitability, and thus the tax benefits of debt financing. Also, as discussed earlier, in dynamic models of capital structure (e.g., DeAngelo et al., 2011) higher expected future profitability can make a firm conserve debt capacity to ensure that it can finance good investment projects that could arise. Thus, under this scenario, higher expected future profitability subsequent to the recognition of the IDD could bias us against finding that firms increase their leverage subsequent to this recognition. We conduct several tests to assess whether higher expected profitability subsequent to the recognition of the IDD could confound our inferences.

In Panel A of Table 6, we augment our baseline specification regressing net leverage on the IDD indicator to control for future profitability. Specifically, we include not only the current value, but also one- and two-year leads of the profitability measure, and conduct separate analyses using two alternative profitability variables: *Profit margin* (the sum of pretax income, interest expense, and depreciation and amortization divided by sales) and *Return on assets* (operating income before depreciation scaled by assets). All regressions include firm and industry-year fixed effects. We find that the estimated impact of the IDD indicator on both net book and net market leverage remains unaffected after controlling for future profitability. These findings mitigate some of the concern that the estimated effect of the recognition of the IDD on financial leverage might somehow be confounded by firms anticipating increases in future profitability after their state courts recognize the IDD.

Second, we examine if the recognition of the IDD affects a firm's future profitability. Here, we measure the dependent variable using both *Profit margin* and *Return on assets*. In the models with control variables, the controls include Log *book assets, Fixed assets, Cash flow volatility, Strength of CNCs, State GDP growth*, and *Political balance*. All regressions include firm and industry-year fixed effects. The results reported in the online Appendix Table A7 show that the coefficient on the IDD indicator is not statistically significant in any of the specifications. Hence, the recognition of the IDD does not seem to have a material impact on a firm's expected future profitability relative to that of its rivals in nonaffected states.

Third, if the recognition of the IDD leads firms to lever up because it increases expected future profitability and the tax benefits of debt financing, then this effect should be larger for firms with higher marginal tax rates and less nondebt tax shields. In the online Appendix Table A8, we augment our baseline specification regressing net leverage on the IDD indicator to include interactions between this indicator and the firm's marginal tax rate (measured as in Blouin et al., 2010), or proxies for the existence of nondebt tax shields (depreciation/assets, tax loss carryforwards/assets, and investment tax credits/assets). We estimate models without control variables, but the inclusion of control variables does not affect our results. The coefficients on all interaction variables are statistically insignificant.

5.5.2. The reduction in uncertainty not related to competitive threats

It could be that the recognition of the IDD leads to a reduction in general uncertainty for a firm that is unrelated to product market threats, and this explains our findings on the impact of this recognition on firms' capital structures. Below we investigate this possibility.

First, we note that our main results (reported in Table 3) show that firms lever up after the recognition of the IDD controlling for historical cash flow volatility, which prior work uses to account for general uncertainty that affects leverage choices (e.g., Lemmon et al., 2008). In Panel B of Table 6, we augment this specification to control not only for the current but also the future values of cash flow volatility up to two years ahead, but this does not affect our results. A concern with this test is that the cash flow volatility measure, which is computed using the prior five years of data and thus exhibits limited year-to-year variation, might not capture discrete changes in risk around the year of IDD rulings accurately. Hence, in Models 2 and 4 of Panel B of Table 6, we replace this variable by its analogous counterpart based on unlevered stock return volatility, which is computed annually using daily stock returns, and thus is better suited to capture time-series variation in cash flow risk. We find that controlling for current and future unlevered stock return volatility also does not affect the estimated effect of the IDD indicator on leverage.

Second, we directly examine whether the recognition of the IDD affects firms' unlevered stock return volatility using an approach similar to that in our profitability tests. The results reported in the online Appendix Table A9 show that, regardless of whether we include control variables, the recognition of the IDD does not affect a firm's unlevered stock return volatility.

The two sets of results reported above do not support the notion that, following the recognition of the IDD in a firm's state, a reduction in general uncertainty that is unrelated to product market threats can explain our main capital structure findings. Further, these results show that standard measures of uncertainty do not capture changes in a firm's ex-ante competitive threats due to legal rulings that affect the protection of its trade secrets. Prior work also highlights that measured cash flow risk and other firm risk proxies do not capture competitive threats. For example, Hoberg et al. (2014) show that product fluidity affects financial policies after controlling for cash flow risk. They explain that a firm facing large competitive threats could

Table 6
Recognition of the IDD and leverage: controlling for profitability and general uncertainty.
This table reports results from OLS regressions of *Net book leverage* and *Net market leverage* on the indicator for the recognition of the IDD. The sample spans the 1977–2011 period and includes 108,752 to 110,212 observations depending on the availability of control variables. *IDD* is an indicator variable equal to one if the firm is headquartered in a state whose courts recognize the IDD, and zero otherwise. In Panel A, the set of control variables used in the benchmark regression in Table 3 is expanded to include, in addition to current profitability, the one-year ahead, and two-years ahead values of profitability measured alternatively as *Profit margin* (the sum of pretax income, interest expense, and depreciation and amortization ($pi + xint + dp$), all divided by sales (*sale*)), or *Return on assets* (defined in Table 3). In Panel B, the set of control variables used in the benchmark regression in Table 3 is expanded to include, in addition to the current value for general uncertainty, the one-year, and two-years ahead values measured alternatively as *Cash flow volatility* (defined in Table 3) or *Unlevered return volatility* (the annualized standard deviation of a firm's daily stock returns over a fiscal year (we require the firm to have at least 180 observations during the fiscal year) multiplied by the ratio of the firm's market value of equity to its market value of assets ($(csho^*prcc\_f)/(at\text{-}ceq + csho^*prcc\_f)$)). All other control variables (*Log book assets, Market-to-book assets, Fixed assets, Cash flow volatility, Dividend payer, Strength of CNCs, State GDP growth*, and *Political balance*) are defined in Tables 2 and 3. Industry fixed effects are defined at the three-digit SIC level. Continuous variables, except state-level variables, are winsorized at their 1st and 99th percentiles. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: controlling for future profitability

	Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)
IDD	0.013**	0.013**	0.012***	0.012***
	(2.50)	(2.37)	(2.86)	(2.82)
Profit margin$_t$	0.003***		0.001	
	(3.29)		(1.21)	
Profit margin$_{t+1}$	0.006***		0.003***	
	(4.35)		(4.87)	
Profit margin$_{t+2}$	0.005***		0.002***	
	(5.01)		(4.51)	
Return on assets$_t$		−0.212***		−0.118***
		(−14.43)		(−6.55)
Return on assets$_{t+1}$		0.076***		0.045***
		(10.43)		(12.99)
Return on assets$_{t+2}$		0.054***		0.035***
		(8.25)		(6.06)
All other control variables	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	108,752	109,217	108,752	109,217
Adjusted R^2	0.741	0.744	0.707	0.709

Panel B: controlling for general uncertainty

	Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)
IDD	0.014**	0.010**	0.013***	0.010**
	(2.46)	(1.98)	(2.94)	(2.43)
Cash flow volatility$_t$	−0.013		0.006	
	(−0.89)		(0.87)	
Cash flow volatility$_{t+1}$	0.005		−0.002	
	(0.36)		(−0.17)	
Cash flow volatility$_{t+2}$	0.003		−0.003	
	(0.13)		(−0.13)	
Unlevered return volatility$_t$		−0.268***		−0.244***
		(−18.59)		(−11.50)
Unlevered return volatility$_{t+1}$		−0.037***		−0.032***
		(−5.41)		(−5.58)
Unlevered return volatility$_{t+2}$		−0.047***		−0.023***
		(−5.90)		(−6.25)
All other control variables	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	110,212	101,013	110,212	101,013
Adjusted R^2	0.741	0.770	0.707	0.738

take steps to maintain ex-post stable cash flows, and thus for such a firm measured cash flow risk could be low, even if the firm faces significant ex-ante competitive threats. Similarly, Valta (2012) finds that the competitive threats a firm faces are priced into its cost of debt after controlling for its ex-ante cash flow volatility and accounting- and market-based measures of its default risk. He highlights that traditional proxies for default risk do not capture banks' assessment of firms' competitive risk exposure.

5.5.3. Recognition of the IDD and investment in the development of trade secrets

The recognition of the IDD increases a firm's ability to appropriate the economic rents generated by its trade secrets, and it could increase the marginal benefit of investment in the creation of trade secrets. In consequence, the recognition of the IDD might increase the firm's demand for external financing that is needed to fund these expenditures.[18] This raises the question of whether the observed increase in financial leverage following the recognition of the IDD could be driven by increased financing needs rather than a decrease in the strategic benefit of maintaining unused debt capacity as implied by our main hypothesis. Below we discuss the results of several tests that suggest this is unlikely to be the case.

In the online Appendix Table A10, we explore whether the recognition of the IDD affects spending in activities that are potentially associated with the creation of trade secrets. To this end, we use our difference-in-differences specification with firm and industry-year fixed effects, and consider models with and without the controls from our main capital structure model. We first examine the impact of IDD rulings on a firm's R&D spending (scaled by sales), the expense most commonly associated with the development of new ideas, and find no effect. Because the development of new ideas could also lead to higher capital expenditures, we consider the impact of IDD rulings on the sum of R&D and capital expenditures and find no effect. The development of new ideas might also lead to more advertising, so we examine the impact of IDD rulings on the sum of R&D, capital, and advertising expenditures, and again find no effect. Finally, in the online Appendix Table A11, we augment our baseline capital structure specification to further include the above proxies for a firm's spending in activities associated with the creation of trade secrets. However, the estimated effect of the recognition of the IDD on net leverage is unaffected by the inclusion of these additional control variables.

5.5.4. Discussion

Given the limitations of our tests reported in Sections 5.5.1–5.5.3, the evidence seems insufficient to entirely rule out the possibility that the recognition of the IDD in a firm's state might also have some impact on the firm's capital structure by affecting its future profitability, reducing the general uncertainty it faces, or increasing its incentives to invest in the development of trade secrets. However, the evidence suggests that these non-strategic mechanisms are unlikely to be the main driver of the increase in leverage we observe after the recognition of the IDD. Further, unlike the strategic view behind our hypothesis, these non-strategic mechanisms cannot easily explain our evidence in Section 5.4, which indicates that the effect of the recognition of the IDD on capital structure depends on the relative financial strength of the firms in an industry, asset specificity in an industry, barriers to entry, and product differentiation.

Overall, the results are consistent with the notion that firms optimally adjust their debt ratios after the recognition of the IDD in their state in a manner that is consistent with a transition between two product market equilibria, as implied by the study's hypothesis. Specifically, firms transition from an equilibrium with weak legal protection of their trade secrets and low leverage (high value of financial flexibility) to another one with stronger legal protection of their trade secrets and higher leverage (lower value of financial flexibility).[19]

5.6. Impact of firm-level measures of the risk of losing trade secrets on capital structure

Our prior capital structure tests rely on the recognition of the IDD to gauge changes in the risk that a firm will lose trade secrets to its rivals. We also conduct tests that instead rely on two firm-level indicators for whether a firm faces a significant risk of losing trade secrets to its competitors, as reported by the firm itself in its 10-K filings. A shortcoming of these tests is that they are based on a shorter sample period for which 10-K filings are available in EDGAR (1993–2011), and they lack a clear identification strategy.

The first indicator considers if a firm reports a risk of losing trade secrets to rival firms in its 10-K filing (*Trade secret risk*). It is constructed similar to the approach in Hoberg and Maksimovic (2015). The second indicator considers if a firm reports a risk of losing "key employees" in its 10-K filing (*Key employee risk*) and is constructed in a way similar to the approach in Eisfeldt and Papanikolaou (2013). They argue that if a firm reports such a risk, then it faces a greater risk that its rivals could try to gain competitive advantages over it by hiring some of its key employees who have inside knowledge of its corporate practices.

Table 7 reports the results of regressions of net leverage on *Trade secret risk* and *Key employee risk*, with the same firm-level control variables as in our prior tests. We also include state and industry-year fixed effects. Because there is limited within-firm time-series variation in these indicators, we do not control for firm fixed effects. We find a negative association between *Trade secret risk* or *Key employee risk* and net leverage. Firms that report a risk of

[18] We note, however, that survey evidence shows that most trade secrets lost to rivals are not technical in nature (e.g., customer lists, strategic plans, or financial data), and it is unclear if the development of such secrets requires significant expenditures. Further, Png (2017) argues and shows that better trade secret protection can increase or decrease a firm's R&D spending, because it can also reduce R&D spillovers from other firms, which often act as a complement to a firm's own R&D spending.

[19] We thank the referee for pointing out this interpretation of the results.

Table 7
Firm-level measures of self-reported risk of losing trade secrets and financial leverage.
This table reports results from OLS regressions of *Net book leverage* and *Net market leverage* on firm-level measures of self-reported risk of losing trade secrets to rivals estimated over the 1993–2011 period and includes 62,066 observations. *Trade secret risk* is an indicator variable set to one if a firm mentions the risk of losing trade secrets in its 10-K filing, and zero otherwise. Specifically, we search each firm's 10-K filing for the key phrases "trade secret," "trade secrets," "confidential information," or "proprietary information," and then set the indicator equal to one if the firm also mentions "protect," "protection," or "safeguard," within a 20-word window before or after one of the previous key phrases. *Key employee risk* is an indicator variable set to one if a firm mentions the risk of losing key employees in its 10-K filing, and zero otherwise. Specifically, we search each firm's 10-K filings for the key phrases "key personnel," "key employees," "key executives," "key members," "key managers," "key officers," "key staff," or "key talent," and then set the indicator equal to one if the firm also mentions "loss of," "departure of," or "retain" within a 20-word window before or after one of the previous key phrases. Control variables are defined in Table 3. Industry fixed effects are defined at the three-digit SIC level. Continuous variables are winsorized at their 1st and 99th percentiles. Standard errors are corrected for heteroskedasticity and clustering at the state level (*t*-statistics are in parentheses). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Net book leverage		Net market leverage	
	(1)	(2)	(3)	(4)
Trade secret risk	−0.094***		−0.060***	
	(−14.44)		(−13.55)	
Key employee risk		−0.044***		−0.024***
		(−7.66)		(−6.31)
Log book assets	0.032***	0.031***	0.022***	0.022***
	(17.50)	(17.08)	(17.28)	(16.87)
Market-to-book assets	−0.027***	−0.028***	0.004***	0.003***
	(−15.79)	(−16.52)	(4.14)	(3.02)
Return on assets	−0.035**	−0.023	−0.012	−0.004
	(−2.35)	(−1.52)	(−1.59)	(−0.54)
Fixed assets	0.532***	0.548***	0.332***	0.343***
	(26.55)	(27.03)	(22.62)	(23.24)
Cash flow volatility	−0.088***	−0.100***	−0.068***	−0.076***
	(−3.78)	(−4.25)	(−5.10)	(−5.63)
Dividend payer	−0.082***	−0.075***	−0.079***	−0.073***
	(−12.05)	(−10.88)	(−15.62)	(−14.54)
Industry × Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	62,066	62,066	62,066	62,066
Adjusted R^2	0.417	0.409	0.368	0.361

losing trade secrets (key employees) hold about 9.4 (4.4) cents less debt (net of cash holdings) per dollar of book assets than do their rivals. This evidence further supports our hypothesis that a firm maintains a lower debt ratio when it faces a greater risk of losing trade secrets to rivals.[20]

5.7. Protection of trade secrets or labor-related mechanisms: discussion

The recognition of the IDD increases the protection of firms' trade secrets by reducing the mobility of workers with access to their trade secrets to rival firms. This raises the question of whether reduced mobility of these workers to rival firms could have a large impact on capital structure through pure labor mechanisms that are unrelated to better protection of trade secrets and drive our results. We are unable to separate the effect on capital structure due to increased protection of trade secrets from additional effects that might operate independently through a reduced mobility of workers with access to trade secrets to rival firms. Below we discuss why pure labor mobility effects that are unrelated to the protection of trade secrets do not seem likely to be the main driver of our findings.

Most arguments linking IDD rulings to capital structure through pure labor mechanisms (e.g., Agrawal and Matsa, 2013; Simintzi et al., 2015; Serfling, 2016) hinge on this event having a large impact on firms' total labor costs. However, the IDD only affects the mobility of a small number of workers who know a firm's trade secrets and whose wages typically account for a minor share of the firm's total wage bill. Another argument is that IDD rulings could increase a firm's debt capacity by reducing the risk that it will lose workers who possess valuable skills. However, reduced labor mobility could instead lower a firm's debt capacity, by reducing workers' effort and investment in hu-

[20] In untabulated tests over the period 1997–2011, we do not find a change in the likelihood that a firm mentions a significant risk of losing trade secrets to its competitors in its 10-K filings after the recognition of the IDD in its state. Noteworthy, only 3 of the 16 adoption events can be used in these tests.

man capital (Garmaise, 2011) and by hampering the firm's ability to recruit high-quality workers who are averse to job lock.

6. Additional investigation

We now briefly discuss the results of additional investigations and robustness tests that are contained and more extensively discussed in the online Appendix to preserve space.

First, we show that the recognition of the IDD in a firm's state reduces its cost of bank debt (see Table A12). This is further support for the proposition that the recognition of the IDD in a firm's state reduces the competitive risk that it faces.

Second, we find that affected firms experience significant positive abnormal returns over the days surrounding the date when a state court adopts the IDD (see Table A13), which is additional evidence consistent with the notion that market participants believe the adoption of the IDD decreases the competitive risks these firms face. Supporting the view that the changes in state courts' positions regarding the IDD are unlikely to be anticipated events, we also show that abnormal returns are not significantly different from zero during the weeks prior to a state court's decision to adopt the IDD.

Third, we provide evidence that suggests the IDD rulings capture a unique source of competitive risk. We find no impact of IDD rulings on the Hoberg et al. (2014) measure of product fluidity (see Table A14). This potentially implies that IDD rulings capture changes in competitive threats related to the loss of trade secrets to rivals, while product fluidity captures other competitive threats, e.g., related to improvements in competitors' products. We also find no effect of IDD rulings on other measures of competitive risk used in Haushalter et al. (2007), Frésard (2010), and Valta (2012) (see Table A15).

Fourth, we find that the recognition of the IDD in a state increases the number of trade secrets cases litigated in that state (see Table A16). This suggests that in spite of reducing the ex-ante mobility to rival firms of workers who know their employers' trade secrets, the recognition of the IDD increases firms' propensities to litigate to protect their trade secrets, possibly because they expect more favorable outcomes after this recognition.

Fifth, because in Bolton and Scharfstein (1990) the optimal debt contract balances the benefits of deterring predation by reducing a firm's financial constraints against the cost of exacerbating managerial agency problems, we examine if the effect of the recognition of the IDD on a firm's capital structure is robust to controlling for its corporate governance. To do so, we proxy for a firm's governance with an indicator for if it is incorporated in a state that has passed business combination laws or with the concentration of the ownership of its equity shares by institutional investors. In Table A17, we show that the effect of the recognition of the IDD on a firm's capital structure is unaffected by the inclusion of these variables.

Sixth, in Table A18 we report findings that suggest measurement error in the protection of trade secrets afforded by the IDD indicator variable arising from firm headquarter relocations to another state, or from geographical dispersion of a firm's work force does not drive our results.

Seventh, in Table A19 we show that our main results are robust to using propensity-score matching to ensure that the treatment and control firms have similar observable characteristics before the onset of the treatment.

Finally, in Table A20 we show that firms significantly increase their outstanding debt during years when they litigate to protect their trade secrets. This evidence supports our argument that having unused debt capacity is strategically useful for firms that face a greater risk of losing their trade secrets to rivals, because it allows them to rapidly raise the funds they need to protect their competitive position when such events materialize.

7. Conclusion

Our message is that the risk a firm's rivals could gain access to its trade secrets induces the firm to choose its capital structure strategically. In the spirit of Telser (1966), Poitevin (1989), and Bolton and Scharfstein (1990), we hypothesize that firms facing a greater risk that their rivals will try to gain access to their trade secrets and hurt their competitive position benefit more from strategically maintaining unused debt capacity, either to be able to respond to such competitive attacks or to deter them ex ante, and thus hold less debt. We test our hypothesis using a difference-in-differences research design that exploits the staggered recognition of the IDD by state courts over the 1977–2011 period. The recognition of this doctrine causes an arguably exogenous decrease in the risk that a firm's rivals might gain access to its trade secrets because it increases the firm's ability to prevent its workers who know its trade secrets from working for rivals.

We first show that the recognition of the IDD significantly reduces the mobility of workers who know trade secrets to rival firms, and thus a firm's risk of losing trade secrets to rivals. Supporting our main hypothesis, we then show that firms significantly decrease their net leverage after the recognition of the IDD by courts in their state of headquarters. This effect is stronger for firms with a higher ex-ante risk of losing trade secrets to rivals through the labor mobility channel. Importantly, highlighting the strategic dimension of a firm's capital structure choices when it faces competitive risk associated with its inability to fully protect its trade secrets and competitive advantages, we find that the effect is stronger for financially weak firms that face financially stronger rivals, for firms in industries with more specific assets or lower barriers to entry, and for firms with less differentiated products.

We also find a negative association between firms' debt ratios and firm-level measures of the risk of losing trade secrets to rivals, as self-reported by firms in their 10-K filings. The results of additional tests show that affected firms earn positive abnormal returns over the days surrounding a state court's final decision to recognize the IDD, and that after this recognition their cost of bank debt decreases. These results support the view that the recognition of the IDD reduces the competitive threats these firms

face. Importantly, we also provide several pieces of evidence that are inconsistent with alternative (nonstrategic) interpretations of the paper's results.

Our paper calls to attention the strategic value of financial flexibility for firms that face competitive threats associated with their inability to fully protect their intellectual property, and suggests that further research on the topic might be fruitful. For some firms, significant threats of this kind can also arise through mechanisms other than the mobility of key employees, such as industrial espionage and outright theft (even by foreign agents), an issue that has become increasingly important in recent years (e.g., with this in mind the US Congress passed the Economic Espionage Act in 1996). Similar threats could also naturally arise when firms find it difficult to enforce their property rights on other forms of intellectual capital besides trade secrets, such as patents, copyrights, or trademarks. An important challenge in pursuing this broader research agenda is to gauge both the relative importance of different kinds of intellectual property for any given firm and the associated competitive risk from losing this property to rival firms.

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