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Actively Keeping Secrets From Creditors: Evidence From the Uniform Trade Secrets Act

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Abstract

We find that an increase in a firm's incentives to use trade secrets to protect its intellectual property results in a more actively managed capital structure. Exploiting U.S. states' adoption of the Uniform Trade Secrets Act as a positive "shock" in the protection afforded to trade secrets, we find that firms covered by the Act reduce debt levels while increasing investments in intangibles. Additional tests suggest that firms fund these financing and investment activities by issuing more equity. Consistent with an increase in overall intangibility magnifying contracting problems with creditors, we find that covered firms experience higher costs of debt.

I. Introduction

An important determinant of capital structure is the *type* of assets a firm holds (Myers (1984)). Relatedly, since knowledge is the key factor of production for most

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U.S. firms (Jaffe and Trajtenberg (2002), Carlaw, Oxley, Walker, Thorns, and Nuth (2006)), many are increasingly reliant on investments in "intangibles" (Corrado and Hulten (2010), Srivastava (2014), and Peters and Taylor (2017)). Broadly defined, the term intangibles refers to assets and expenditures (such as R&D and intellectual property (IP), human capital and organizational development, product designs and brands, and supplier and customer relationships) that are essential inputs and outputs of innovation. Surprisingly, the literature on corporate financing policy has only just considered how knowledge-based intangibility affects capital structure decisions (see, e.g., Hochberg, Serrano, and Ziedonis (2018), Klasa, Ortiz-Molina, Serfling, and Srinivasan (2018), and Mann (2018)).

In this article, we study the change in a firm's financing choices due to a shift in its investments and asset composition toward greater overall intangibility in the form of trade secrets. Generally speaking, trade secrets can take shape as devices, formulas, methods, processes, programs, and other configurations of sensitive information which are used in a firm's operations but may or may not be patentable, are not generally known or readily ascertainable, are subject to reasonable efforts to keep the information secret and give its holder an economic advantage. Common examples of trade secrets include computer algorithms, financial data (e.g., pricing and cost information), business plans and strategies, customer and supplier contact lists, and product prototypes.[1] Moreover, consistent with prior survey evidence that suggests trade secrets are one of the most important mechanisms to protect a firm's knowledge (see, e.g., Hall, Helmers, Rogers, and Sena (2014)), recent regulation indicates policymakers are also concerned with the preservation of domestic secrets.[2]

To identify how a firm's financing and investment decisions are affected by an increased incentive to use trade secrets, we exploit the quasi-natural experiment provided by U.S. states' staggered adoption of the Uniform Trade Secrets Act (UTSA). The UTSA strengthens trade secrets protection by codifying states' existing common law, standardizing the legal definition of a trade secret, enumerating what constitutes illegal misappropriation, and clarifying the rights and remedies of victimized firms (Uniform Law Commission (1985)). Other recent studies have explored the impact of the UTSA on R&D expenditure, patenting, and corporate disclosure (Png (2017a), (2017b), and Glaeser (2018)).[3] To the best of our knowledge, this paper is the first to systematically examine its effect on capital structure, finding that its passage results in significant reductions in the financial leverage of

[1]For instance, some well-publicized examples of trade secrets include: the Google search algorithm, the Coca-Cola soft drink recipe, the New York Times Bestseller list, and the WD-40 chemical formula.

[2]See, e.g., the "Defend Trade Secrets Act (2016)" in the U.S. (Pub.L. 114–153, 130 Stat. 376, codified at 18 U.S.C. § 1836, et seq.); "The Trade Secrets Directive (2016)" in the E.U. (*2016/943/EU*); and the "The Trade Secrets (Enforcement, etc.) Regulations (2018)" in the U.K. (*SI 2018/597*). The U.S. also previously adopted the "Economic Espionage Act (1996)" (Pub. L. No. 104–294, 110 Stat. 3488, codified at 18 U.S.C. §§ 1831–1839 (Supp. IV (1998)).

[3]Png (2017a) finds that the UTSA is associated with higher R&D among larger companies and those in high-tech industries. Png (2017b) finds that the UTSA is associated with fewer patents, on average, suggesting that the Act encourages firms to substitute toward secrecy. Glaeser (2018) finds that firms that begin to rely more heavily on trade secrecy after the passage of the UTSA decrease their level of corporate transparency by substituting increased voluntary disclosure of nonproprietary information for decreased disclosure of proprietary information.

firms headquartered in adopting states (i.e., "UTSA-firms") relative to similar firms headquartered elsewhere.

The finding that an increase in trade secrets protection via the UTSA leads to decreases in firms' debt levels may appear surprising, especially since prior empirical evidence suggests that stronger IP protection encourages firms to use debt (see, e.g., Kerr and Nanda (2015), Klasa et al. (2018)) and since theoretical scholarship demonstrates that firms strategically use leverage to manage unexpected future events and funding requirements (see, e.g., DeAngelo, DeAngelo, and Whited (2011)). Thus, a reasonable expectation could be that debt is a likely source of funds to finance increases in R&D spurred by the stronger IP protection following UTSA adoption (Png (2017a)), and therefore, debt use would also increase. Our evidence, however, suggests that firms choose to pay down debt at the same time that they invest in R&D and other intangibles, by issuing enough equity to fund both activities. Additionally, we confirm the prior finding that UTSA-firms decrease their reliance on patents (Png (2017b)) and present new evidence that, following the laws' passage, these firms' general levels of intangibility increase, and that they expand their reach in competitor markets through more product differentiation and diversifying acquisitions. Consistent with an increase in overall intangibility (i.e., a decrease in asset pledgeability) and a greater reliance on trade secrets magnifying contractibility problems with creditors, we also find that firms affected by the UTSA experience significant increases in the cost of both private and public debt, rendering it a less desirable source of financing.[4] We interpret these findings as an *active* decision by the firm to manage its capital structure in a way that takes advantage of its increased incentives to use trade secrets as an IP protection mechanism.

We begin our analysis by investigating the plausibility that UTSA adoptions were exogenous events. To this end, we employ a Cox proportional hazard model where the outcome is represented by the passage of the UTSA. We include predetermined state-level firm characteristics, macroeconomic, and corporate law variables (e.g., state-year median debt ratios, a state's rate of GDP growth, and an indicator for whether a state has passed other trade secrets law) and year fixed effects and find no significant predictors for the adoption of these laws in our fully specified model. This evidence suggests that UTSA adoptions were not associated with the states' then-prevailing legal and economic environments, consistent with the principal assumption that the laws identify plausibly exogenous changes in trade secrets protection.

[4]From a contractual viewpoint, the intangible nature of trade secrets leaves creditors susceptible to significant risks. First, many forms of trade secrets exist as knowledge or "know-how" held in the minds of a firm's employees and therefore, cannot be collateralized (Smith (2000)). Second, for secrets that permit pledgeability, there is the inherent risk that the information might become public knowledge after the lending agreement is reached and thus would no longer be private property. For example, without any wrongdoing of the borrowing firm, an outside party could independently discover or reverse engineer the trade secret (Sandeen (2008)). This concern is also problematic during bankruptcy proceedings which by general rule are a matter of public record (Smith (2000)). Moreover, even if the secret was divulged illegally (e.g., theft and espionage), once the information is known by the public its value as collateral is lost forever (Menell (2007)). Third, trade secrets are commonly viewed as "general intangibles" by bankruptcy courts (Bramson (1981)) and as such are much more challenging forms of collateral to identify, trace and value (Hall et al. (2014), Reid, Searle, and Vishnubhakat (2014)).

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We then transition to the core of our empirical tests, estimating the effect of the UTSA on the financial leverage of firms located in adopting states over the period 1977–2016. We use difference-in-differences regressions that include firm, U.S. Census region-by-year, and industry-by-year fixed effects. We find that the strengthened trade secrets protection brought about by the passage of these laws results in a statistically significant reduction in a firm's book (market) leverage as compared to an industry rival operating in a similar geographical region but located in a state without the UTSA, with an economic significance of 5.5% (4.2%) relative to the sample mean. We confirm that the decreases in debt transpire after the laws' passage and not before. Regressions of the UTSA indicator on alternative measures of financial leverage, including net book and net market leverage, and the natural logarithm of total debt give similar results. Moreover, using a trade secrets protection index that measures the change in protection engendered by the UTSA relative to that afforded by the adopting state's pre-existing common law (from Png (2017a), (2017b)), yields similar results on all five proxies of financial leverage.

We also show that our main result on leverage survives a battery of robustness tests aimed at addressing important endogeneity concerns common among studies that employ state laws for identifying variation. In particular, we find that the result is robust to i) removing each state that adopts the UTSA one-by-one from each separate estimation of our baseline model to alleviate the concern that any one UTSA-adopting state might drive our findings, ii) estimating our debt ratio regression models on simulated data that randomly assigns states UTSA treatment in the exact fashion that actual enactment years occur to address the concern that unobserved factors that coincide with UTSA adoptions might bias our estimates, iii) employing a matched sample, where we match on relevant observable characteristics in the year before the law is passed, to control for a potential selection bias created by firms relocating into states that had already passed the UTSA, and iv) specifying control variables that are lagged 1-period or that are fixed in the specific year before the adoption of a state's respective law (i.e., that are time-invariant) to address the "bad controls" problem (Angrist and Pischke (2009)), that is, control variables that might also be affected by the UTSA and drive the effect of the stronger trade secrets protection on debt levels.

We then examine possible economic channels through which greater trade secrets protection, as enabled by the enactment of the UTSA, could lead to decreases in debt. Based on prior predictions in the theoretical capital structure literature, we primarily investigate the "asset pledgeability hypothesis" (see, e.g., Long and Malitz (1985), Williamson (1988), and Shleifer, and Vishny (1992)). Under this premise, an increase in the use of trade secrets (i.e., intangibles) (and away from patents) amplifies contracting problems with creditors because such types of assets are more difficult to redeploy and more challenging to sell in secondary markets, ultimately leading to a reduction in debt.

Consistent with the asset pledgeability hypothesis, we find that firms located in UTSA-adopting states and more ex ante reliant on trade secrets exhibit more pronounced reductions in debt levels. Moreover, the strengthened trade secrets protection enabled by these laws incentivizes investments in intangible assets,

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capital, and investment opportunities.[5] As a corollary, creditors of UTSA-firms respond to the increase in overall intangibility and, thus, reduction in asset pledgeability, by requiring higher bank loan and bond yield spreads, rendering debt a more costly source of financing.

The next set of tests investigates the channel by which UTSA-firms fund both their investments in intangibles and pay down existing debt. Our evidence suggests that firms located in states with the UTSA are more likely to issue new equity and to increase the offered size of the issuance, while not finding any change in cash, total payout, or asset sales. Further, following the methodology in Fama and French (2005), we find that the increase in equity issuance for UTSA-firms is driven by the subset that has more severe financing deficits. Overall, our results support the asset pledgeability hypothesis as they are consistent with prior evidence suggesting that more innovation-intensive firms rely more heavily on equity finance due to these firms' inherent information problems and lack of collateral value (Brown, Fazzari, and Petersen (2009), Hall and Lerner (2010)).[6]

Finally, we explore how UTSA induced increases in trade secrets protection affect firm behavior in the product and M&A market. First, we document, using the "total similarity" measure from Hoberg and Phillips (2016), that the UTSA leads to reductions in product market similarity. Second, employing the "product fluidity" measure from Hoberg, Phillips, and Prabhala (2014), we find that rival firms located in non-UTSA-adopting states experience intensified changes in their product space due to actions taken by UTSA-competitors in the rival's product market. Third, we show firms in UTSA-adopting states are more likely to have positive advertising *and* R&D expenditures, implying a shift toward more differentiated products (Sutton (1991)). Fourth, we find that UTSA-firms are more likely to make diversifying acquisitions (primarily financed with equity) after the laws' passage. Overall, this evidence suggests that the documented changes in a firm's financing and investment decisions, stemming from the UTSA, results in an expanded reach in competitors' markets.

In sum, our study uncovers a novel dimension on the relation between capital structure and knowledge-based intangibility, finding that firms actively manage their capital structures away from debt and toward equity when their trade secrets become better protected. As an economic explanation, we show that this effect on debt materializes through an asset pledgeability channel (see, e.g., Long and Malitz, (1985), Williamson (1988), and Shleifer and Vishny (1992)) as the stronger protection afforded to trade secrets incentivizes firms to increase their use of secrecy and overall level of intangibility, which amplifies contracting problems with creditors and leads to higher costs of debt. Overall then, this article broadly contributes

[5]We also confirm the findings of prior literature showing that the passage of the UTSA tends to result in increases in R&D spending and decreases in patenting activity (Png (2017a), (2017b)).

[6]Additionally, we examine two alternative economic mechanisms: the static (see, e.g., Kraus and Litzenberger (1973), Scott (1976)) and dynamic (see, e.g., DeAngelo et al. (2011)) trade-off theories of capital structure. Under these frameworks, higher (lower) future expected distress costs (profitability) i) brought about by the UTSA alternatively supports our findings (static framework) or ii) transpire prior to UTSA adoptions and confound our inference (dynamic framework). Our results are not consistent with either of these mechanisms.

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to the scholarship examining potential determinants of capital structure (see, e.g., Rajan and Zingales (1995), Frank and Goyal (2008), Lemmon, Roberts, and Zender (2008), and DeAngelo and Roll (2015)) as well as to the nascent literature exploring the corporate policy implications of greater trade secrets protection (see, e.g., Png (2017a), (2017b), Glaeser (2018), and Klasa et al. (2018)).[7]

We also contribute to the scholarship examining the financing of corporate innovation, supporting the view that debt makes a poor substitute for equity finance for firms more engaged in innovation-related investments (see, e.g., Acharya and Subramanian (2009), Brown et al. (2009), and Hall and Lerner (2010)), and especially for firms with more severe financing deficits (Frank and Goyal (2003)). Our findings are also consistent with recent evidence which shows that when the collateral value of patents is strengthened, patenting firms fund future innovation with debt (Liu and Wong (2011), Hochberg et al. (2018), and Mann (2018)). This article further contributes to recent studies documenting the growing importance of investments in intangibles in the U.S. economy (see, e.g., Corrado and Hulten (2010), Peters and Taylor (2017)) and its relationship with product markets (see, e.g., Hombert and Matray (2018)) and M&A activity (see, e.g., Bena and Li (2014), Harford, Schonlau, and Stanfield (2019)).

II. Legal Background

A. The Uniform Trade Secrets Act

To assist in the improved protection and codification of trade secrets laws, the Uniform Law Commissioners designed and proposed the Uniform Trade Secrets Act (UTSA) for state-level enactment. The UTSA provides three key improvements above the previously established common law procedures.[8] First, it more comprehensively defined a trade secret as "information, including a formula, pattern, compilation, program device, method, technique, or process that 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 is the subject of efforts that are reasonable under the circumstances to maintain its secrecy" (Uniform Law Commission, Section 1.4, p. 5 (1985)). The Commissioners further commented that negative information about failed ideas is valuable and that works-in-progress such as ongoing R&D activity are also covered under the act.

[7]In a related paper, Klasa et al. (2018) show that firms located in states with courts that recognize the Inevitable Disclosure Doctrine (IDD) decrease their strategic use of unused debt capacity. The IDD reduces the mobility of employees with knowledge of a firm's trade secrets to rivals, thus increasing its protection. Unlike studies using the UTSA, however, they do not find that the IDD results in changes in investments in R&D (*and* advertising). We confirm this result in our sample as well as the inability of the IDD to explain other increases in intangibles, which helps reconcile its alternative implication for debt relative to the UTSA.

[8]Prior to the UTSA, the primary governing code for trade secrets protection was established in the Restatement (First) of Torts, which is a treaty providing guidance to judges and lawyers in a common law system. However, because the formalization was not legally binding it produced conflicting court decisions across states.

The second major improvement of the UTSA over the general common law of the time was that it outlined what it meant for a secret to be misappropriated. Section 1.2 of the UTSA prescribes misappropriation of a secret to mean the "acquisition of a trade secret of another by a person who knows or has reason to know that the trade secret was acquired by improper means, or disclosure or use of a trade secret of another without express or implied consent by a person who used improper means to acquire knowledge of the trade secret" (Uniform Law Commission, pp. 4–5, 1985). The misappropriation of a trade secret through improper means can include bribery, theft, misrepresentation, breach of duty to maintain secrecy, or espionage. This would be considered a form of unfair competition. However, trade secrets can be legally acquired if a company involuntarily discloses the secret, or a competitor independently discovers or reverse engineers the prized, clandestine information. Moreover, as specified by existing patent law, the competitor firm could attempt to patent (if patentable) its newly discovered information, disallowing the use of the secret by the originating firm.

Finally, the third and arguably most important improvement was that the UTSA clarified the rights and remedies for businesses that had secrets wrongly appropriated and used. Remedies for infringement include injunctive relief, damages, reasonable royalties, and, in certain circumstances, attorney fees.[9] The UTSA established a statute of limitations upon which any action under the act must be brought forth within 3 years after the discovery of the misappropriation. Moreover, the UTSA outlines that courts deciding cases should take reasonable precautions to preserve the secrecy of the contested information, and if the UTSA is enacted, it supersedes existing state-specific common laws.

B. The Inevitable Disclosure Doctrine

Another important form of state-level trade secrets protection stems from the Inevitable Disclosure Doctrine (IDD). Under this doctrine, firms have the legal ability to obtain an injunction to prevent current or former employees from gaining employment at another company without having to show that the individual applied, disclosed, or intended to use any of the plaintiffs' trade secrets. Instead, the IDD only requires firms to prove that the defendant's new position is one in which trade secrets would inevitably be disclosed. This key legal distinction, contrasted above, is that of "threatened misappropriation" (Klasa et al. (2018)). Thus, if a firm perceives there is a risk of threat of misappropriation by an individual with trade secrets knowledge who finds work in a similar position at a rival firm, the IDD can be invoked.

By the doctrine, for a firm to file suit and obtain an injunction against an individual it must establish the following: i) the employee worked in some capacity which granted him or her access to the firm's trade secrets, ii) the role and

[9]Anecdotal evidence suggests protected firms do prosecute suspected perpetrators and earn sizeable awards for their victimization. For instance, Best Buy, a consumer electronics retailer, was found liable of stealing secrets from an electronics recycling start-up, TechForward, and forced to pay $27 million (Kopelman (2012)). Further, a back-of the envelope calculation in Hall et al. (2014), based on a 2011 federal court ruling in *Kolon Industries Inc.* v. *Dupont Co.*, suggests an average value of $6.3 million per trade secret.

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responsibilities of the employee in their new position are so similar to that which they had at the plaintiff firm, that it would not be difficult to use or disclose the trade secrets, and iii) the employee and new employer cannot be trusted not to use the trade secrets, and this would cause the former employing firm irreparable economic harm.

C. Comparing the UTSA and IDD

Trade secrecy in the United States is primarily governed by state rather than federal law (Pooley (1997)), and the two most important state-level legal precedents, outlined above, are the UTSA and the IDD. The UTSA is passed in the form of state statutes via a legislative process, whereas the IDD is recognized by state courts. The IDD was adopted in some states prior to the UTSA (New York in 1919, Florida in 1960, Delaware in 1964, Michigan in 1966, and North Carolina in 1976), but the codification of the UTSA in 1979 strengthened the protective capacity and applicability of the IDD. That is, due to the nonuniformity of general trade secrets common law before the creation of the UTSA, the IDD was subject to state-varying definitions of secrecy and misappropriation, which made the doctrine more challenging to cite in judicial proceedings. Hence, IDD adoptions after 1979 follow the same guiding principles specified in the UTSA.

Moreover, since trade secrets cases are generally tried and based on the law where the plaintiff maintains its principal place of business, the relevant jurisdiction for a litigating firm seeking to protect its trade secrets via state laws is usually interpreted as the firm's headquarter of location (see, e.g., Ribstein and Kobayashi (1996), Almeling, Snyder, Sapoznikow, and McCollum (2010)). Consequently, both the UTSA and the IDD establish protection for a firm's trade secrets even if the firm accused of misappropriation (i.e., defendant) is located in a state which has not adopted the respective law (Png (2017a), Glaeser (2018), and Klasa et al. (2018)).[10]

The number of states that have passed the UTSA more than doubles those that recognize the IDD. Supplementary Figure OA1 shows the number of states that have adopted the UTSA and the IDD by year. In total, 48 states have enacted the UTSA (cataloged in Table A1), whereas 21 states' courts have recognized the IDD as customary common law. There are currently, however, only 18 states with effective IDD laws since there were three instances (Florida in 2001, Michigan in 2002, and Texas in 2003) in which judges later rejected the doctrine (Klasa et al. (2018)); there are no such examples of states later abolishing the UTSA.

D. Testing for Determinants of UTSA Adoption

To investigate the capital structure implications of strengthened trade secrets protection, we exploit the quasi-natural experiment provided by U.S. states' staggered adoption of the UTSA. The primary working assumption of this strategy is that the enactment of the UTSA creates exogenous state-level variation in the protection afforded to trade secrets. Therefore, a crucial step in providing evidence

[10]The issue of relevant jurisdiction is less of a concern for the UTSA since nearly every state has enacted it.

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for this assumption is to examine whether states were more likely to pass the UTSA conditional on certain characteristics that could coincide or lead to its adoption and which could also correlate with debt ratios (which would invalidate our empirical strategy).

Following the approach in Acharya, Baghai, and Subramanian (2014), we explore this concern, by estimating a Cox proportional hazard model, where we define a "failure event" as the enactment of the UTSA, and where potential determinants include state-level firm characteristics, macroeconomic, political economy, and corporate law factors that a priori might predict the laws' passage and year fixed effects. For instance, to examine a potential reverse causality problem, we specify state-year (SY) median levels and changes (DELTA) in book (SY_BLEV and SY_DELTA_BLEV) or market leverage (SY_MLEV and SY_DELTA_MLEV). Further, we include predictors for whether an eventual UTSA-enacting state has already adopted corporate laws pertaining to the IDD (IDD), R&D tax credits (RD_TAX_CREDIT) (Wilson (2009)), any of the six most common antitakeover statutes (ATS), such as first-generation, business combination, control share, directors' duties, fair price, and poison pill laws (Karpoff and Wittry (2018)), and wrongful discharge laws (WDL), which include the good faith, implied policy, and public policy exceptions (Serfling (2016)).

Moreover, some of our models also include a state's GDP per capita (ln(GDPPC)) and its growth rate of GDP (GDP_GROWTH), an indicator for whether the majority of a state's U.S. House of Representatives belongs to the Democratic party (POLITICAL_REP), a state's population level (ln(POPULATION)), rates of unemployment (UNEMPLOYMENT), and establishment entry and exit (EST_ENTRY and EST_EXIT), and state-year median levels and changes in patent counts (SY_PATENT and SY_DELTA_PATENT). We provide variable definitions in Appendix B. The sample period spans 1977–2016, and states are dropped from the analysis once they adopt the UTSA. Each of our predictor variables is pre-determined, meaning that they are measured in the year before the law's passage (t1). Additionally, all continuous independent variables are standardized to have a mean of 0 and unit variance to ease comparisons across hazard rates, and standard errors are adjusted by the state of location clustering. Table 1 presents the results.

The overall evidence suggests that relevant state-level factors are unable to determine the adoption of the UTSA. Beginning in column 1 (2), we consider whether states' median levels and changes in book (market) leverage, in a given year, can predict UTSA enactment. However, the hazard rates are insignificantly different from 1, providing reassuring initial evidence that reverse causality is likely not a concern for our empirical strategy. Moving down the column, we find the only indication that UTSA adoption might be predictable. Specifically, the hazard rate on the IDD predictor is marginally significant at the 10% level. This implies that states that have already passed the IDD are less likely to adopt the UTSA, suggesting that the two forms of state-level trade secrets protection are substitutes. This is an interesting result as it appears to indicate that states prefer the UTSA to the IDD since the former has been passed by more than double (48) the number of states currently recognizing the latter (18) (see Supplementary Figure OA1).

Although, once we specify additional state-level macroeconomic, political, and legal factors in columns 3–4, and further append states' median levels and

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TABLE 1

Predicting UTSA Adoptions

Table 1 reports hazard rates from Cox proportional hazard models analyzing determinants of state adoption of the UTSA. The sample period is 1977 to 2016, except for columns 5 and 6, which employ patent data that ends in 2010. The dependent variable (or "failure event") is an indicator equal to 1 if a firm's state of location adopts the UTSA, and 0 otherwise. We exclude states from the sample once they enact the UTSA. Predictor variables are predetermined ($t1$) and measured at the state level. Appendix B provides variable definitions. We standardize the continuous predictors to have a mean of 0 and unit variance. Continuous variables are winsorized at the 2.5% level in both tails. t-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	1	2	3	4	5	6
SY_BLEV_t1	1.020		1.022		0.993	
	(0.19)		(0.21)		(−0.07)	
SY_DELTA_BLEV_t1	1.006		1.014		1.018	
	(0.26)		(0.47)		(0.61)	
SY_MLEV_t1		0.959		0.972		0.952
		(−0.32)		(−0.22)		(−0.36)
SY_DELTA_MLEV_t1		1.019		1.022		1.026
		(0.63)		(0.62)		(0.72)
ATS_t1	0.965	0.978	1.020	1.031	1.041	1.053
	(−0.30)	(−0.18)	(0.16)	(0.25)	(0.31)	(0.40)
IDD_t1	0.358*	0.344*	0.453	0.437	0.560	0.547
	(−1.72)	(−1.74)	(−1.24)	(−1.27)	(−0.89)	(−0.92)
RD_TAX_CREDIT_t1	1.006	0.951	1.005	0.960	0.957	0.918
	(0.01)	(−0.11)	(0.01)	(−0.08)	(−0.09)	(−0.16)
WDL_t1	0.964	0.960	0.992	0.985	1.011	1.002
	(−0.16)	(−0.18)	(−0.04)	(−0.07)	(0.05)	(0.01)
ln(GDPPC) _t1			0.858	0.863	0.859	0.864
			(−0.83)	(−0.89)	(−0.83)	(−0.91)
GDP_GROWTH_t1			0.987	1.004	0.986	1.011
			(−0.09)	(0.03)	(−0.10)	(0.07)
POLITICAL_REP_t1			0.973	0.973	0.997	0.997
			(−0.33)	(−0.33)	(−0.04)	(−0.03)
UNEMPLOYMENT_t1			0.777	0.787	0.778	0.786
			(−1.13)	(−1.10)	(−1.11)	(−1.10)
ln(POPULATION) _t1			0.989	0.990	0.930	0.936
			(−0.08)	(−0.07)	(−0.46)	(−0.43)
EST_ENTRY_t1			0.864	0.856	0.847	0.834
			(−0.53)	(−0.57)	(−0.59)	(−0.64)
EST_EXIT_t1			1.527	1.529	1.566	1.569
			(1.05)	(1.06)	(1.08)	(1.10)
SY_PATENT_t1					0.991	0.990
					(−0.20)	(−0.21)
SY_DELTA_PATENT_t1					1.018	1.017
					(0.85)	(0.79)
YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	484	484	484	484	471	471
Pseudo-R^2	0.018	0.018	0.027	0.027	0.025	0.025

changes in patent counts in columns 5–6, the IDD predictor loses its marginal significance. In sum, we document evidence that the UTSA seems to provide plausibly exogenous variation in trade secrets protection.

III. Sample Selection, Variable Definitions, and Summary Statistics

Our main sample includes U.S.-listed corporations from the merged CRSP-Compustat database. We require that firms are located and incorporated in the USA, have nonmissing or nonnegative book value of assets or net sales, and operate in any

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industry outside of utilities (SIC codes 4900–4999) or financials (SIC codes 6000–6999). The sample period is from 1977 to 2016, which begins and ends 3-years before and after the first and last state's UTSA adoption year in our sample. This selection criterion results in a panel data set with 14,526 firms and 135,628 firm-year observations.

Our primary measure of trade secrets protection is a dummy variable indicating whether a firm is located in a state that has adopted the UTSA. We use a firm's headquarter state as a proxy for its geographical location since this is typically where its major plants and operations are located (Henderson and Ono (2008)). This assumption is relatively standard in the empirical finance literature which exploits variation at the state level (see, e.g., Chava, Oettl, Subramanian, and Subramanian (2013), Gormley and Matsa (2016), and Jiang, John, Li, and Qian (2018)). The dummy variable UTSA is set equal to 1 in the year of adoption and remains 1 for all subsequent state-years, or otherwise is equal to 0. Our information on which states have adopted the UTSA and in which years comes directly from the website of the Uniform Law Commission (https://www.uniformlaws.org/committees/community-home?CommunityKey=3a2538fb-e030-4e2d-a9e2-90373dc05792).

For robustness, we also employ an alternative measure of trade secrets protection, denoted as the UTSA_INDEX. This alternate variable is proposed in Png (2017a), (2017b) and is constructed to measure the change in protection brought about by the UTSA law relative to the pre-existing level of trade secrets protection that the enacting state maintained beforehand via common law. The index varies from 0 to 1 with a higher score representing stronger protection. We obtain data for the UTSA_INDEX, which is available from 1970 to 2008, from Professor Ivan Png's website. However, due to data limitations, we prefer the use of the UTSA indicator, which allows us to study the entire UTSA quasi-natural experiment with enactments transpiring from 1980 to 2016.

Our main measures of financial leverage are book leverage (BLEV) and market leverage (MLEV). BLEV is defined as a firm's book value of long-term debt plus debt in current liabilities divided by its book value of assets, while MLEV is defined using the same numerator but divided by the firm's market value of debt and equity. These variable definitions are standard in the capital structure literature (see, e.g., Rajan and Zingales (1995), Frank and Goyal (2008), Lemmon et al. (2008), and Kisgen (2009)). Also in robustness checks, we consider alternative measures of financial leverage (such as net book leverage (NBLEV) and net market leverage (NMLEV)) that are net of cash and short-term investments, and the natural logarithm of 1 plus a firm's book value of long-term debt and debt in current liabilities (ln(DEBT)).

We also maintain a baseline of control variables that prior work has shown to associate with financial leverage. These controls include the following firm-level characteristics (denoted as "Firm-level controls" in the tables): the natural logarithm of the book value of assets (ln(ASSETS)), market-to-book ratio (MTB), return on assets (ROA), the ratio of fixed assets to total assets (FIXED_ASSETS), and a dummy variable indicating dividend payers (DIVIDEND). We also include state-level macroeconomic, political economy, and other corporate law control variables (denoted as "State-level controls" in the tables) to account for potential sources of variation within headquarter states that might correlate with both UTSA adoption

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and financial leverage. These include the natural logarithm of GDP per capita (ln(GDPPC)), the growth rate of GDP (GDP_GROWTH), a dummy variable indicating which states' representatives primarily belong to the Democratic party (POLITICAL_REP), and dummy variables indicating whether states have adopted antitakeover statutes (ATS), the Inevitable Disclosure Doctrine (IDD), or wrongful discharge laws (WDL).

Table 2 reports the summary statistics for the variables used in our study. In this table, we present means, standard deviations, 25th, 50th, and 75th percentiles, and the total number of observations for each of the measures (over applicable sample periods). Moreover, to deal with extreme outliers, we winsorize each of the reported

TABLE 2

Summary Statistics

Table 2 presents summary statistics for the variables used in this study (over applicable sample periods). Appendix B provides variable definitions. All continuous variables are winsorized at the 2.5% and 97.5% levels and the dollar values are expressed in 2009 dollars.

Dependent Variables	Mean	Std. Dev.	P25	Median	P75	Obs.
BLEV	0.218	0.192	0.041	0.190	0.339	135,628
MLEV	0.213	0.211	0.022	0.152	0.351	135,628
NBLEV	0.045	0.329	−0.156	0.090	0.278	135,628
NMLEV	0.097	0.270	−0.082	0.068	0.280	135,628
ln(DEBT)	2.906	2.379	0.730	2.558	4.707	135,628
INTAN_ASSETS	0.170	0.283	0.000	0.022	0.215	135,628
INTAN_CAPITAL	0.630	0.274	0.456	0.693	0.860	133,078
INTAN_INV_OPP	0.179	0.374	0.000	0.001	0.175	132,791
YLD_SPRD	0.041	0.039	0.014	0.030	0.052	8,532
LOAN_SPRD	0.020	0.012	0.011	0.018	0.028	22,946
EQUITY_ASSETS	0.515	0.231	0.363	0.518	0.692	135,628
PCT_INC_EQUITY	1.117	0.488	0.941	1.076	1.206	120,249
SEO_DUMMY	0.031	0.172	0.000	0.000	0.000	135,628
ln(NET_PROCEEDS)	4.217	1.106	3.497	4.200	4.916	4,146
ln(SHARES_FILED)	15.124	0.884	14.509	14.987	15.687	3,812
BNEQUITY	0.090	0.208	−0.019	0.042	0.149	120,258
MNEQUITY	0.076	0.197	−0.000	0.006	0.049	120,255
BNDEBT	0.039	0.143	−0.029	0.026	0.099	120,259
CASH_ASSETS	0.174	0.202	0.027	0.090	0.248	135,628
PCT_CHG_CASH	1.548	1.837	0.663	1.029	1.560	119,610
ASSET_SALES	0.792	0.406	1.000	1.000	1.000	135,628
DIV_ASSETS	0.008	0.014	0.000	0.000	0.011	134,455
REPURCH_ASSETS	0.012	0.029	0.000	0.000	0.005	126,919
EQUITY_PAYOUT	−0.047	0.174	−0.014	0.000	0.018	123,508
DELTA_TOT_SIMLRTY	1.022	0.558	0.923	0.996	1.048	58,388
DELTA_PRD_FLUID	1.040	0.385	0.852	0.987	1.151	53,335
POS_ADVTS_RD	0.208	0.406	0.000	0.000	0.000	129,921
EQUITY_PAYMENT	0.664	0.472	0.000	1.000	1.000	1,837
DIVERSIFY_ACQ	0.609	0.488	0.000	1.000	1.000	1,837
Independent Variables						
UTSA	0.535	0.499	0.000	1.000	1.000	135,628
UTSA_INDEX	0.183	0.236	0.000	0.000	0.367	115,823
PATENTLESS_RD	0.447	0.497	0.000	0.000	1.000	89,104
UNDER_EXPLAINED_RD	0.335	0.472	0.000	0.000	1.000	94,669
SECRETS_INDUSTRY	0.261	0.439	0.000	0.000	1.000	72,529
DEFICIT_DUMMY	0.255	0.436	0.000	0.000	1.000	120,261
ln(ASSETS)	5.192	2.014	3.702	5.086	6.590	135,628
MTB	2.020	1.494	1.091	1.482	2.306	135,628
ROA	0.015	0.212	0.009	0.077	0.123	135,628
FIXED_ASSETS	0.280	0.217	0.105	0.224	0.399	135,628
DIVIDEND	0.337	0.473	0.000	0.000	1.000	135,628
ln(GDPPC)	3.697	0.184	3.570	3.699	3.843	135,628
GDP_GROWTH	0.064	0.036	0.041	0.062	0.087	135,628
POLITICAL_REP	0.563	0.190	0.476	0.577	0.643	135,628
ATS	1.561	1.521	1.000	1.000	1.000	135,628
IDD	0.425	0.494	0.000	0.000	1.000	135,628
WDL	1.740	0.973	1.000	2.000	2.000	135,628

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continuous variables at the 2.5% level in each of their distributions' tails.[11] We also adjust our nonratio controls for inflation using 2009 inflation-adjusted dollars.

The descriptive statistics for our variables are on par with the existing capital structure literature (see, e.g., Wald and Long (2007), Serfling (2016), and Klasa et al. (2018)). In particular, BLEV has a mean of 0.22 and a standard deviation of 0.19, while MLEV has a mean and standard deviation of 0.21. Our main independent variable, UTSA, indicates that 53.5% of the firm-year observations in our sample are covered by the trade secrets act.

IV. Results

A. Empirical Strategy

Our primary econometric model focuses on the relationship between an indicator of UTSA adoption and measures of financial leverage. In particular, we use a difference-in-differences estimator to compare changes in debt ratios among firms headquartered in states that adopt the UTSA with changes in debt ratios among firms that are headquartered elsewhere. This strategy exploits variation triggered by the staggered adoption of the UTSA by multiple states and across multiple time periods. It closely resembles the approach employed by Bertrand, Duflo, and Mullainathan (2004).

We estimate the following empirical specification:

$$y_{ijlst} = \beta \text{UTSA}_{st} + \gamma' \mathbf{X}_{ijlst} + f_i + \omega_{lt} + \lambda_{jt} + \epsilon_{ijlst}, \tag{1}$$

where y proxies for financial leverage (primarily either BLEV or MLEV) for firm i, operating in industry j, located in region l, headquartered in state s, in year t. Further, UTSA is an indicator that equals 1 if state s has adopted the UTSA by year t, and $\mathbf{X}$ is a vector of control variables (outlined in Section III) the prior literature has shown to correlate with financial leverage significantly.[12] f_i denotes firm fixed effects, ω_{lt} represents U.S. Census region-by-year fixed effects, and λ_{jt} are 4-digit standard industrial classification (SIC) industry-by-year fixed effects. We include firm fixed effects to control for unobserved, time-invariant heterogeneity across firms, and region-by-year and industry-by-year fixed effects to control for unobserved, time-varying heterogeneity across regions of location and industries, respectively (for similar fixed effects strategies in studies exploiting state laws see, e.g., Acharya et al. (2014), Gormley and Matsa (2016)). Finally, we cluster the standard errors by headquarter states of location to adjust for a potential problem with grouped error terms since UTSA protection is assigned at this level (Bertrand et al. (2004)).

We include region-by-year and industry-by-year fixed effects to safeguard our estimates from potential regional and industry-specific sources of unobserved variation that could bias our results. The U.S. Census Bureau groups state into the

[11] Our inferences are unchanged if instead we winsorize at the 1% or 5% level.

[12] In our main tests, we also estimate equation (1) without specifying the vector of controls ($\mathbf{X}$) since many of these variables are endogenous and potentially correlated with UTSA adoptions (i.e., "bad controls"), which could bias our point estimates for BLEV and MLEV (Angrist and Pischke (2009)). We further address this issue in Table 6.

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following four census regions: Northeast, Midwest, South, and West. We use these definitions and assign regions based on where a firm is headquartered since this is generally where a firm's focal operations are located (Henderson and Ono (2008)) and since state-level economic conditions tend to spill across to nearby states (Heider and Ljungqvist (2015)). This specification allows us to identify the effect of the UTSA on financial leverage by comparing within-firm changes in debt ratios of firms that operate in the same geographical region, but where only a subset of these firms headquarter in states that adopt the UTSA. Therefore, any unobserved, time-varying regional factors (e.g., local economic conditions) that might coincide with both UTSA adoptions and changes in debt levels should not confound our analysis.

Moreover, we include industry-by-year fixed effects to alleviate further concerns that a potential differential, time-varying trend at the industry level might bias our findings. We use 4-digit SIC code definitions to create industry dummies (as in Gormley and Matsa (2016)) since this is likely where trade secrets protection is the most relevant.

B. Keeping Secrets From Creditors

We begin our empirical analysis by investigating whether firms experiencing strengthened trade secrets protection alter their capital structure decision making. Table 3 presents our findings. In Panel A of Table 3, we specify BLEV as the dependent variable, while Panel B employs MLEV. Additionally, the odd-numbered columns only include firm and industry-by-year fixed effects, whereas the even-numbered versions additionally append region-by-year fixed effects to the model.

Each of the columns in Panel A of Table 3 suggests that UTSA adoption is negatively related to book leverage. For instance, in column 1, where we only specify the UTSA indicator as an independent variable and include firm and industry-by-year fixed effects, we find that firms decrease their use of BLEV by 1.3 percentage points after their trade secrets become better protected by the UTSA. The economic magnitude of the UTSA's effect on book leverage remains constant after including region-by-year fixed effects in column 2, but the improved counterfactual comparisons ensured by these additional fixed effects increase the statistical significance from a t-stat of -3.39 to -3.76. Moving over to our baseline model in column 4, which includes the full set of controls and fixed effects, we document that UTSA-firms experience decreases in BLEV of 5.5% (= 0.012/0.218) relative to the sample mean, and when compared to non-UTSA-firms located in the same U.S. Census region and after controlling for unobserved, time-varying trends within 4-digit SIC industries.

Panel B of Table 3 shows additional evidence on the negative effect of UTSA adoption on financial leverage. In these specifications, we use a firm's market leverage as the dependent variable and find again that we can reject the null hypothesis that the UTSA does not matter for debt decision making at the 5% significance level in our baseline specification (column 4). The point estimate magnitude is slightly reduced in the market leverage regression compared to the book leverage analog. However, it still remains economically meaningful as we

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TABLE 3

UTSA Adoptions and Financial Leverage

Table 3 reports results from panel regressions of measures of financial leverage on a UTSA indicator variable. In Panel A, we measure financial leverage using a firm's book leverage (BLEV). In Panel B, we measure financial leverage using a firm's market leverage (MLEV). UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	1	2	3	4
Panel A. Dependent Variable is Book Leverage				
UTSA	−0.013***	−0.013***	−0.011***	−0.012***
	(−3.39)	(−3.76)	(−3.39)	(−3.55)
ln(ASSETS)			0.032***	0.032***
			(10.03)	(9.96)
MTB			−0.007***	−0.007***
			(−8.71)	(−8.44)
ROA			−0.193***	−0.193***
			(−17.11)	(−17.31)
FIXED_ASSETS			0.212***	0.212***
			(22.95)	(22.98)
DIVIDEND			−0.033***	−0.033***
			(−7.78)	(−7.84)
ln(GDPPC)			0.004	0.001
			(0.17)	(0.03)
GDP_GROWTH			0.004	−0.004
			(0.16)	(−0.15)
POLITICAL_REP			−0.011	−0.005
			(−1.39)	(−0.67)
ATS			0.002*	0.002*
			(1.74)	(1.72)
IDD			0.007**	0.006*
			(2.42)	(1.75)
WDL			−0.005	−0.007**
			(−1.51)	(−2.33)
FIRM_FE	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes
REGION_YEAR_FE	No	Yes	No	Yes
No. of obs.	135,628	135,628	135,628	135,628
Adj. R^2	0.594	0.594	0.631	0.631
Panel B. Dependent Variable is Market Leverage				
UTSA	−0.009**	−0.008**	−0.008***	−0.009**
	(−2.49)	(−2.25)	(−2.73)	(−2.61)
ln(ASSETS)			0.035***	0.035***
			(8.42)	(8.43)
MTB			−0.035***	−0.032***
			(−10.28)	(−10.17)
ROA			−0.196***	−0.196***
			(−10.66)	(−10.74)
FIXED_ASSETS			0.168***	0.168***
			(21.50)	(21.66)
DIVIDEND			−0.048***	−0.048***
			(−10.11)	(−10.12)
ln(GDPPC)			−0.008	−0.009
			(−0.37)	(−0.34)
GDP_GROWTH			−0.105***	−0.130***
			(−4.22)	(−4.12)
POLITICAL_REP			−0.019**	−0.015*
			(−2.34)	(−1.77)
ATS			0.002	0.002
			(1.55)	(1.41)
IDD			0.005	0.004
			(1.29)	(0.88)
WDL			−0.004	−0.006*
			(−1.15)	(−1.70)
FIRM_FE	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes
REGION_YEAR_FE	No	Yes	No	Yes
No. of obs.	135,628	135,628	135,628	135,628
Adj. R^2	0.639	0.639	0.696	0.696

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document that UTSA-firms reduce their use of MLEV by 4.2% (= 0.009/0.213) relative to the sample mean, and after including region-by-year and industry-by-year fixed effects. Our finding that state-level regulatory changes have a larger effect on BLEV than MLEV is consistent with prior studies (see, e.g., Serfling (2016), Klasa et al. (2018)).

Concerning controls, firms that are larger in size and have more fixed assets tend to have higher debt ratios, while firms with greater investment opportunities and profitability, and that pay dividends are less inclined to use debt financing. The correlations we find between these standard firm-level variables and financial leverage are consistent with the prior capital structure literature (see, e.g., Rajan and Zingales (1995), Wald and Long (2007), and Frank and Goyal (2008)). We also find evidence that a firm's book leverage is positively associated with the IDD (columns 3–4; as in Klasa et al. (2018)) and ATS (columns 3–4; as in John and Litov (2010)), and negatively associated with WDL (column 4; as in Serfling (2016)).[13]

We next explore the validity of our difference-in-differences estimator. As highlighted in Angrist and Pischke (2009), the fundamental assumption of this identification strategy is that of parallel trends in the outcome variable of the treated and nontreated (i.e., "control") groups in the period before treatment is dispensed (where treatment is defined in our study by UTSA protection). We provide evidence on the validity of the parallel trends assumption in Figure 1 and Table 4.

First, we follow the conventional approach in prior papers that consider state-level policy "shocks" (see, e.g., Acharya et al. (2014), Gormley and Matsa (2016), and Serfling (2016)) and regress our measures of financial leverage on dummies that indicate a firm's state's relative year to UTSA adoption, along with firm, region-by-year, and industry-by-year fixed effects. We plot the coefficients on the year dummy regressors on the *y*-axis, and indicators for each year in a plus or minus 4-year window surrounding UTSA adoption on the *x*-axis. Additionally, we plot the 95% confidence interval for the point estimates, where the interval is based on robust standard errors with state of location clustering. Graph A (B) of Figure 1 pertains to regressions with BLEV (MLEV) specified as the dependent variable. In both panels, we find that UTSA-firms and non-UTSA-firms had insignificantly different levels of debt in the period before the act is passed. However, the differences in BLEV and MLEV start to widen in the year of adoption between firms in UTSA- and non-UTSA-passing states and become statistically different in the 1- through 4-years after the law is enacted.

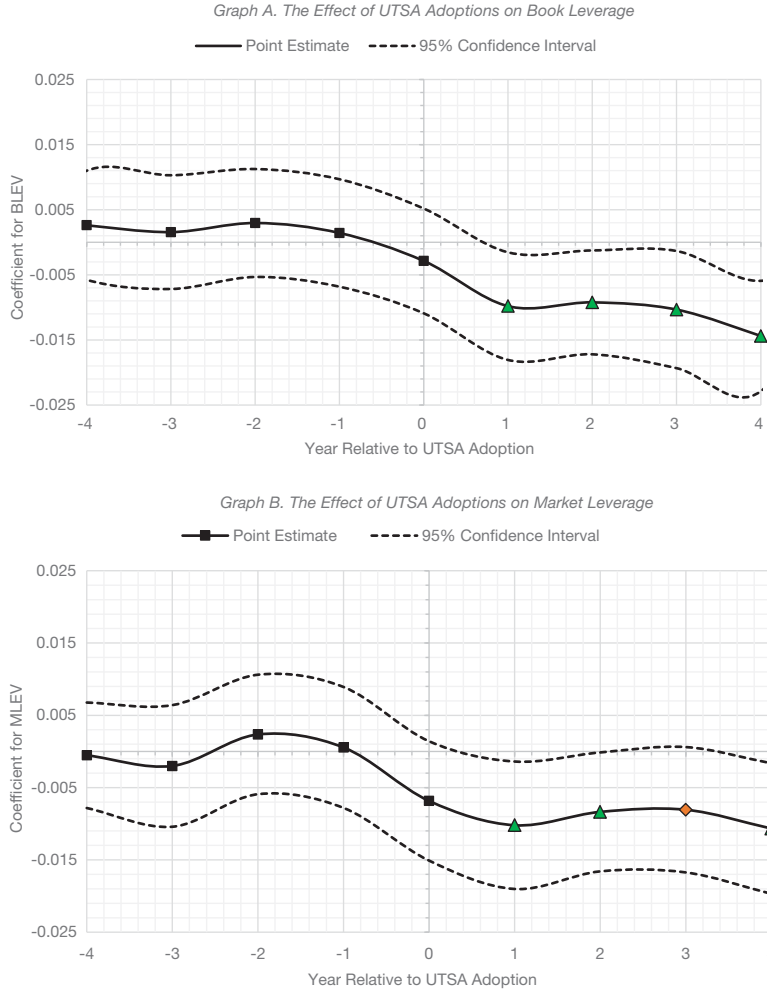
Second, we employ an additional approach widely used in the state-level quasi-natural experiment literature (see, e.g., Chava et al. (2013), Klasa et al. (2018)) to shed further light on the validity of the parallel trends assumption in the UTSA setting. Specifically, in Table 4, we regress, separately, BLEV and MLEV on the following UTSA adoption timing indicators. YEAR_BEFORE1, YEAR_BEFORE2, and YEAR_BEFORE3 are dummies that falsely assume the trade secrets act was enacted 1-, 2-, or 3-years before it was actually passed, respectively, and 0 otherwise; YEAR_0 is a dummy variable equal to 1 in the current year that

[13]We check the robustness of our findings in Table 3 to alternatively defining industry dummies at the 3-digit SIC code level, showing that our results continue to hold (see Supplementary Table OA1).

FIGURE 1

The Effect of UTSA Adoptions on Financial Leverage

Figure 1 plots the timing of changes in BLEV (Graph A) and MLEV (Graph B) relative to the timing of the adoption of the UTSA over the period 1977–2016. We regress BLEV (or MLEV) on dummies for the year relative to UTSA adoption and firm, industry-by-year, and region-by-year fixed effects and plot the resultant coefficients on the relative year dummies on the *y*-axis. The dashed lines correspond to 95% confidence intervals and green triangles (orange diamonds) indicate significance at the 5% (10%) level or higher.



law was adopted, and 0 otherwise; YEAR_1, YEAR_2, and YEAR_3_AND_AFTER are dummies set equal to 1 in the 1-, 2-, or 3-or-more years since the UTSA was enacted, respectively, and 0 otherwise. The dependent variable in the first (last) two columns is BLEV (MLEV).

Similar to Figure 1, we do not find evidence across the four columns in Table 4 that UTSA-firms and non-UTSA-firms had significantly different debt ratios in the pre-adoption years as the point estimates on each of the YEAR_BEFORE1, YEAR_BEFORE2, and YEAR_BEFORE3 dummies are both economically and

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TABLE 4

Timing of UTSA Adoptions and Changes in Financial Leverage

Table 4 reports results from panel regressions of measures of financial leverage on UTSA timing indicator variables. The first (last) two columns specify BLEV (MLEV) as the dependent variable. The UTSA timing indicator variables, YEAR_BEFORE3, YEAR_BEFORE2, YEAR_BEFORE1, YEAR_0, YEAR_1, YEAR_2, and YEAR_3_AND_AFTER, indicate the year relative to each respective states' adoption of the UTSA. Where indicated, we specify the same control variables (firm-level and state-level) as in Table 3 but do not report their respective point estimates to conserve space. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	BLEV		MLEV	
Variable	1	2	3	4
YEAR_BEFORE3	0.000	0.001	−0.002	−0.001
	(0.05)	(0.24)	(−0.53)	(−0.38)
YEAR_BEFORE2	0.002	0.002	0.002	0.003
	(0.48)	(0.55)	(0.57)	(0.82)
YEAR_BEFORE1	0.000	0.000	−0.000	0.000
	(0.04)	(0.09)	(−0.10)	(0.11)
YEAR_0	−0.004	−0.002	−0.007*	−0.005
	(−1.18)	(−0.68)	(−1.85)	(−1.53)
YEAR_1	−0.010***	−0.010***	−0.010**	−0.010**
	(−2.96)	(−2.96)	(−2.42)	(−2.41)
YEAR_2	−0.009**	−0.008**	−0.006	−0.007*
	(−2.53)	(−2.21)	(−1.46)	(−1.90)
YEAR_3_AND_AFTER	−0.013***	−0.011***	−0.008**	−0.007*
	(−3.65)	(−3.12)	(−2.03)	(−1.92)
Firm-level controls	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes
No. of obs.	135,628	135,628	135,628	135,628
Adj. R^2	0.595	0.632	0.638	0.695

statistically insignificant. In contrast, after the law has been passed, and firms have time to adjust their leverage policies, there is a significant decrease in BLEV and MLEV for firms in UTSA-states compared to similar firms located elsewhere. All told, the evidence from Figure 1 and Table 4 suggests the adoption of the UTSA leads to significant reductions in affected firms' financial leverage.

C. Robustness Checks

The analyses contained in this section are aimed at testing the robustness of our main finding that the UTSA leads to reductions in debt. We first examine the relationship between the UTSA and three alternate proxies of financial leverage: NBLEV (NMLEV) denotes net book (market) leverage and is defined as the book value of long-term debt plus debt in current liabilities minus cash and short-term investments divided by the book value of assets (market value of debt and equity); ln(DEBT) is constructed as the natural logarithm of 1 plus book value of long-term debt plus debt in current liabilities. Panel A of Table 5 presents the results.

Focusing only on the fully specified baseline models, the even-numbered columns indicate that firms experiencing increases in statutory protection of trade secrets reduce their use of net book leverage (column 2), net market leverage (column 4), and total debt (column 6). For example, in column 4, we find that the average UTSA-firm decreases its NMLEV ratio by 8.2% (= 0.008/0.097)

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TABLE 5

Robustness Checks

Table 5 reports results from different robustness checks on the effect of UTSA adoptions on financial leverage. In Panel A, we employ alternative measures of financial leverage: NBLEV, NMLEV, and ln(DEBT). In Panel B, we use an alternative measure of trade secrets protection: UTSA_INDEX, which is defined as the change in a state's trade secrets protection after it adopts the UTSA, relative to its level of trade secrets protection beforehand. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Alternative Financial Leverage Measures

	NBLEV		NMLEV		ln(DEBT)	
Variable	1	2	3	4	5	6
UTSA	−0.012**	−0.010**	−0.009**	−0.008**	−0.064**	−0.059***
	(−2.41)	(−2.27)	(−2.09)	(−2.01)	(−2.23)	(−2.84)
Firm-level controls	No	Yes	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	135,628	135,628	135,628	135,628	135,628	135,628
Adj. R^2	0.674	0.726	0.640	0.676	0.818	0.866

Panel B. Alternative Trade Secrets Protection Measure

	BLEV	MLEV	NBLEV	NMLEV	ln(DEBT)
Variable	1	2	3	4	5
UTSA_INDEX	−0.020**	−0.014*	−0.026**	−0.019**	−0.121**
	(−2.34)	(−1.74)	(−2.55)	(−2.42)	(−2.34)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
State-level controls	Yes	Yes	Yes	Yes	Yes
FIRM_FE	Yes	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes	Yes
No. of obs.	115,823	115,823	115,823	115,823	115,823
Adj. R^2	0.637	0.700	0.729	0.675	0.878

relative to its sample mean and after controlling for unobserved, time-varying regional and industry-based heterogeneity. Thus, we document suggestive evidence that the negative relation between UTSA and financial leverage is robust to using alternative dependent variables.

In Panel B of Table 5, we consider a different proxy for the strength of trade secrets protection engendered by the UTSA. Following the approach in Png (2017a), (2017b), our main independent variable is the UTSA_INDEX which captures the change in secrecy protection provided by the UTSA vis-à-vis the level of protection afforded beforehand via states' common law. This measure is described in detail in Table A2 of the Supplemental Appendix in Png (2017a), but, briefly defined here, it encompasses the three dimensions of substantive law, civil procedure, and remedies pertaining to trade secrets law, with scores closest to 1 representing the greatest increase in protection from the UTSA and a score of 0 indicating no law (or no change). The last year data is available for the UTSA_INDEX is 2008, and, consequently, our sample period in Panel B of Table 5 is from 1977 to 2008.

We consider the relation between UTSA_INDEX and all five of our measures for debt financing. Each of the columns in Panel B includes firm, region-by-year, and industry-by-year fixed effects, and includes the full set of control variables (our results are similar if we exclude controls). From these regressions, we show that our

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main finding of a negative relation between enhanced trade secrets protection and financial leverage is robust to the alternative UTSA_INDEX measure. For instance, column 1 (4) indicates that a firm experiencing a 1-standard deviation increase in the UTSA_INDEX reduces its BLEV (NMLEV) by 2.2% (= 0.020 × 0.236/0.218) (4.6% = 0.019 × 0.236/0.097), relative to its sample mean.

D. Potential Endogeneity Concerns

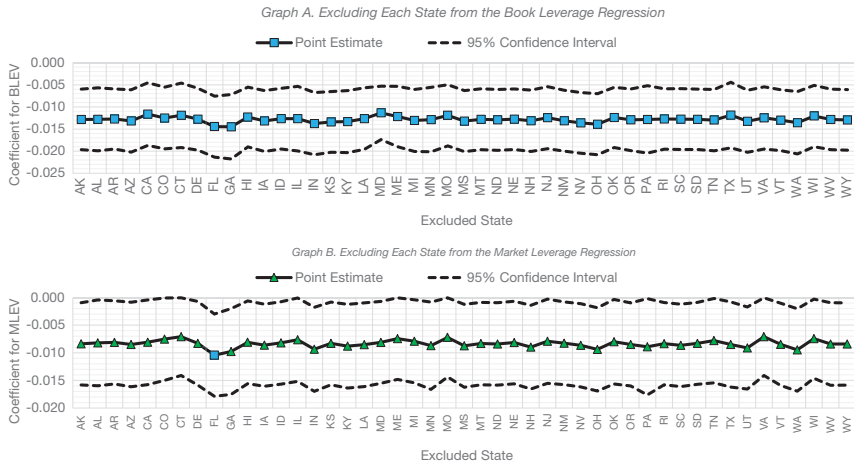
Our next set of tests attempts to rule out potential endogeneity concerns that are inherent in studies that use state laws as a source of identifying variation. In particular, we check the possibility that the negative relation we document between UTSA adoption and debt ratios is driven by i) any single UTSA-enacting state; ii) unobservable factors that are omitted from our regression models but coincide with UTSA adoptions; iii) firms selecting into enhanced trade secrets protection by relocating into a UTSA-adopting state; and iv) misspecified controls.

To begin, we investigate the concern that one particular UTSA-adopting state with a disproportionate number of firm-year observations is driving our results. For example, California houses the most firms in our sample, and it passed the UTSA legislation in 1985. As a corollary, 28.3% (26.1%) of the unique UTSA-firms (firm-years) in our data are located in California. We address this potential issue by estimating analog regressions of column 2 in Panels A and B of Table 3 except where we drop each UTSA-adopting state, one-by-one, from the analysis. We then plot each corresponding point estimate and 95% confidence interval end-points on the *y*-axis. The *x*-axis denotes which state was excluded from the regression estimates. Figure 2 presents our findings.

FIGURE 2

The Effect of UTSA Adoptions on Financial Leverage With Each Adopting State Dropped Once

Figure 2 plots the coefficient estimates from regressions of BLEV (Graph A) and MLEV (Graph B) on a UTSA indicator variable, respectively, where we exclude each adopting state one-by-one over the period 1977–2016. The specification in Graph A (B) is the same as that reported in Table 3, Panel A (B), column 2. Dashed lines correspond to 95% confidence intervals and blue squares (green diamond) indicate significance at the 1% (5%) level.



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Graph A (B) of Figure 2 is specific to the book (market) leverage regressions. We observe from both panels the point estimates are quite stable, with coefficients on BLEV ranging from −0.014 to −0.010, and on MLEV from −0.011 to −0.008. These compare favorably to the respective coefficients of −0.013 and −0.008 we find in Table 3. Moreover, the point estimates in Panel A are always significantly different from 0 at the 1% significance level, whereas 45 out of the 46 coefficient estimates in Panel B are significant at the 5% level (the remaining coefficient estimate is statistically significant at the 1% level).

Moving forward, we next explore the potential concern that our models are misspecified by omitting unobserved relevant factors that coincide with UTSA adoptions. To do so, we follow a similar strategy employed in Gao, Hsu, Li, and Zhang (2020) and randomly assign states (without replacement) UTSA treatment, restricting assignment to the same years in which actual UTSA adoptions occur (i.e., in lockstep with the actual empirical distribution). The general idea behind this placebo test is that if there are confounding, unobserved factors that transpire around the same time as the enactment of the UTSA, they should remain present in the testing framework and could continue to bias our estimates.

We repeat the simulation 2000 times and then estimate the BLEV-(MLEV-) regression model from column 2 in Panel A (B) of Table 3 on the simulated data. Graph A (B) of Figure 3 plots the distribution of the resulting coefficient estimates. The vertical gray lines represent the actual respective regression coefficient based on the actual data. We find that the actual coefficient from the BLEV-(MLEV-) regression lies toward the bottom left tail of the distribution, precisely 3 (2) standard deviations from the mean, suggesting that the effects we find on debt are attributable to the actual UTSA adoptions.

We then proceed to address the concern that a selection bias exists in our empirical strategy and limits our ability to identify the effect of the UTSA on debt ratios. Specifically, using the staggered difference-in-differences research design permits firms to relocate and first-time locate into UTSA-adopting states. As such, the set of firms relocating to states that had already adopted the UTSA are nonrandom with respect to the effect these laws may have on corporate leverage.[14]

To account for a potential selection effect, we create a propensity score-matched sample, where we match each "treated" firm in a UTSA-enacting state in the year before adoption to a "control" firm located in a state without a UTSA in at least the 2 years following its matched counterpart' adoption year. The basic setup behind this approach is that by matching treated and control firms in the year before treatment, we ensure that our matched sample only consists of firms that were located in the state before the UTSA was passed, which disallows the possibility that firms selected into treatment by (re)locating into UTSA-adopting states. Our matching criterion restricts, whenever possible, treated and control firms to locate in the same U.S. Census region and 4-digit SIC industry. However, when it is

[14]For instance, Minnesota (MN) adopts the first UTSA law in 1980 and therefore the only MN-firms that likely did not anticipate strengthened trade secrets protection were those that were located there pre-1980. In contrast, firms that are headquartered in MN any time after 1980 were aware of the stronger trade secrets protection post-UTSA adoption. Hence, there is the potential for a selection bias for a subset of firms that either relocate or are a new establishment in MN post-1980.

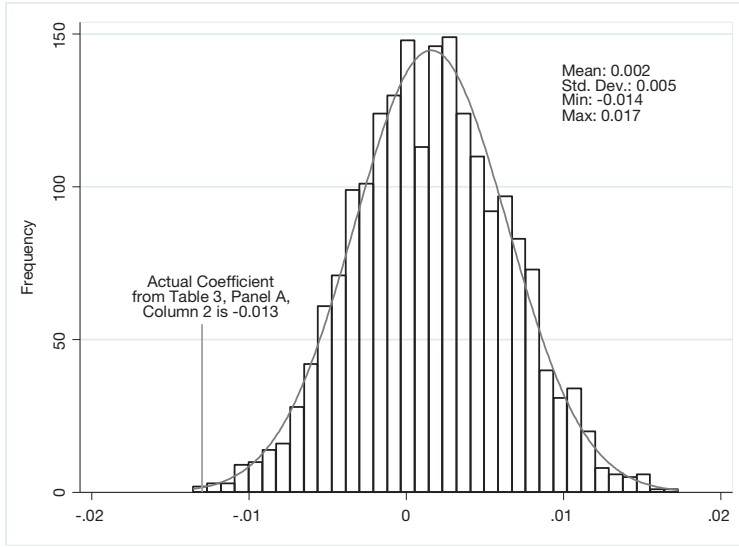
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FIGURE 3

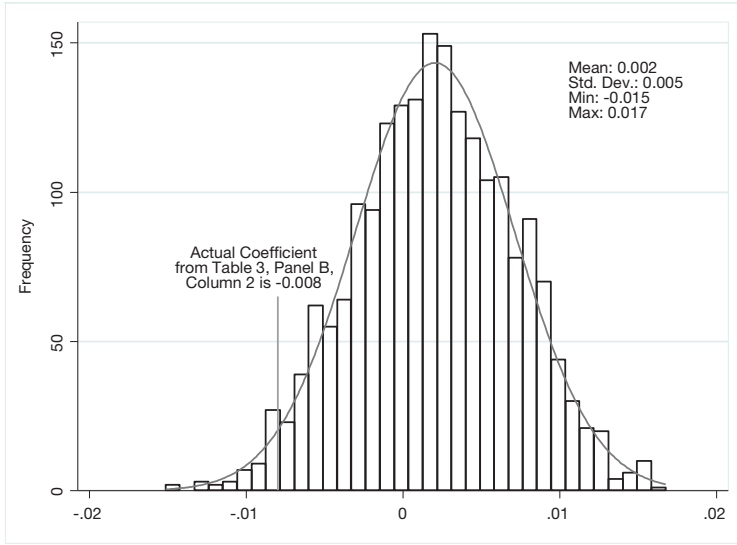
Randomized UTSA Adoptions and Financial Leverage

Figure 3 plots the histogram of the coefficient estimates from randomized UTSA adoption dates across different states. We simulate fictitious adoptions by randomly assigning states UTSAs but maintain the structure of the empirical distribution of actual adoptions. We repeat the simulation 2000 times. In each of the 2000 simulated samples, we run the BLEV (MLEV) regression as in Table 3, Panel A (B), column 2 and plot the histogram of the coefficient estimates in Graph A (B). The vertical gray lines represent the actual regression coefficients based on the actual data.

Graph A. Histogram of the Placebo Coefficient Estimates from the Book Leverage Regressions



Graph B. Histogram of the Placebo Coefficient Estimates from the Market Leverage Regressions



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infeasible to match on exact regions (4-digit SIC industries), we permit matches to the next closest region (3-digit SIC industry). We construct propensity scores for matching based on these conditions along with pre-treatment year levels of BLEV, MLEV, ln(ASSETS), and MTB.

Panel A of Table 6 reports summary statistics for the resultant matched sample in the year before treatment. Each of the matching variables is statistically indifferent between the 2 groups. For example, the MLEV of treated firms in year $t - 1$ is 0.22 with a standard deviation of 0.21, while the MLEV for the matched control firms is 0.23 with a standard deviation of 0.21. The small 0.004 absolute difference is statistically indifferent from 0 with a corresponding absolute t-statistic of 0.46. Furthermore, the SIC4 and REGION dummies are very similar between the 1,423 treated and 1,423 one-to-one matched control firms. Supplementary Table OA2 presents summary statistics for the full matched sample period.

In Panel B of Table 6, we report the coefficient estimates for regressions of a TREATED×POST (we use this variable name instead of UTSA in the matched sample only) interaction term on measures of debt ratios over a $t \pm 2$ estimation window. The first (last) two columns specify BLEV (MLEV) as the dependent variable, and odd-(even-) numbered columns exclude (include) controls. Further, even though we match on region and industry in year $t - 1$, we want to ensure that our comparisons in the post-estimation window remain between these pairs, and therefore, we include firm, region-by-year, and industry-by-year fixed effects. Focusing on column 2 (4), we find that our matched treated firms significantly reduce their use of book (market) leverage by 0.7 (0.9) percentage points, which translates to a 3.3% (= 0.007/0.213) (4.2% = 0.009/0.215) decrease relative to its matched sample mean. These findings alleviate concerns that a selection effect biases our estimates in the full sample.

Finally, we check the concern that our findings are biased by the inclusion of time-varying controls (i.e., the "bad controls" problem; Angrist and Pischke (2009)). For example, including a control for firm size (ln(ASSETS)) in the debt ratio regressions might bias the coefficient on UTSA if the control itself is also affected by the UTSA, rendering any causal inference invalid. Panel C of Table 6 employs two approaches to address this concern. First, in the odd-numbered columns, we lag the potentially endogenous controls by one-period ($t1$) to separate the timing of the effect of the UTSA on contemporaneous debt levels, finding that our estimates are unchanged. Second, in the even-numbered columns, we fix the value of a UTSA-firm's control variable in the specific year before the passage of its state's respective law (denoted by t(S)_1, where t(S) represents the year that state S adopts a UTSA). We then interact the fixed control with the UTSA dummy to control for a UTSA-firm's pre-law control variable in the post-law adoption period. Our inference remains unchanged using this approach.[15]

Overall, the combined findings from the robustness checks and the tests for potential endogeneity concerns continue to support our interpretation that the strengthened trade secrets protection brought about by the passage of the UTSA negatively impacts firm reliance on debt finance.

[15]We verify that all of the tests in the paper are robust to the inclusion and exclusion of time-varying controls.

TABLE 6

Endogeneity Concerns

Table 6 reports results from tests of potential endogeneity concerns on the effect of UTSA adoptions on financial leverage. In Panel A, we report summary statistics and differences in means (*t*-statistics in parentheses) for a matched sample in the year before the UTSA is adopted. We construct our matched sample using propensity score matching in year $t-1$ on BLEV, MLEV, ln(ASSETS), and MTB, and exactly (when possible) on U.S. Census regions and 4-digit SIC codes; when it is not possible to match on exact regions (4-digit SIC) we match on the next closest region (3-digit SIC). TREATED (CONTROL) firms are defined as such if their state of location has (not) adopted the UTSA (in at least the 2-year period following the adoption date for its matched counterpart). In Panel B, we provide the matched sample regression results over a $t \pm 2$ estimation window. In each of these four panels, the same (firm-level and state-level) control variables are specified where indicated as in Table 3 but are unreported to conserve space. In Panel C, we try two alternative approaches to deal with potentially "bad controls" that could also be affected by the UTSA. The first approach takes the lagged value of the firm-level and state-level (excluding the plausibly exogenous other state law) controls. The second approach interacts the UTSA dummy with firm-level and state-level (excluding the plausibly exogenous other state law) controls that are measured in the year before the state adopts the UTSA. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Matching Variable Summary Statistics in Year t − 1

	TREATED	CONTROL	Difference
Variable	1	2	3
BLEV	0.230	0.230	−0.000
	(0.195)	(0.193)	(−0.07)
MLEV	0.223	0.227	−0.004
	(0.210)	(0.211)	(−0.46)
ln(ASSETS)	4.714	4.586	0.128
	(2.012)	(2.053)	(1.63)
MTB	1.904	1.866	0.037
	(1.391)	(1.394)	(0.69)
SIC4	4316	4317	−0.727
	(1992)	(1992)	(−0.01)
REGION	2.658	2.607	0.051
	(1.061)	(1.056)	(1.26)
No. of obs.	1,423	1,423	

	BLEV		MLEV	
Variable	1	2	3	4
Panel B. Matched Sample Book and Market Leverage Regressions				
TREATED×POST	−0.008**	−0.007**	−0.008**	−0.009**
	(−2.12)	(−2.10)	(−2.08)	(−2.04)
Firm-level controls	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes
No. of obs.	24,320	24,320	24,320	24,320
Adj. R^2	0.681	0.719	0.729	0.772
Panel C. Alternative Approaches for Potentially "Bad Controls"				
UTSA	−0.013***	−0.009**	−0.009**	−0.011***
	(−3.63)	(−2.66)	(−2.37)	(−2.85)
Lagged controls	Yes	No	Yes	No
UTSA×CONTROL_t(S)_1	No	Yes	No	Yes
Other state laws as before	Yes	Yes	Yes	Yes
FIRM_FE	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes
No. of obs.	120,261	135,628	120,261	135,628
Adj. R^2	0.628	0.620	0.679	0.677

V. Economic Channels

In this section, we explore potential economic channels that might explain our finding that stronger trade secrets protection, as endorsed by the UTSA, reduces firms' reliance on debt. As motivation, we draw on the existing theoretical and

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empirical capital structure literature and particularly focus our investigation on the "asset pledgeability hypothesis."

A. Asset Pledgeability Hypothesis

Under the asset pledgeability hypothesis, increasing the incentives of a firm to invest in more intangible, firm-specific assets and growth opportunities (by strengthening the capacity of trade secrets to protect its IP) is problematic for creditors due to the lack of collateral value for these *types* of assets, which magnifies contracting problems and makes debt a less attractive source of finance (see, e.g., Long and Malitz (1985), Williamson (1988), Shleifer and Vishny (1992), Hart and Moore (1994), Almeida and Campello (2007), Benmelech and Bergman (2009), and Rampini and Viswanathan (2013)). For instance, prior work suggests that firms with more generalizable (or pledgeable) assets are less susceptible to contracting problems with creditors because assets of this type are easier to redeploy to alternative uses and by alternative users (see, e.g., Campello and Giambona (2013), Kim and Kung (2017)), and are relatively more liquid in secondary markets (see, e.g., Alderson and Betker (1995), Benmelech, Garmaise, and Moskowitz (2005), and Sibilkov (2009)), including when the firm is experiencing financial distress (see, e.g., Ortiz-Molina and Phillips (2014)).

In the following subsections, we test the asset pledgeability hypothesis by analyzing whether UTSA-firms i) that are more likely to (ex ante) rely on trade secrets show more pronounced reductions in debt, ii) increase their investments in intangibles and, correspondingly, away from more pledgeable assets, iii) experience higher costs of private and public debt, and iv) employ alternative means of finance that might be more appealing to firms reliant on trade secrets.

1. Secrecy Reliance

Our first test of the asset pledgeability hypothesis centers on how the UTSA might have heterogeneously impacted firms that were ex ante more reliant on secrecy. We expect to find a more pronounced reduction in financial leverage for this subset of firms because they are the most likely to have pre-existing opaque assets and expenditures and, arguably, the most likely to augment their use of these types of intangibles after the passage of the UTSA (Glaeser (2018)).

We gauge a firm's reliance on secrecy using the following three measures. First, we construct the indicator, PATENTLESS_RD, by setting its value equal to 1 if a firm has nonzero R&D expenditure in the current or preceding 3 years *and* 0 patents granted in the current or following 3 years, and 0 otherwise.[16] Second, we create an indicator labeled UNDER_EXPLAINED_RD which equals 1 if a firm's residual in annual regressions of R&D on the natural logarithm of 1 plus patent counts and our baseline set of fixed effects is negative (i.e., under explains R&D investments), and 0 otherwise.[17] Third, we employ the indicator, SECRETS_INDUSTRY,

[16]A drawback of this measure is that it could capture "bad" patenting firms, rather than secrecy reliant firms. We find, however, that our other measure of secrecy reliance that are not subject to this concern suggest a similar inference.

[17]Our results are unchanged if we construct this measure by including firm-level and/or state-level controls.

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that equals 1 for firms in the manufacturing industry with an above-average survey response citing the effectiveness of "Secrecy" to protect its process innovations (as these innovations are more frequently protected by secrecy than product innovations (Cohen and Klepper (1996), Kultti, Takalo, and Toikka (2007))), and 0 otherwise (Cohen, Nelson, and Walsh (2000)); our analysis focuses on manufacturing firms only when using this measure. We use predetermined ($t1$) values of these measures to capture ex ante or pre-UTSA reliance on secrecy.

Table 7 presents our findings. Panel A (B) reports the coefficient estimates with BLEV (MLEV) as the dependent variable. Further, in each of the specifications, we include our full set of baseline controls (our results are similar if we exclude them) and fixed effects and continue to adjust the standard errors with states of location clustering. We find consistent evidence across each of the columns in both panels that firms that were more ex ante reliant on secrecy reduced their debt ratios more than UTSA-firms that were less dependent on trade secrets. For example, column 1 in Panel A (B) suggests that firms conducting PATENTLESS_RD decreased their use of BLEV (MLEV) by 4.6% (=0.010/0.218) (5.2% = 0.011/0.213), relative to the sample mean. Additionally, in column 3 of Panel A (B), we find that the manufacturing firms that surveyed as more reliant on secrecy decreased BLEV (MLEV) by 1.6 (1.2) percentage points.

Thus, for trade secrets-intensive firms, which are more dependent on an opaque and intangible set of assets and expenditures, the strengthening of protection afforded to trade secrets leads to a more pronounced reduction in financial leverage, consistent with the asset pledgeability hypothesis.

2. Investing in Intangibles

We next test the impact of the UTSA on firm investments in intangible-based assets, capital, and investment opportunities. The asset pledgeability hypothesis suggests that if firms increase their overall use of certain types of assets that are more difficult to redeploy and liquidate in secondary markets or bankruptcy then this could explain the negative relation we find between the UTSA and financial leverage. To further explore this mechanism, we use the following dependent variables to measure potential changes in investments in intangibles.

First, we construct the outcome, INTAN_ASSETS, measured as a firm's intangible assets net of goodwill divided by its total assets (see, e.g., Long and Malitz (1985), Titman and Wessels (1988), and Giannetti (2003)). Second, we specify, INTAN_CAPITAL, which represents a firm's replacement cost of intangible capital scaled by its replacement cost of total capital (Peters and Taylor (2017)). Third, we employ the measure, INTAN_INV_OPP, to capture a firm's intangible-based investment opportunities. We construct this outcome variable as the residuals from regressions of Total Tobin's Q (which explicitly accounts for intangible capital) (Peters and Taylor (2017)) on Tobin's Q (that only explicitly accounts for physical capital) and our baseline fixed effects, with negative residuals set equal to 0.

Table 8 shows our results. The odd-numbered columns exclude the firm- and state-level controls, while the even-numbered columns include them. Further, each of the six columns specifies our full set of fixed effects. To start, columns 1–2 indicate that the average firm located in a UTSA-adopting state increases its

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TABLE 7

Heterogeneous Effects of UTSA Adoptions on Financial Leverage

Table 7 reports results from panel regressions of financial leverage on a UTSA indicator variable and its interaction with measures of firm reliance on trade secrets. In Panel A, we measure financial leverage using a firm's book leverage (BLEV). In Panel B, we measure financial leverage using a firm's market leverage (MLEV). UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. Measures of firm reliance on trade secrecy include: PATENTLESS_RD is an indicator equal to 1 if a firm has nonzero R&D expenditure in the current or preceding 3 years and 0 patents granted in the current or next 3 years, and 0 otherwise; UNDER_EXPLAINED_RD is an indicator equal to 1 if a firm's residual from annual regressions of R&D on ln(1 + PATENT) is negative, and 0 otherwise; SECRETS_INDUSTRY is an indicator equal to 1 if a firm belongs to a manufacturing industry with an above-average reliance on secrecy, and 0 otherwise. Each of these trade secrecy reliance indicators are lagged 1-period (t1). Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Dependent Variable is Book Leverage

	BLEV		
Variable	1	2	3
UTSA×PATENTLESS_RD_t1	−0.010**		
	(−2.08)		
UTSA×UNDER_EXPLAINED_RD_t1		−0.005**	
		(−2.01)	
UTSA×SECRETS_INDUSTRY_t1			−0.016**
			(−2.02)
UTSA	−0.009**	−0.010***	−0.002
	(−2.07)	(−2.97)	(−0.36)
PATENTLESS_RD_t1	0.002		
	(0.43)		
UNDER_EXPLAINED_RD_t1		0.006***	
		(3.39)	
SECRETS_INDUSTRY_t1			NA
Firm-level controls	Yes	Yes	Yes
State-level controls	Yes	Yes	Yes
FIRM_FE	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes
No. of obs.	89,104	94,669	72,529
Adj. R^2	0.631	0.636	0.589

	MLEV		
Variable	1	2	3
Panel B. Dependent Variable is Market Leverage			
UTSA×PATENTLESS_RD_t1	−0.011**		
	(−2.58)		
UTSA×UNDER_EXPLAINED_RD_t1		−0.006**	
		(−2.34)	
UTSA×SECRETS_INDUSTRY_t1			−0.012*
			(−1.72)
UTSA	−0.001	−0.006	−0.005
	(−0.29)	(−1.56)	(−1.11)
PATENTLESS_RD_t1	0.001		
	(0.51)		
UNDER_EXPLAINED_RD_t1		0.002	
		(0.91)	
SECRETS_INDUSTRY_t1			NA
Firm-level controls	Yes	Yes	Yes
State-level controls	Yes	Yes	Yes
FIRM_FE	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes
No. of obs.	89,104	94,669	72,529
Adj. R^2	0.699	0.697	0.706

TABLE 8

UTSA Adoptions and Intangibility

Table 8 reports results from panel regressions of measures of firm-level intangibility on a UTSA indicator variable. Measures of firm-level intangibility include INTAN_ASSETS, INTAN_CAPITAL, and INTAN_INV_OPP. UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. Firm-level controls include: ln(ASSETS), MTB (excluded from columns 5–6), ROA, FIXED_ASSETS (excluded from columns 1–2), and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	INTAN_ASSETS		INTAN_CAPITAL		INTAN_INV_OPP	
Variable	1	2	3	4	5	6
UTSA	0.009**	0.009**	0.007**	0.005**	0.030***	0.027***
	(2.03)	(2.18)	(2.60)	(2.22)	(3.02)	(2.69)
Firm-level controls	No	Yes	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	135,628	135,628	133,078	133,078	132,791	132,791
Adj. R^2	0.714	0.736	0.891	0.919	0.228	0.298

investments in intangible assets by 5.3% (=0.009/0.170), relative to the sample mean. Moving over to the next two columns, we document that UTSA-firms increase their levels of intangible capital. Finally, in columns 5–6, we find a strongly significant (at the 1% level) effect of the UTSA on the affected firms' intangible-based investment opportunities, suggesting that the strengthening of trade secrets protection results in 15.1% (=0.027/0.179) to 16.8% (=0.030/0.179) improvements in INTAN_INV_OPP.[18]

Overall, the findings in Table 8 are consistent with the asset pledgeability hypothesis as the evidence suggests the UTSA meaningfully impacted firms' incentives to increase their overall investments in intangibles, which are primarily unobservable by creditors and, as such, are much more difficult to pledge as collateral.

3. Cost of Debt

In this subsection, we consider whether the increases in investments in intangibles and overall intangibility, documented above, translates to higher costs of debt. We conjecture via the asset pledgeability hypothesis that the UTSA results in reductions in financial leverage by making debt a less desirable (i.e., more costly) source of funds. To test this explanation, we regress measures of public and private debt costs on the UTSA indicator.

We define the cost of public debt as the yield spread (YLD_SPRD) on a publicly issued corporate bond. In particular, YLD_SPRD is calculated as the yield to maturity of the bond minus the yield to maturity on a treasury bond of similar maturity. We convert the spreads to a firm-year measure by taking the average spread on all outstanding bonds that trade over a year. Our data for the corporate bond yields come from the WRDS Bond Returns database (which incorporates data

[18]We also confirm prior findings that the UTSA is positively associated with R&D spending and negatively related to patenting activity (Png (2017a), (2017b)). These results are included in Supplementary Table OA3.

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TABLE 9

UTSA Adoptions and the Cost of Debt

Table 9 reports results from panel regressions of measures of a firm's cost of debt on a UTSA indicator variable. In Panel A, we measure the cost of debt using yield spreads on publicly issued corporate bonds (YLD_SPRD) over the sample period 2002–2016. In Panel B, we measure the cost of debt using loan spreads on bank debt (LOAN_SPRD) over the sample period 1987–2016. In both panels, we multiply the respective dependent variables by 100. UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Dependent Variable is the Yield Spread

	YLD_SPRD			
Variable	1	2	3	4
UTSA	0.451**	0.472**	0.465**	0.250**
	(2.27)	(2.15)	(2.24)	(2.05)
Firm-level controls	No	No	No	Yes
State-level controls	No	No	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes
YEAR_FE	Yes	Yes	No	No
INDUSTRY FE	No	Yes	Yes	Yes
REGION_YEAR_FE	No	No	Yes	Yes
No. of obs.	8,532	8,532	8,532	8,532
Adj. R^2	0.668	0.672	0.674	0.717

Panel B. Dependent Variable is the Loan Spread

	LOAN_SPRD			
Variable	1	2	3	4
UTSA	0.118**	0.128**	0.118**	0.094***
	(2.26)	(2.26)	(2.56)	(2.69)
Firm-level controls	No	No	No	Yes
State-level controls	No	No	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes
YEAR_FE	Yes	Yes	No	No
INDUSTRY FE	No	Yes	Yes	Yes
REGION_YEAR_FE	No	No	Yes	Yes
No. of obs.	22,948	22,946	22,946	22,946
Adj. R^2	0.531	0.535	0.535	0.568

from FINRA's TRACE data and Mergent FISD and applies the filtering techniques from Dick-Nielsen (2009, 2014)) and for the treasury yields from the Federal Reserve's H15 reports. Our measure for the cost of private debt, LOAN_SPRD, is defined as the all-in spread drawn, which is the amount the borrower pays in basis points over LIBOR for each dollar drawn down. We convert spreads to a firm-year measure by taking the average spread on all outstanding loans that originate over a year. The data for LOAN_SPRD comes from the Dealscan database, and we follow the filtering techniques of prior studies (see, e.g., Chava and Roberts (2008), Jiang et al. (2018)). We convert YLD_SPRD and LOAN_SPRD to percentage forms (and multiply by 100 in the regressions).

Panel A (B) of Table 9 reports the findings on public (private) debt. In each of the panels, the first three columns exclude firm- and state-level controls while the last column includes the full set of controls. Further, each of the four columns specifies firm fixed effects, while including different combinations of year, industry, and/or region-by-year fixed effects.[19] In support of the asset pledgeability

[19]Given the limitations of the debt pricing data, our sample size is substantially reduced by specifications that require industry-by-year fixed effects, leaving inadequate power for statistical tests.

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hypothesis, we find suggestive evidence that UTSA-firms experience higher costs of debt in both the bond market and for bank loans, reflecting the significantly higher risks of trade secrets-based intangibility for creditors. For example, in both panels, our fully specified model in column 4 shows, respectively, that the YLD_SPRD is 6.1% (=0.25/4.1) and LOAN_SPRD is 4.7% (=0.094/2) higher for a firm located in a state that adopts the UTSA, relative to its sample average and compared with firms located elsewhere.

4. Sources of Funds

The aim of this subsection is to investigate how firms located in UTSA-adopting states fund both the reductions in debt and increases in intangible investments, and if that financing choice is consistent with the asset pledgeability hypothesis. Motivated by prior work that finds that more innovation-intense firms tend to prefer equity finance (see, e.g., Acharya and Subramanian (2009), Brown et al. (2009)), we hypothesize that UTSA-firms are more likely to issue new equity, and especially for the subset of firms facing more severe financing constraints (Frank and Goyal (2003)).

In Panel A of Table 10, we measure a firm's use of equity financing with the following dependent variables. Our first outcome, EQUITY_ASSETS, is defined as stockholder's equity scaled by total assets. Second, we calculate the percentage increase in equity (PCT_INC_EQUITY) as the ratio of current stockholder's equity (t) to last period's ($t1$) and set the negative changes in equity to 0. Third, we set the indicator variable, SEO_DUMMY, equal to 1 if a firm undertakes a seasoned equity offering in the current year, and 0 otherwise (Atanassov (2016)). Fourth, we estimate the offer size of the SEO, ln(NET_PROCEEDS), as the natural logarithm of an offer's net proceeds (Lee and Masulis (2009)). The final outcome, ln(SHARES_FILED), is measured as the natural logarithm of the number of shares filed at the original SEO filing (Mola and Loughran (2004)). Our data for the last three variables come from the SDC Global Issues database, and the regression models specific to this data follow similar specifications as in Lee and Masulis (2009).

Beginning with columns 1–2 of the panel, we find that strengthened trade secrets protection via the UTSA is positively related to both EQUITY_ASSETS and PCT_INC_EQUITY. For example, the coefficient estimate of 0.011 in column 1 represents a 2.1% (=0.011/0.515) increase in a firm's equity-to-asset ratio, relative to the sample mean, following the adoption of the UTSA. Moving to column 3, our evidence suggests that firms located in UTSA-adopting states are 1.5% more likely to issue equity in an SEO relative to firms located elsewhere. Rounding out the panel, columns 4–5 imply that UTSA-firms' SEO offer size increases, respectively, by 6.7% in terms of net proceeds and 6.6% with respect to the number of shares filed at the original filing.

Next, in Panel B of Table 10, we analyze the impact of the UTSA on net equity (and debt) issuances for firms with more severe financing deficits (Frank and Goyal (2003)). Following Fama and French (2005), we employ both a book (BNEQUITY) and market (MNEQUITY) measure of net equity issuance (along with a measure of net book debt issuance, BNDEBT). We estimate the financing deficit as the difference between changes in total assets and retained earnings, respectively, scaled by total assets. Further, to capture the severity of a firm's

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TABLE 10

UTSA Adoptions and Equity Financing

Table 10 reports results from panel regressions investigating the effect of UTSA adoptions on equity financing decisions. In Panel A, we regress the following measures of equity financing on a UTSA indicator variable: EQUITY_ASSETS, PCT_INC_EQUITY, SEO_DUMMY, ln(NET_PROCEEDS), and ln(SHARES_FILED). In Panel B, we regress the following measures of equity (and debt) issuance on a UTSA indicator and its interaction with a financing deficit dummy variable: BNEQUITY and MNEQUITY (and BNDEBT). UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. DEFICIT_DUMMY is set to 1 if a firm's level of its financing deficit lies in the top quartile of the empirical distribution, and 0 otherwise. We lag the financing deficit-dummy 1-period (t1). Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Equity Financing

	EQUITY_ASSETS	PCT_INC_EQUITY	SEO_DUMMY	ln(NET_PROCEEDS)	ln(SHARES_FILED)
Variable	1	2	3	4	5
UTSA	0.011***	0.013**	0.015**	0.067**	0.066*
	(2.89)	(2.02)	(2.43)	(2.57)	(1.72)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
State-level controls	Yes	Yes	Yes	Yes	Yes
FIRM_FE	Yes	Yes	No	No	No
INDUSTRY_YEAR_FE	Yes	Yes	Yes	No	No
REGION_YEAR_FE	Yes	Yes	Yes	No	No
YEAR_FE	No	No	No	Yes	Yes
INDUSTRY_FE	No	No	No	Yes	Yes
REGION_FE	No	No	No	Yes	Yes
No. of obs.	135,628	120,249	38,167	4,146	3,812
Adj. R^2	0.631	0.213	0.373	0.734	0.536

Panel B. Funding the Financing Deficit

	BNEQUITY		MNEQUITY		BNDEBT	
Variable	1	2	3	4	5	6
UTSA×DEFICIT_DUMMY_t1	0.042***	0.039***	0.031*	0.030*	−0.006	−0.008
	(2.95)	(2.95)	(1.68)	(1.85)	(−0.75)	(−0.95)
UTSA	−0.015***	−0.014***	−0.008	−0.007	−0.004	−0.004
	(−3.15)	(−2.95)	(−1.61)	(−1.43)	(−1.43)	(−1.45)
DEFICIT_DUMMY_t1	0.290***	0.277***	0.125***	0.106***	0.199***	0.197***
	(27.39)	(28.18)	(10.11)	(10.05)	(30.48)	(31.37)
Firm-level controls	No	Yes	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes	No	Yes
FIRM_FE	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	120,258	120,258	120,255	120,255	120,259	120,259
Adj. R^2	0.605	0.622	0.450	0.509	0.355	0.375

financing deficit, we create the indicator variable, DEFICIT_DUMMY, which is set equal to 1 if a firm's level of its financing deficit lies in the top quartile of the empirical distribution, and 0 otherwise; we lag this measure by 1 year (*t*1). The odd-(even-)numbered columns exclude (include) both firm- and state-level control variables.

In columns 1–4, we find that the passage of the UTSA results in a statistically significant increase in net book and net market equity issuances for firms with more severe financing deficits. Meanwhile, the UTSA-firms with less pressing financing needs either decrease or leave unchanged their equity financing. Finally, in columns 5–6, we find a negative but statistically insignificant coefficient estimate on the standalone UTSA dummy and its interaction with DEFICIT_DUMMY, suggesting that UTSA-firms, irrespective of financing needs, do not rely on debt as a source of

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funds to finance investments in intangibles or to repay existing debt. Overall, the combined evidence in Table 10 is consistent with the asset pledgeability hypothesis as it supports prior conclusions that innovation-intensive firms are more likely to employ equity finance, instead of debt, on account of the inherent information problems and lack of collateral value associated with these types of firms (Brown et al. (2009)).

We conclude this subsection by checking whether UTSA-firms utilize any other forms of financing besides equity to pay down debt and ramp up investments in intangibles. In particular, we consider three alternative sources of funds. Cash, measured either as the ratio of cash and short-term investments scaled by the book value of assets (CASH_ASSETS) (Harford, Klasa, and Maxwell (2014)) or as the percentage change in cash holdings (PCT_CHG_CASH) over the year; asset sales (ASSET_SALES), calculated as an indicator set to 1 if a firm recognizes a gain or loss from the sale of its property, plant, and equipment, and 0 otherwise; payout, defined either as the ratio of a firm's cash dividends to assets (DIV_ASSETS), as share repurchases scaled by assets (REPURCH_ASSETS), or as cash dividends plus the difference between the purchase and sale of common and preferred stock (EQUITY_PAYOUT) (Danis, Rettl, and Whited (2014)).

Table 11 presents the results. For starters, we do not find evidence that the UTSA-firms use of cash (columns 1–2) or asset sales (column 3) is influenced by the act's passage.[20] In column 4, however, we find marginally significant evidence that UTSA-firms might cut their payout to fund the investments in intangibles and pay down debt as the coefficient estimate of −0.001 suggests these firms decreased cash dividends by 12.5% (= 0.001/0.008), relative to its sample average. Although, the evidence on payout as a source of funds is less robust as we do not observe any

TABLE 11

UTSA Adoptions and Alternative Financing Methods

Table 11 reports results from panel regressions of measures of alternative methods of financing on a UTSA indicator variable. Measures of alternative financing methods include CASH_ASSETS, PCT_CHG_CASH, ASSET_SALES, DIV_ASSETS, REPURCH_ASSETS, and EQUITY_PAYOUT. UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND (excluded from columns 4–6). State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	CASH_ ASSETS 1	PCT_CHG_ CASH 2	ASSET_ SALES 3	DIV_ ASSETS 4	REPURCH_ ASSETS 5	EQUITY_ PAYOUT 6
UTSA	−0.003	0.000	−0.010	−0.001*	−0.001	−0.003
	(−0.97)	(0.01)	(−1.15)	(1.93)	(−1.17)	(−0.88)
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes
State-level controls	Yes	Yes	Yes	Yes	Yes	Yes
FIRM_FE	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
REGION_YEAR_FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	135,628	119,610	135,628	134,455	126,919	123,508
Adj. R^2	0.731	0.033	0.419	0.660	0.263	0.429

[20]This evidence is inconsistent with the pecking order theory (Myers and Majluf (1984)) in which increases in intangibility and investment opportunities via the UTSA (thus increasing a firm's asymmetric information) would result in the prioritization of internal financing.

changes in UTSA-firms utilization of share repurchases (column 5) or total equity payout (column 6), which includes cash dividends, as a means of alternative financing.

B. The Product and M&A Market

In this subsection, we explore the strategic impact of UTSA-firms' financing and investment choices, focusing in particular on the product and M&A market. We expect that UTSA-firms take advantage of their newfound trade secrets protection by actively managing their capital structures to expand their reach in the markets of competitors. Table 12 tests our hypothesis.

In Panel A of Table 12, we employ three main measures to capture the effect of the UTSA in the product market. First, using the metric on "total similarity" from Hoberg and Phillips (2016), we create DELTA_TOT_SIMLRTY as the year-over-year change in total similarity. Second, we measure the change in a rival firm's product fluidity, DELTA_PRD_FLUID, employing Hoberg et al.'s (2014) "product

TABLE 12

The Product and M&A Market

Table 12 reports results from panel regressions of measures of changes in product and M&A markets on a UTSA indicator variable. In Panel A, measures of changes in the product market include DELTA_TOT_SIMLRTY, DELTA_PRD_FLUID, and POS_ADVTSE_RD. The sample period in columns 1–2 (3–4) is 1996–2016 (1997–2016), and in columns 5–6 it is 1976–2016. In Panel B, measures in changes in the M&A market include EQUITY_PAYMENT and DIVERSIFY_ACQ. The sample period is 1985–2016. UTSA equals 1 if a firm's state of location has adopted the UTSA, and 0 otherwise. NO_UTSA equals 1 if a firm's state of location has not adopted the UTSA, and 0 otherwise. Firm-level controls include: ln(ASSETS), MTB, ROA, FIXED_ASSETS, and DIVIDEND. State-level controls include: ln(GDPPC), GDP_GROWTH, POLITICAL_REP, ATS, IDD, and WDL. Appendix B provides variable definitions. Industry dummies are defined by 4-digit SIC codes and region dummies are measured with U.S. Census regions. All continuous variables are winsorized at the 2.5% level in both tails. *t*-statistics (clustered by state of location) are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. The Product Market

	DELTA_TOT_SIMLRTY		DELTA_PRD_FLUID		POS_ADVTSE_RD	
Variable	1	2	3	4	5	6
UTSA	−0.011**	−0.016**	NA	NA	0.012*	0.012**
	(−2.20)	(−2.01)			(1.87)	(2.17)
NO_UTSA	NA	NA	0.010**	0.012***	NA	NA
			(2.52)	(5.66)		
Firm-level controls	No	Yes	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes	No	Yes
INDUSTRY_FE	Yes	Yes	Yes	Yes	No	No
YEAR_FE	Yes	Yes	Yes	Yes	No	No
FIRM_FE	No	No	No	No	Yes	Yes
INDUSTRY_YEAR_FE	No	No	No	No	Yes	Yes
REGION_YEAR_FE	No	No	No	No	Yes	Yes
No. of obs.	58,388	58,388	53,335	53,335	129,921	129,921
Adj. R^2	0.001	0.004	0.187	0.188	0.892	0.893

Panel B. The M&A Market

	EQUITY_PAYMENT		DIVERSIFY_ACQ	
Variable	1	2	3	4
UTSA	0.102**	0.070*	0.058*	0.076*
	(2.31)	(1.73)	(1.69)	(1.95)
Firm-level controls	No	Yes	No	Yes
State-level controls	No	Yes	No	Yes
INDUSTRY_FE	Yes	Yes	Yes	Yes
REGION_FE	Yes	Yes	Yes	Yes
YEAR_FE	Yes	Yes	Yes	Yes
No. of obs.	1,837	1,837	1,837	1,837
Adj. R^2	0.149	0.197	0.169	0.171

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fluidity" variable. Third, we construct an indicator set equal to 1 if a firm has positive advertising and R&D expenditure, POS_ADVTSE_RD, in the current year, and 0 otherwise. This last variable has been used by prior studies to capture changes in product differentiation as a means of erecting endogenous barriers to entry (Sutton (1991)). Our regression models in this panel are similar to specifications in Hoberg and Phillips (2016).

Starting in columns 1–2, and either including or excluding controls, we find, respectively, that the UTSA results in a 1.1%–1.6% reduction in product market similarity, relative to the sample average (=1.022), and, thus, a movement toward more differentiated products. In columns 3–4, we show that rival firms located in non-UTSA-adopting states (NO_UTSA) experience a 1%–1.2% intensified change in their product space, compared with its sample average (= 1.040), due to the actions of UTSA-competitors in the rivals' product market. Finally, columns 5–6 show that firms in UTSA-adopting states are 1.2% more likely to have positive advertising and R&D expenditures, implying that these firms take advantage of their strengthened trade secrets protection by differentiating their products, thus, erecting endogenous barriers to entry.

In Panel B of Table 12, we analyze how strengthened trade secrets protection affects firms' behavior in the M&A market. Our tests in this panel both consider how UTSA-firms fund acquisitions as well as the types of acquisitions being made. First, we define the indicator variable, EQUITY_PAYMENT, by setting its value to 1 if a firm uses at least some equity as payment in an acquisition (i.e., stock-only transaction or a mix of stock and cash transaction), and 0 otherwise (i.e., cash-only transaction). Second, we construct, DIVERSIFY_ACQ, as an indicator equal to 1 if a firm acquires a firm in a different 4-digit SIC code industry, and 0 otherwise (as in Custodio (2014)). The odd-(even-)numbered columns exclude (include) our baseline controls, and each column specifies industry, region, and year-fixed effects.

Consistent with prior evidence suggesting that a firm's capital structure matters for its M&A decisions (Harford, Klasa, and Walcott (2009)), we find that UTSA-firms are more likely to use equity as payment in an acquisition. For example, in column 1, after the passage of the UTSA, firms located in the adopting states are 10.2% more likely to use some equity, rather than only cash, when acquiring a target firm. This evidence is supportive of our prior findings that suggest UTSA-firms increase their use of equity finance. Next, in columns 3–4, we show that acquiring firms in UTSA-states are 5.8%–7.6% more likely to make a diversifying acquisition, indicating that the laws incentivize affected firms to branch out into more diverse markets via M&A.

Overall, the combined findings from Table 12 imply that the increases in investments in intangibles and the active decision to switch from debt to equity finance, stemming from the UTSA, enables firms to take advantage of strengthened trade secrets protection by expanding their competitive reach through the product market and M&A market.

C. Other Possible Channels

We consider two other possible economic channels as an explanation for our main finding that the UTSA leads to reductions in debt levels: the static and dynamic versions of the trade-off theory of capital structure.

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Under the static framework, firms choose an optimal mix of debt and equity by balancing the tax benefits with the financial distress costs of debt (see, e.g., Kraus and Litzenberger (1973), Scott (1976), and Graham (2003)). Thus, increases (reductions) in a firm's expected future distress costs (profitability), perhaps due to increases in riskier intangible investments, result in lower debt ratios. Alternatively, in a dynamic setting, higher (lower) expected future distress costs (profitability) could make a firm less likely to conserve its debt capacity because a scarcity of future investment opportunities renders this financial resource unnecessary (DeAngelo et al. (2011)). Under this framework, anticipated higher (lower) expected future distress costs (profitability) prior to a firm's state of location adopting the UTSA could confound our estimates, leading to the incorrect inference that the laws are the cause of the decreases in debt.

Checking the validity of these two alternative explanations, first, in Supplementary Table OA4, we investigate whether UTSA adoptions impact affected firms' level of financial distress and profitability. In Panel A of this table, we specify MOD_Z_SCORE (i.e., modified Altman's *Z*-Score) and O_SCORE (i.e., Ohlson's O-Score) to measure financial distress, and in Panel B, we measure profitability with ROA and PROFIT_MARGIN; Supplementary Table OA6 provides definitions for variables used in the Supplementary Material only. The four columns across both panels include our standard set of fixed effects, while the odd-(even-) numbered columns exclude (include) the firm- and state-level controls. Inspecting each of the coefficient estimates reveals that the strengthened trade secrets protection provided by the UTSA does not significantly change a firm's level of financial distress or profitability, inconsistent with the static trade-off theory of capital structure.

We next explore the possibility that a firm's expected future distress costs and/or profitability changed prior to UTSA adoptions, thus rendering the laws spuriously correlated with financial leverage. In Panel A (B) of Supplementary Table OA5, we append our baseline model to include controls for current (*T*), next year's (*T*1), and 2-years' (*T*2) from now financial distress (profitability): MOD_Z_SCORE and O_SCORE (ROA and PROFIT_MARGIN). In each of the panels, the first (last) two columns specify BLEV (MLEV) as the dependent variable. From these regressions, we find that the negative effect of the UTSA on financial leverage remains economically and statistically significant even after appending additional controls for a firm's level of future financial distress or profitability. This combined evidence helps to rule out that our main results are driven by a firm's anticipation of changes in financial distress or profitability after their state adopts a UTSA.

VI. Conclusions

This study investigates changes in a firm's financing decisions due to a shift in its investments and composition toward more overall intangibility in the form of trade secrets. To identify the impact of trade secrecy on capital structure choices, we exploit U.S. states' staggered adoption of the Uniform Trade Secrets Act (UTSA).

The UTSA increases the protection of trade secrets by codifying states' pre-existing common law, standardizing its legal definition, detailing what constitutes illegal misappropriation, and, most importantly, clarifying the rights and remedies for wronged firms.

Using a difference-in-differences research design with firm, region-by-year, and industry-by-year fixed effects, we compare the changes in the debt ratios of firms headquartered in states that adopt the UTSA to those of firms headquartered elsewhere but which operate in the same geographical region and share time-varying industry trends. We document an economically and statistically significant decline in book and market leverage following the adoption of the UTSA. Results from a battery of robustness tests aimed at addressing endogeneity concerns support this conclusion.

As an economic explanation for the finding that strengthened trade secrets protection lowers optimal debt ratios, we set forth the "asset pledgeability hypothesis" (see, e.g., Long and Malitz (1985), Williamson (1988), and Shleifer and Vishny (1992)). Under this framework, an increase in the use of secrecy (and intangibles) magnifies contracting problems with creditors because such types of assets are more difficult to redeploy and more challenging to sell in secondary markets or bankruptcy, leading to a net reduction in debt.

In support of the asset pledgeability hypothesis, we find that firms located in UTSA-adopting states and more ex ante reliant on secrecy show more pronounced decreases in debt. Additionally, the strengthened trade secrets protection enabled by the UTSA encourages investments in intangibles (and away from patents), with creditors of UTSA-firms responding by demanding higher loan and yield spreads as compensation for the increase in overall firm-specific intangibility (and, thus, reduction in asset pledgeability), rendering debt a more costly source of financing.

Consistent with prior studies' assessment that more innovation-intense firms have inherent information problems and a lack of collateral value (see, e.g., Brown et al. (2009)), which makes debt a less compatible source of funds, we show that UTSA-firms finance both their investments in intangibles and pay down debt by issuing new equity. Relatedly, we find that the increases in net equity issuances are primarily driven by firms in UTSA-states with more severe financing deficits (Frank and Goyal (2003)). Finally, we explore whether strengthened trade secrets protection affects firm behavior in the product and M&A market. We find that the UTSA results in both more product differentiation and diversifying acquisitions, suggesting that UTSA-firms take advantage of the increased incentives to use trade secrets by expanding their competitive reach through the product and M&A market.

Overall, our study highlights the interdependence of financial policies with decisions on how best to protect knowledge-based intangibles and provides new insights into how stronger trade secrets protection can lead to more actively managed capital structures and the strategic behavior therein.

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Appendix A. Adoption of the UTSA

TABLE A1

List of States With the Uniform Trade Secrets Act (UTSA)

Table A1 lists the years when different states adopted the UTSA. The New York Senate introduced Senate Bill 2468 on Jan. 8, 2020 that, if passed, would make New York the 49th state to adopt a UTSA.

State	Adoption Year	State	Adoption Year
Alabama	1987	Montana	1985
Alaska	1988	Nebraska	1988
Arizona	1990	Nevada	1987
Arkansas	1981	New Hampshire	1990
California	1985	New Jersey	2012
Colorado	1986	New Mexico	1989
Connecticut	1983	New York	
Delaware	1982	North Carolina	
Florida	1988	North Dakota	1983
Georgia	1990	Ohio	1994
Hawaii	1989	Oklahoma	1986
Idaho	1981	Oregon	1988
Illinois	1988	Pennsylvania	2004
Indiana	1982	Rhode Island	1986
Iowa	1990	South Carolina	1992
Kansas	1981	South Dakota	1988
Kentucky	1990	Tennessee	2000
Louisiana	1981	Texas	2013
Maine	1987	Utah	1989
Maryland	1989	Vermont	1996
Massachusetts	2018	Virginia	1986
Michigan	1998	Washington	1982
Minnesota	1980	West Virginia	1986
Mississippi	1990	Wisconsin	1986
Missouri	1995	Wyoming	2006

Appendix B. Variable Definitions

ASSETS: The book value of assets adjusted for inflation using 2009 dollars. We use the natural logarithm of this variable.

ASSET_SALES: An indicator variable set equal to 1 if a firm recognizes either a gain or loss from the sale of its property, plant, and equipment, and 0 otherwise. Calculated from Compustat using *sppe*.

ATS: A count variable summing the number of antitakeover statutes a firm's state of incorporation has adopted by the current year. ATS is comprised of first generation, business combination, control share, directors' duties, fair price, and poison pill laws. Calculated using adoption dates from Karpoff and Wittry (2018).

BLEV: Book leverage. Calculated from Compustat using $(dltt + dlc)/at$.

BNDEBT: Book measure of net debt issued. Calculated from Compustat using $(lt - lt_t1)/at$.

BNEQUITY: Book measure of net equity issued. Calculated from Compustat using $((seq - seq_t1) - (re - re_t1))/at$.

CASH_ASSETS: Cash and short-term investments scaled by the book value of assets. Calculated from Compustat using che/at.

DEBT: The book value of long-term debt plus debt in current liabilities. Calculated from Compustat using $dltt + dlc$. We use the natural logarithm of this variable.

DELTA_PRD_FLUID: The change in product market fluidity. Calculated using the 10-K based Product Market Fluidity data from Hoberg et al. (2014).

DELTA_TOT_SIMLRTY: The change in total similarity. Calculated using the 10-K Text-based Network (TNIC) Industry Total Similarity data from Hoberg and Phillips (2016).

DIV_ASSETS: Cash dividends scaled by the book value of assets. Calculated from Compustat using *dv*/*at.*

DIVERSIFY_ACQ: An indicator set to 1 if a firm acquires another firm operating in a different 4-digit SIC code industry, and 0 otherwise. Calculated using SIC codes from the SDC M&A database.

DIVIDEND: An indicator variable set to 1 if a firm pays a common dividend during the current fiscal year, and 0 otherwise. Calculated from Compustat using *dvc.*

EQUITY_ASSETS: Stockholder's equity scaled by the book value of assets. Calculated from Compustat using *seq*/*at.*

EQUITY_PAYMENT: An indicator variable set to 1 if at least some of the payment used in the acquisition is equity (i.e., either an all equity payment or a mix of equity and cash), and set to 0 if no equity is used (i.e., an all cash deal). Calculated using data from the SDC M&A database.

EQUITY_PAYOUT: Equity payout scaled by the book value of assets. Calculated from Compustat using $(dv + prstkc - sstk)/at.$

EST_ENTRY (EST_EXIT): The establishment entry (exit) rate in a firm's state of location. Retrieved from the Business Dynamics Statistics database of the U.S. Census Bureau.

FINANCING_DEF: Financing deficit. Calculated from Compustat using $((at - at_t1) - (re - re_t1)/at.$

FIXED_ASSETS: The ratio of property, plant, and equipment to the book value of assets. Calculated from Compustat using *ppent*/*at.*

GDP_GROWTH: The GDP growth rate over the fiscal year in a firm's state of location. Calculated using data from the U.S. Bureau of Economic Analysis.

GDPPC: A state's GDP divided by its total population in a firm's state of location. Calculated using data from the U.S. Bureau of Economic Analysis. We use the natural logarithm of this variable.

IDD: An indicator variable equal to 1 if a firm's state of location recognizes the Inevitable Disclosure Doctrine, and 0 otherwise. Calculated using adoption dates from Klasa et al. (2018).

INTAN_ASSETS: Intangible assets net of goodwill scaled by total assets. Calculated from Compustat using $(intan + intano - gdwl)/at.$

INTAN_CAPITAL: Intangible capital. The replacement cost of intangible capital scaled by the replacement cost of total capital. Calculated from Peters and Taylor Total Q database and Compustat as $k_int/(k_int + ppent).$

INTAN_INV_OPP: Intangible investment opportunities. Calculated as the residuals from the following regression: $\text{TOTAL_}Q_{\text{ijlt}} = \beta Q_{\text{it}} + f_i + \omega_{lt} + \lambda_{jt} + \epsilon_{ijlt}$, where negative residuals are set equal to 0. The fixed effects and general notation are the same as the baseline model used throughout the paper. Data for Total Q comes

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from the Peters and Taylor Total Q database. Q is calculated from Compustat using $(at - be + prcc_f \times csho)/at$.

LOAN_SPRD: The all-in spread drawn, converted to percentage form. The amount the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the spread of the loan with any annual (or facility) fee paid to the bank group. We convert spreads to a firm-year measure by taking the average spread on all outstanding loans that originate over a year. Calculated using loan data from the Dealscan database.

MLEV: Market leverage. Calculated from Compustat using $(dltt + dlc)/(dltt + dlc + prcc_f \times csho)$.

MNEQUITY: Market measure of net equity issued. Calculated from Compustat using $((csho \times ajex) - (csho_t1 \times ajex_t1)) \times (((prcc_f_t1/ajex_t1) + (prcc_f/ajex))/2)$.

MTB: Market-to-book ratio. Calculated from Compustat using $(at + prcc_f \times csho - ceq)/at$.

NBLEV: Net book leverage. Calculated from Compustat using $(dltt + dlc - che)/at$.

NET_PROCEEDS: The SEO offer size measured as an offer's net proceeds. Calculated from the SDC Global Issues database using *Proceeds Amt – in this Mkt.* We use the natural logarithm of this variable.

NMLEV: Net market leverage. Calculated from Compustat using $(dltt + dlc - che)/(dltt + dlc + prcc_f \times csho)$.

PATENT: The number of patents granted to a firm in a given year. Calculated using the KPSS patent data – Kogan, Papanikolaou, Seru, and Stoffman (2017).

PATENTLESS_RD: An indicator equal to 1 if a firm has nonzero R&D expenditure in the current or preceding 3 years *and* 0 patents granted in the current or next 3 years, and 0 otherwise. Calculated from Compustat using *xrd* and from the KPSS patent data using patent counts. We lag this measure by 1-period t1.

PCT_CHG_CASH: Percentage change in cash holdings. Calculated from Compustat using che/che_t1, where $t1$ represents last period's value of *che.*

PCT_INC_EQUITY: Percentage increase in equity. Calculated from Compustat using seq/seq_t1, where t1 represents the last period's value of *seq.* We set negative changes in equity to 0. We find similar results using common equity (*ceq*) instead.

POLITICAL_REP: The percentage of a firm's state of location's representatives in the U.S. House of Representatives who belong to the Democratic Party, in a given year. Calculated from data provided by the U.S. House of Representatives' website.

POPULATION: The total population in a firm's state of location. Retrieved from the U.S. Census Bureau. We use the natural logarithm of this variable.

POS_ADVTSE_RD: An indicator variable equal to 1 if a firm has positive advertising *and* R&D expenditure in a given year, and 0 otherwise. Calculated from Compustat using *xad* and *xrd.*

RD_TAX_CREDIT: An indicator variable equal to 1 if a firm's state of location adopts a tax credit for R&D expenditure, and 0 otherwise. Calculated using adoption dates from Wilson (2009).

REPURCH_ASSETS: Share repurchases scaled by the book value of assets. Calculated from Compustat using *prstkc*/*at.*

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ROA: Return on assets. Calculated from Compustat using *oibdp*/*at*.

SECRETS_INDUSTRY: An indicator equal to 1 if a firm belongs to a manufacturing industry with an above-average reliance on secrecy to protect its process innovations, and 0 otherwise. Calculated using survey data from Cohen et al. (2000). We lag this measure by 1-period *t*1.

SEO_DUMMY: An indicator equal to 1 if a firm undertakes a seasoned equity offering in the current year, and 0 otherwise. Calculated using data from the SDC Global Issues database.

SHARES_FILED: The number of shares filed at the original filing. Calculated from the SDC Global Issues database using *Shares Filed – in this Mkt.* We use the natural logarithm of this variable.

UNDER_EXPLAINED_RD: Under explained R&D expenditure. An indicator equal to 1 if a firm's residual from annual regressions of R&D on ln(1 + PATENT) is negative, and 0 otherwise. The residuals are estimated using: $RD_{ijlt} = \beta \ln(1 + \text{Patent})_{it} + f_i + \omega_{lt} + \lambda_{jt} + \epsilon_{ijlt}$. We employ the same fixed effects and general notation as the baseline model used throughout the paper. Data for RD (*xrd*) comes from Compustat and the data for patent counts comes from the KPSS patent data. We lag this measure by 1-period t1.

UNEMPLOYMENT: The unemployment rate in a firm's state of location. Retrieved from the U.S. Bureau of Labor Statistics Local Area Unemployment Statistics Series.

UTSA: Uniform Trade Secrets Act. An indicator equal to 1 if a firm's state of location adopts a UTSA, and 0 otherwise. We use adoption dates provided by the Uniform Law Commission's website.

UTSA_INDEX: An index measuring the change in trade secrets protection for a firm located in a state that adopts the UTSA, relative to the state's pre-UTSA level of trade secrets protection. Calculated using the methodology in Png (2017a), (2017b).

WDL: A count variable summing the number of Wrongful Discharge Laws a firm's state of location adopts by the current year. WDLs include: Good faith, implied contract, and public policy exceptions. Calculated using adoption dates from Serfling (2016).

YLD_SPRD: The yield to maturity of the bond minus the yield on a treasury bond of similar maturity, converted to percentage form. We convert spreads to a firm-year measure by taking the average spread on all outstanding bonds that trade over a year. Calculated using corporate bond data from the WRDS Bond Returns database (which incorporates data from FINRA's TRACE and Mergent FISD) and using treasury yield data from the Federal Reserve's H15 reports.

Supplementary Material

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