Bernard, D

(2016)

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Journal of Accounting and Economics, 62 (2-3). pp. 305-325. ISSN 0165-4101

DOI: https://doi.org/10.1016/j.jacceco.2016.07.001

Elsevier
http://www.sciencedirect.com/science/article/pii/S...

# Is the risk of product market predation a cost of disclosure?*

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June 26, 2016

ABSTRACT

Competitors engage in product market predation when they lower prices or increase expenditures on nonprice competition with the goal of forcing a rival to exit. This study provides evidence that financially constrained firms avoid financial statement disclosure to mitigate predation risk. The empirical tests examine German private firms, most of which failed to comply with financial statement public disclosure requirements until an enforcement change increased noncompliance costs. The evidence shows more financially constrained firms were more likely to avoid disclosure until the change. Results from cross-sectional and supplemental analyses are consistent with predation risk driving this relation.

Keywords: product market predation; proprietary costs; disclosure; private firms

* I thank the members of my dissertation committee, Dave Burgstahler (chair), Dawn Matsumoto, Jonathan Karpoff, and Ed Rice for their guidance and support. I also thank John Core (editor) and an anonymous referee at the Journal of Accounting and Economics, two anonymous reviewers for and participants at the 77th (2015) German Academic Association for Business Research Conference, participants at the 2015 Journal of Accounting and Economics Conference, workshop participants at Harvard Business School, London Business School, Stanford University, University of Michigan, and University of Washington, and Terrence Blackburne, Nicole Cade, Weili Ge, Jörg-Markus Hitz (discussant), Devrimi Kaya, Sarah McVay, Panos Patatoukas (discussant), Christy Sebastian, Nemit Shroff (discussant), Brandon Szerwo, and Sara Toynbee for helpful comments on earlier versions of this paper. A previous version of this paper won the 2015 American Accounting Association Western Regional Meeting Best Doctoral Paper Award.

## 1. Introduction

Competitors engage in product market predation ("predation") when they lower prices or increase expenditures on nonprice competition with the goal of forcing a rival to exit. Prior research shows that firms prey to keep or attain market power, acquire competitors at lower cost, or deter current or future entrants, but do so only under certain conditions. For example, theory suggests that information asymmetries between potential prey and external parties, such as capital providers, can influence predation risk (e.g., Bolton and Scharfstein, 1990). Anecdotal and archival evidence also suggests that prey tend to be financially constrained, in the sense that they lack financial resources to survive even short price wars or business downturns. Consider, for instance, the plight of Quidsi, parent of Diapers.com. Quidsi was founded in 2005 and grew to about $300 million in annual sales by 2010, thanks largely to its diaper business. At that point, Amazon.com sensed opportunity and slashed its diaper prices by a third. According to *Bloomberg BusinessWeek*, "Quidsi's profitability sank, and [Quidsi] was forced to sell out to Amazon during the Great Recession, when additional capital to fund the fight was impossible to obtain."[1]

I examine evidence that financially constrained firms—those most vulnerable to predation—make disclosure decisions to preserve information asymmetries with potential predators to attempt to avoid fates like Quidsi's. Financially constrained firms have incentives to avoid public disclosure of information that would help to resolve competitors' uncertainty about the costs and benefits of predation. For example, without the financial disclosures of rivals, potential predators lack information about the financial resources, production capacity, and time needed for predation to be successful. Thus, just as some firms have incentives to withhold disclosure to avoid other proprietary costs, such as the threat of attracting a copycat into a

[1] Stone, Brad, "Wipe off that smile," *Bloomberg Businessweek*, Jan. 12–18, 2015, p. 44.

profitable segment (e.g., Botosan and Stanford, 2005), some firms have incentives to avoid revealing information about performance or financial position to mitigate predation risk.

I test the effect of predation risk on disclosure decisions using data from German private firms following a 2006 regulatory change. Like most other European countries, Germany has required since the 1980s that all limited liability private firms publish certain annual financial statement information. However, unlike most other European countries, Germany essentially did not enforce the requirement for decades, and most firms did not comply. In 2006, under pressure from the European Commission, the German government finally implemented a strict enforcement regime, which made available financial statement information for firms that had long avoided disclosure (Henselmann and Kaya, 2009). I test whether the level of financial constraint helps explain the choice to avoid financial statement disclosure until this change.

This setting has several advantages. First, Germany requires all limited liability private firms to prepare full accounts for shareholders, *regardless of public disclosure decisions* (Kaya, 2010), so it is implausible that firms avoided disclosure due to incremental accounting or agency costs (Berger, 2011; Vashishtha, 2014). Second, disclosure avoidance could substantially limit the financial information available to potential predators, given the lack of alternative information sources for private firms. Third, financial statement filings of private firms form the basis of tax returns in Germany (Eberhartinger, 1999; Eierle et al., 2007; Kaya, 2010; Szczesny and Valentinčič, 2013; Watrin et al., 2012), so the disclosures are likely to be reliable (Hanlon et al., 2014).

I hypothesize that the probability of disclosure avoidance before the enforcement change increases with financial constraint at an increasing rate, consistent with theory and evidence that predation risk is particularly high at the highest levels of financial constraint (Campello, 2006;

Opler and Titman, 1994). I measure financial constraint using industry-adjusted book leverage net of cash, based on evidence that financial constraint increases with observable leverage ratios and decreases with cash holdings (e.g., Kaplan and Zingales, 1997). By adjusting the book leverage of the firm (net of cash) by the industry average, I isolate within-industry (i.e., relative-to-rivals) differences in financial constraint (e.g., Campello, 2006). The results show financial constraint has a strong positive relation with disclosure avoidance and this relation is greater at higher levels of constraint. Estimated marginal effects show the relation is economically significant compared to other determinants of disclosure avoidance previously studied, such as profitability (e.g., Dedman and Lennox, 2009).

I also conduct several cross-sectional tests based on evidence that predation risk is a function of firm and industry characteristics in addition to financial constraint. Prior work shows that easier access to external financing (for the predator) can facilitate predation (e.g., Bolton et al., 2000), so predation risk is likely to be higher in industries with a public rival. Prior papers also suggest that predation risk is greater for firms that do not rely on ex ante sales contracts and for firms smaller or less profitable than rivals (Burns, 1986; Chevalier, 1995; Scott Morton, 1997; Weiman and Levin, 1994). The results of the tests provide evidence consistent with these predictions. Overall, the findings suggest that the strength of the link between financial constraint and disclosure avoidance depends on factors related to predation risk but less clearly related to potential alternative explanations, such as nondisclosure to hide financial constraints from other firm counterparties, like suppliers or customers.

Finally, I conduct a series of supplemental analyses to corroborate my interpretation of the findings. A falsification test in the spirit of Badertscher et al. (2013) shows that the results do not extend to the UK, which did not tighten enforcement in 2006. Consistent with firms using

disclosure decisions to mitigate competitive threats, I also find that more financially constrained German private firms delayed public disclosure during the implementation of the new regime. I likewise find that the relation between subsequent firm performance (e.g., changes in market share) and financial constraint is generally more negative for German firms that previously avoided disclosure compared to those that did disclose or similar UK firms. These results are consistent with the enforcement change facilitating predation and provide evidence on the real effects of German private firms' disclosure decisions (e.g., Shroff et al., 2014).

This study contributes to two bodies of literature. First, it provides evidence of a proprietary cost of disclosure fundamentally different from those previously examined. Whereas prior papers show that firms avoid disclosures to thwart product copycats or hide information about customers and material contracts (e.g., Botosan and Stanford, 2005; Ellis et al., 2012; Verrecchia and Weber, 2006), I present evidence that suggests financing characteristics constitute important proprietary information due to predation risk. The evidence also suggests that the relation between profitability and proprietary costs depends on the firm's financial constraint and challenges the notion that disclosure of negative information does not impose proprietary costs (Bens et al., 2011; Tang, 2012). These findings are likely to matter to managers and regulators concerned about the competitive implications of mandatory disclosure regimes.

Second, this paper adds to the literature on product market predation. Theory suggests information asymmetries between potential prey and external parties, including capital providers, can affect predation risk (e.g., Bolton and Scharfstein, 1990). I provide evidence that private firms can withhold financial disclosures to raise rivals' uncertainty about the costs and benefits of predation. These results complement prior findings suggesting that firms also make financing and hedging decisions to mitigate predation risk (Haushalter et al., 2007).

## 2. Mandatory disclosure regime in Germany

Under German law, limited liability private firms have been required to publicly disclose certain annual financial statement information since 1987, consistent with European Commission Directives on firm disclosure (namely, the 1968 and 2003 EU Corporate Disclosure Directives). When these requirements were adopted, the responsibility to monitor compliance was delegated to local courts. However, the courts in Germany failed to impose effective penalties for noncompliance, which led most firms to ignore the requirement (e.g., Henselmann and Kaya, 2009).

Events in the late-1990s and mid-2000s pressured the German government to address the systematic non-compliance with public disclosure requirements. In a court case decided in December 1997 (CASE C-97/96), the European Court of Justice ruled that Germany had failed to implement an effective system of sanctions to ensure compliance with EU public disclosure requirements. A statement by the European Commission in September 1998 (CASE C-191/95) similarly concluded that the German government had failed to meet its EU obligations. In 2003, the European Commission mandated all European firms make their annual financial statements available as electronic filings at a national register beginning January 1, 2007.

In April 2005, the German government introduced the draft bill for the law that became known as "EHUG" (Electronic Commercial and Company Registrar, *Gesetz über elektronische Handelsregister und Genossenschaftsregister sowie das Unternehmensregister*). It proposed central monitoring of financial statement filings and the imposition of substantial penalties for failure to comply with disclosure requirements (Bernard et al., 2016). The EHUG bill was debated and revised before being enacted in November 2006, and the enforcement regime

became effective for fiscal years ending December 31, 2006, and later. Figure 1 presents a timeline of events affecting German private firms' public disclosure requirements since 1987.

<FIGURE 1>

The passage of EHUG changed the de facto voluntary disclosure regime into a mandatory one. Before the change, the cost of avoiding disclosure was relatively low, and financially constrained firms that feared predation could withhold financial statements that would have revealed crucial information. In contrast, after the change in enforcement, the substantial penalties made noncompliance prohibitively costly for most firms, which led to increased compliance. Thus, by comparing the *previously unobservable* characteristics of firms that did not disclose before the passage of EHUG against those that did disclose, I can test whether high levels of financial constraint relate to decisions to withhold financial disclosures.

## 3. Hypothesis development

### *3.1. Predation risk, financial constraint, and disclosure avoidance*

Competitors engage in predation when they lower prices or increase expenditures on nonprice competition with the goal of forcing a rival to exit.[2] Exit does not necessarily entail bankruptcy or liquidation—it can also take other forms such as abandoning a specific product market or the sale of the firm to the predator (e.g., Burns, 1986). Additionally, my definition of predation does not limit its scope to competition among established firms. For example, the analytical literature considers predation by established firms on potential entrants (e.g., Fudenberg and Tirole, 1986), and an entrant may exploit an incumbent's financial constraint to rapidly establish itself in an industry.

[2] This definition of predation follows Fudenberg and Tirole (1986). Other papers and court rulings use a variety of definitions, but these alternatives often reflect specific characteristics or mechanisms of predation (e.g., Haushalter et al., 2007; Ordover and Willig, 1981; Scharfstein, 1984). I make no prediction regarding *how* predation happens in my setting, so I follow a definition of predation generally inclusive of other definitions.

The literature mainly focuses on firm characteristics and industry conditions that facilitate predation. For example, Chevalier (1995) finds evidence that supermarkets that recently underwent leveraged buyouts (LBOs) are often undercut on prices and forced to exit local markets if rivals are relatively unlevered. Bolton and Scharfstein (1990) argue that firms can become financially constrained and targeted for predation even absent major leveraging events or economic shocks (i.e., predation occurs even in equilibrium). They model the firm's optimal managerial contract and show that investors can mitigate incentive problems by providing funding in stages and committing to terminate funding if firm performance falters. The disadvantage is that the financial constraints imposed by the contract give rivals the incentive to prey and ensure the firm's performance is poor. Their model also implies that firms and their capital providers are more likely to contract to alleviate financing constraints when an external shock increases predation risk. Haushalter et al. (2007) provide empirical evidence consistent with this idea; they show that firms build cash holdings and take derivative positions to ensure key investments can be financed internally under the threat of predation.[3]

Managers likely make disclosure decisions partly to lower predation risk. Financial statement disclosures contain reliable information that can inform competitors about the costs and benefits of predation. The income statement and balance sheet set forth the firm's size, leverage, liquidity, and operating performance, all of which are determinants of financial constraint and therefore vulnerability to predation (Hadlock and Pierce, 2010). By withholding disclosures, then, firms can raise a potential predator's uncertainty about the efficacy of a predatory product market strategy, including the financial resources, production capacity, and

[3] Predators could be better off buying their prey rather than preying (e.g., Bolton et al., 2000), particularly to the extent firms manage predation risk. However, not all prey are willing to sell, especially if the managers obtain some private benefits of control. Purchasing competitors can also attract new entrants similarly hoping to be bought out. This reasoning is sometimes used to explain why, at the turn of the 20th century, American Tobacco Company preyed on rivals to reduce their value before purchasing them (Burns, 1986).

time needed for predation to be successful. In this way, disclosure avoidance can act as a wedge between rivals, and potential predators may lose the ability to reliably identify vulnerable prey.

Of course, the incentive to withhold disclosure depends on the critical assumption that *the act of nondisclosure* does not itself signal the firm's type. In essence, this condition requires that some managers have incentives to avoid disclosure for reasons unrelated to the threat of predation; otherwise, nondisclosure would fully inform competitors. Ex ante, this condition is likely to be satisfied, as prior literature suggests that firms withhold information for many reasons, such as to avoid drawing copycats into profitable product markets.[4]

Thus, I predict that financially constrained German private firms were likely to "stay dark" until penalties for nondisclosure began to be enforced in 2006.[5] Specifically, the threat of predation suggests that financial constraint relates positively to disclosure avoidance, where the strength of the relation increases at higher levels of constraint. This prediction is based on theory and prior empirical evidence that the risk of predation is relatively low for firms with low to moderate levels of constraint but pronounced for those with high levels of constraint; the most constrained firms have exhausted their borrowing capacity and are most susceptible to conflicts between managers and capital providers (Bolton and Scharfstein, 1990; Campello, 2006; Opler and Titman, 1994).

This leads to my first hypothesis, in alternative form:

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[4] For example, Dedman and Lennox (2009) examine the propensity for medium-sized UK private firms to withhold sales and cost of goods sold disclosure. They find that better performing firms—those with higher gross profit margins—are less likely to disclose, consistent with a competitive incentive for some firms to avoid revealing "strength." In contrast, the threat of predation generally provides a competitive incentive for some firms to avoid revealing "weakness."

[5] Not all firms avoided disclosure prior to EHUG (Henselmann and Kaya, 2009). Reasons for voluntary disclosure by private firms include idiosyncratic factors (e.g., a manager's belief that disclosure is "good policy") and contracting incentives (Dedman and Lennox, 2009). For example, although information can be disclosed to counterparties through private channels, which in principle avoids disclosure to competitors, firms whose size or business models lead them to contract with large numbers of counterparties may simply choose to publicly disclose information due to the volume of "confidential" disclosures.

*H1a: Firms that are more financially constrained are more likely to avoid public disclosure of financial statement information.*

*H1b: The relation between financial constraint and disclosure avoidance is more positive at higher levels of financial constraint.*

### *3.2. Cross-sectional evidence of predation risk on disclosure decisions*

Several firm and industry characteristics are likely to moderate the relation between financial constraint and disclosure avoidance. Although these firm and industry characteristics are closely related to predation risk, they are less clearly related to alternative explanations for the association between financial constraint and disclosure avoidance, as discussed below.

#### *3.2.1. Relative size*

Size relative to rivals partially determines susceptibility to predation. Preying on a larger rival is relatively costly and less likely to succeed, as larger firms typically have more diverse operations and more financial flexibility than small firms (e.g., Hadlock and Pierce, 2010).[6] In contrast, prior literature shows that large firms prey on small rivals to acquire them more cheaply, undermine their growth, force price accommodation, capture additional market power, or deter product market entry (Bolton et al., 2000; Burns, 1986; Chevalier, 1995; Milgrom and Roberts, 1982; Weiman and Levin, 1994). These factors suggest that the risk of predation and therefore the probability of disclosure avoidance is concentrated among firms smaller than industry rivals.[7]

This leads to my second hypothesis, in alternative form:

*H2: The relation between financial constraint and disclosure avoidance is more positive for firms smaller than industry rivals.*

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[6] Although production capacity and financing constraints impede a small firm's ability to prey on a large rival, small firms could collude to drive a large competitor out of business. However, collusion is difficult to achieve and maintain. See Porter (2005) for a review of the problems inherent in collusive arrangements.

[7] This prediction is consistent with the view of antitrust authorities, who often note that predation is a widespread concern among firms with larger, more dominant rivals. For instance, in a review of competition in the fuel sector in 2011, Germany's antitrust authority noted that the issue of predatory pricing "is a pressing one for small and medium-sized oil companies" (Bundeskartellamt, 2011).

*3.2.2. Relative operating profitability*

Less profitable firms are also more susceptible to predation, as they are less likely to generate cash flows sufficient to finance investments internally or meet debt obligations. Likewise, firms that are merely *less profitable than industry rivals* are susceptible, as they are typically higher-cost producers. Thus, the positive relation between profitability and disclosure avoidance documented previously is likely to be concentrated among firms facing little threat of predation (e.g., Dedman and Lennox, 2009). That is, while highly profitable firms are more likely to avoid disclosure than unprofitable firms, this effect is likely to be diminished or reversed among financially constrained firms, as unprofitable and financially constrained firms are particularly vulnerable to predation.

This leads to my third hypothesis, in alternative form:

> *H3: The relation between financial constraint and disclosure avoidance is more positive for firms less profitable than industry rivals.*

*3.2.3. Public firm presence*

Public firm presence is likely to be associated with greater predation risk for two reasons. First, cheaper and easier access to financing is critical to facilitate predation (e.g., Bolton et al., 2000; Chevalier, 1995), so private firms are likely to be more vulnerable to predation by public competitors, which have on average lower debt levels than private firms and face lower absolute costs when accessing external capital markets (Brav, 2009).

Second, firms are sensitive to industry uncertainty, as a lack of information about rivals' financing and investment decisions makes the outcomes of their own decisions less certain (Dixit and Pindyck, 1994). As a result, the more opaque the information environment of an industry, the more firms hold back on potential investment opportunities. For the same reasons, industry

uncertainty is likely to mute the propensity to engage in predation—a firm will not prey unless its managers are reasonably certain to eventually recoup the costs of predation (Bolton et al., 2000). In this context, public firms can enrich an industry's information environment and thereby facilitate predation. Consistent with this, Badertscher et al. (2013) present evidence that the availability of public firm disclosures reduces industry uncertainty and improves the responsiveness of other firms' investment decisions to potential investment opportunities.

This leads to my fourth hypothesis, in alternative form:

*H4: The relation between financial constraint and disclosure avoidance is more positive for firms in industries with public rivals.*

*3.2.4. Ex ante sales contracting*

The characteristics of sales contracting constitute another dimension of industry competition likely to affect the risk of predation. In particular, the use of ex ante sales contracts—that is, those signed in advance of production and delivery—mitigate the risk of predation. These contracts reduce the net benefits of predation by giving prey more time to raise capital or take other actions to stave off predators. For example, a price war immediately undercuts a firm (such as a supermarket) that relies primarily on ad hoc sales, but the effect is delayed for a firm (such as a parts supplier for an airplane manufacturer) that has secured key contracts in advance.

Long-term supply contracts are a subset of ex ante sales contracts particularly likely to mitigate the risk of predation. A customer is unlikely to break a long-term contract with its supplier unless the predator offers substantially better prices or terms of trade, which would per se erode the benefit of predation. Scott Morton (1997) makes a similar point about the role of supply contracts in mitigating predation risk facing product market entrants: "Contracts secured by an entrant before entry will make a … price war less effective in reducing an entrant's

financial resources, and therefore longer, less likely to succeed, and less likely to be undertaken… [E]ntrants with contracts should not be preyed upon" (p. 701).

This leads to my fifth and final hypothesis, in alternative form:

*H5: The relation between financial constraint and disclosure avoidance is more positive for firms in industries where the use of ex ante sales contracting is less common.*

## 4. Empirical methodology

I model disclosure avoidance using data drawn from Amadeus, a Bureau van Dijk database widely used in studies of both public and private European firms (e.g., Burgstahler et al., 2006). All independent variables are measured as of the firm's fiscal year ending between December 31, 2006, and December 30, 2007—the first annual period after the new enforcement regime took effect and financial statement data became available for most firms. Thus, the values of industry and firm characteristics in the first year following the enforcement change are used as proxies for these characteristics in earlier years when managers chose whether to avoid disclosure. This approach benefits from the high level of persistence of most variables studied in prior papers on disclosure avoidance. For example, book leverage is highly persistent for public firms and even more so for private firms (Brav, 2009; Lemmon et al., 2008), so the firm's leverage in 2006 or 2007 is likely to closely approximate its leverage during earlier periods.

Equation (1) presents the primary model specification:

$$(1)\ \text{No disclosure} = \mathrm{f}\begin{pmatrix} \beta_0 + \beta_1 \times \text{Industry–adjusted leverage net of cash} \\ + \beta_2 \times \text{Industry–adjusted leverage net of cash}^2 + \text{Controls} + \varepsilon \end{pmatrix}.$$

I proxy for the firm's decision to not disclose before the enforcement change using an indicator variable that equals one if the firm first appears in the Amadeus database for its fiscal year-end between December 31, 2005, and December 30, 2006 *or* December 31, 2006, and December 30, 2007, and zero otherwise. Although the new enforcement regime did not take effect until fiscal

years ending December 31, 2006, or later, the number of observations on Amadeus increases substantially from calendar year 2004 to calendar year 2005 and again from calendar year 2005 to 2006 (see Table 3 Panel B in Bernard et al., 2015). Since private firms have up to 12 months after the end of the fiscal year to file annual accounts under the German Commercial Code (Section 325), most firms were still within the filing deadline for their 2005 accounts when EHUG was passed in November 2006 (e.g., Bauer and Bigus, 2014). Thus, the increase in compliance between 2004 and 2005 suggests that many firms filed 2005 accounts once it became apparent that disclosure requirements would be enforced. As a result, firms that first filed either 2005 or 2006 accounts are classified as disclosure avoiders.[8]

I proxy for financial constraint using the industry-adjusted book leverage of the firm net of cash holdings (that is, the firm's total debt net of cash, scaled by the firm's total assets, minus the average of this ratio for all firms in the same four-digit NAICS code). A number of results in prior work motivate this proxy. First, there is robust, consistent evidence that, on average, a firm's observable leverage positively relates to its financial constraint, incremental to the effect of several other determinants, such as size, operating performance, and firm age. Although some prior papers form linear combinations of these firm-level variables to measure financial constraint (e.g., Whited and Wu, 2006), I do not, because some variables necessary to construct these measures (such as Tobin's Q) are unavailable for the firms in my sample. Nonetheless, I note that prior archival, survey, and analytical papers underscore leverage as a key determinant of financial constraint. Hadlock and Pierce (2010) and Kaplan and Zingales (1997) find that it strongly positively relates to the probability that public firm managers make qualitative disclosures in SEC filings indicating financial constraint, and Lamont et al. (2001) and Whited

[8] The main results are robust to an alternative specification for which only firms that delayed filing until fiscal years ending between December 31, 2006, and December 30, 2007, are classified as disclosure avoiders.

and Wu (2006) positively weight it in constructing parsimonious models of financial constraint. Graham and Harvey (2001) likewise show that managers view financial flexibility as decreasing with debt. In a similar vein, several analytical papers suggest that high levels of leverage impede a firm's willingness to invest due to the debt overhang problem (e.g., Myers, 1977).[9]

Second, by deducting cash holdings from the total debt of the firm, the measure accounts for prior evidence that cash holdings reduce the firm's financial constraint (Fresard, 2010; Haushalter et al., 2007; Kaplan and Zingales, 1997). Third, by adjusting the book leverage of the firm (net of cash) by the industry average, I subtract industry-level factors that could account for cross-sectional differences in leverage ratios and cash holdings. This approach is consistent with papers that study the interaction of capital structure and product markets (e.g., Campello, 2006) as well as the intuition that rivals' financing decisions partially determine financial constraint.

As with all other continuous variables included in the empirical tests, industry-adjusted leverage net of cash is winsorized at the 1st and 99th percentiles to minimize the influence of outliers and then standardized to have a mean of zero and a standard deviation of one. Standardizing the continuous variables allows for easier comparison across regression coefficients. Hypotheses 1a and 1b predict the coefficients $\beta_1$ and $\beta_2$ are significantly positive.

Equation (1) also includes variables to control for other benefits and costs of disclosure. I control for the firm's relative operating profitability using its industry-adjusted operating return on assets (i.e., operating earnings scaled by total assets, minus the average of this ratio for all firms in the same four-digit NAICS code). This measure is included to account for evidence that, on average, better performing firms face greater proprietary costs of financial statement

[9] Prior papers also provide evidence that predation risk increases with the leverage of the firm relative to rivals (Chevalier, 1995; Lerner, 1995; Zingales, 1998). However, these studies do not explicitly show that financial constraint is the mechanism for this relation.

disclosure (Botosan and Stanford, 2005; Dedman and Lennox, 2009). Controlling for relative operating profitability is also important given the strong negative relation between leverage and operating performance documented in the capital structure literature (e.g., Lemmon et al., 2008). To proxy for the higher proprietary costs faced by firms that depend more on patents, licenses, customer lists, and other intangible assets (Ellis et al., 2012), I also control for the firm's level of intangibility using the book value of intangible assets scaled by total assets.

I include controls for two potentially important dimensions of industry competition—public firm presence and market concentration. I proxy for the presence of a public rival using an indicator variable that equals one if there is at least one public German company in the firm's four-digit NAICS code. This measure is intended to account for (1) the presence of competitors with fewer financing frictions than private firms (Brav, 2009) and (2) higher investment sensitivity in the industry (Badertscher et al., 2013). I include the measure of public firm presence as a main effect (as well as an interactive effect in the cross-sectional tests below) because greater investment sensitivity plausibly raises proprietary costs of disclosure across all firms.

To control for market concentration, I construct the Herfindahl-Hirschman index formed by four-digit NAICS code using total assets of German firms with publicly disclosed financial statement information (i.e., including private limited liability companies and public firms). I use total assets instead of sales because small and medium-sized private firms in Germany are not required to disclose sales. Ali et al. (2009) show that incorporating private firm data is critical to proxy for market concentration, consistent with the importance of private firms to economic activity in the US and Europe (Allee and Yohn, 2009; Badertscher et al., 2013; Minnis, 2011). Nonetheless, measures of market concentration are controversial in studies of proprietary

disclosure costs for a number of conceptual and empirical reasons (Dedman and Lennox, 2009; Lang and Sul, 2014), so I include the measure mainly for completeness and make no prediction on its directional effect.

The remaining controls include a measure of firm size, the natural log of total assets, as larger firms are likely to have more counterparties, which reduces the likelihood that information disclosed in contracting remains proprietary (Dedman and Lennox, 2009). I control for the effects of high labor law enforcement using an indicator variable that equals one for firms in industries that may face additional pressure to publicly disclose due to greater regulatory scrutiny under German labor laws and zero otherwise.[10] I also include an indicator variable that equals one if the firm fails to report sales and zero otherwise, as medium-sized German firms that choose to not report sales reveal a preference for nondisclosure. Missing sales data can reflect certain proprietary disclosure costs and other costs of disclosure that the setting does not fully rule out, such as the personal or social preference of an owner-manager to publicly disclose as little as possible. Finally, I include (1) an indicator variable that equals one (zero) for firms in the former East (West) Germany, to control for potential historical differences in disclosure avoidance between the two regions; (2) a control for the 2006 mean disposable income (in thousands) of the district in which the firm is located to account for differences in economic development across Germany; and (3) a control for the year the firm was incorporated to account for the fact that older firms are better known (Dedman and Lennox, 2009).[11]

[10] This control variable equals one for firms in the forestry, construction, transportation, hospitality, animal processing, and facilities-services industries—that is, firms in three-digit NAICS codes 113, 236, 237, 238, 481, 482, 483, 484, 485, 486, 487, 488, 721, and 722, as well as four-digit NAICS codes 3116, 5612, and 5617. Historically, German firms in these industries have been more likely to employ "undocumented" or "informal" labor (ILO, 2009).

[11] Although the proxies for relative operating profitability, size, and firm age are intended to capture important costs or benefits of disclosure unrelated to predation risk, some papers provide evidence that these variables are systematically associated with financial constraint (e.g., Hadlock and Pierce, 2010). As a result, these proxies may

## 5. Sample selection and descriptive statistics

### *5.1. Sample selection*

I select observations of German firms on Amadeus with fiscal year-ends between December 31, 2006, and December 30, 2007—the first annual period the EHUG enforcement regime was in effect. I exclude nonlimited liability legal forms, as public disclosure requirements generally do not apply to them, and I exclude observations without basic data on the firm's industry (NAICS code), location, or year of incorporation.

I exclude firms that report total assets less than or equal to €4,015,000, the bright-line asset size threshold separating small from medium firms under German law in 2006 and 2007 (see appendix). Small private firms in Germany are not required to be audited or disclose income statement information, but medium and large private firms must be audited and disclose at least some income statement information. Thus, this selection choice (1) increases the probability that the disclosures in the sample are audited and reliable and (2) ensures that tiny firms with limited public disclosure requirements do not drive the results.

Finally, I exclude observations missing financial statement data necessary for the empirical tests as well as firms incorporated in 2005 or later. The latter requirement ensures that all firms in the sample were required to file financials at least once before the implementation of EHUG. Table 1 shows that these sample selection criteria yield a final sample of 31,305 firm observations.[12]

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not capture distinct constructs. However, it is not clear how this limitation could provide an alternative explanation for the paper's primary findings.

[12] Bureau van Dijk deletes all firm-year observations on Amadeus for firms that fail to file financial statements for four consecutive years (e.g., because the firms went bankrupt and liquidated). These deletions are unlikely to explain the paper's findings, given that I examine disclosure decisions of firms before the enforcement change *conditional on each firm's inclusion in the dataset for its fiscal year-end between December 31, 2006, and December 30, 2007*. That is, while it is likely that more financially constrained firms are missing from the dataset to the extent high financial constraint is associated with bankruptcy, it is not clear how this lack of data availability would induce the

<TABLE 1>

*5.2. Descriptive statistics*

Table 2 shows basic descriptive statistics for the final sample. Panel A presents the mean level of disclosure avoidance before the enforcement change and the number of observations in the final sample by industry (two-digit NAICS code). Panel B presents summary statistics on the independent variables, including the continuous variables before they are each standardized to have a mean equal to zero and standard deviation equal to one. Panel C presents summary statistics on the continuous variables after standardization. Panel D presents Pearson correlations.

<TABLE 2>

The results in Panel A show that while 55% of firms did not disclose before the change in enforcement, the level of disclosure avoidance varies considerably across industries, ranging from a low of 28% for utilities to a high of 62% for retailers. The results in Panels B and C highlight substantial variation in the independent variables. The interquartile range of industry-adjusted leverage net of cash is 0.39,[13] and the interquartile range of industry-adjusted ROA is 0.12 (that is, 12%). The statistics also show that at least 90% of firms in the sample were incorporated by 2002, suggesting the vast majority faced nominal public disclosure requirements for multiple years before the enforcement change. Finally, the results in Panel D show a relatively strong negative correlation (−0.21) between industry-adjusted ROA and industry-adjusted leverage net of cash, a result that is broadly consistent with evidence in the capital structure literature that operating performance and leverage are negatively related (e.g., Myers, 1993).

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empirical relations I predict for firms that are in the dataset for fiscal year-ends between December 31, 2006, and December 30, 2007.

[13] The mean of book leverage net of cash, without industry adjustment, is approximately 0.59 (untabulated), consistent with prior evidence that private firms are relatively more levered than public firms (Brav, 2009).

## 6. Results

### *6.1. Determinants of disclosure avoidance (H1)*

Table 3 presents the results of estimating Equation (1) using ordinary least squares. I use a linear probability model so the model coefficients presented throughout the paper are interpretable as marginal effects (see e.g., Ai and Norton, 2003), though the results are inferentially identical when I use a binary (e.g., probit) model instead. Columns 1–3 exclude the squared leverage term that is included in columns 4–6. Columns 1 and 4 exclude all control variables, columns 2 and 5 include all control variables except those that plausibly reflect proprietary disclosure costs, and columns 3 and 6 include the complete set of control variables.

<TABLE 3>

The results present consistent, significant evidence that financial constraint has a positive quadratic relation with disclosure avoidance, consistent with H1a and H1b. Table 3 shows that the coefficients on the linear and quadratic terms for industry-adjusted leverage net of cash are positive and statistically significant in each of the models, and the results are generally more significant when control variables are added.

Figure 2 plots estimated margins and corresponding 95% confidence intervals for [–3 standard deviations, +3 standard deviations] of financial constraint based on the estimation of Equation (1) in Table 3, column 6. The results suggest that moving from –1 standard deviation of financial constraint (mean financial constraint) to +1 standard deviation of financial constraint (+2 standard deviations of financial constraint) results in a roughly 3.7 (8.3) percentage point increase in the likelihood of prior disclosure avoidance.

<FIGURE 2>

Figure 3 provides a visual representation of the estimated margins and corresponding 95% confidence intervals for [–3 standard deviations, +3 standard deviations] of four control variables (relative operating profitability, intangibility, market concentration, and firm size) that are widely studied in prior literature on proprietary disclosure costs (Bens et al., 2011; Botosan and Stanford, 2005; Dedman and Lennox, 2009; Ellis et al., 2012). Based on the estimation of Equation (1) in Table 3, column 6, a two standard deviation increase in relative operating profitability (intangibility) increases the likelihood of disclosure avoidance by 3.3 (1.5) percentage points, whereas a two standard deviation increase in market concentration (firm size) decreases the likelihood of disclosure avoidance by 2.0 (8.0) percentage points. Overall, the effect of financial constraint on disclosure avoidance appears to be economically significant.

<FIGURE 3>

The coefficient estimates on the remaining control variables in Table 3 are mostly consistent with my predictions. I find that firms in industries subject to greater regulatory scrutiny under German labor laws are less likely to have avoided disclosure, while, in contrast, firms that do not disclose sales and those that incorporated more recently are more likely to have avoided disclosure. Interestingly, the results also show that East German firms are significantly less likely than West German firms to have avoided disclosure, even after controlling for average income by district.[14]

*6.2. Cross-sectional evidence of predation risk on disclosure decisions (H2–H5)*

Equation (2) is used to test hypotheses 2–5:

[14] The results in Section 6.1. remain significant and consistent with H1a and H1b when (1) disclosure avoidance is modeled using either a logit model or a probit model (using either average marginal effects or marginal effects "at means"), (2) financial and public administration firms are dropped from the sample, (3) industry-adjusted leverage net of cash is truncated instead of winsorized at the 1st and 99th percentiles, (4) industry level is defined using three-digit NAICS codes instead of four-digit NAICS codes, (5) industry fixed effects or quadratic terms for operating profitability or size are included in the model, (6) cash holdings are not subtracted from total debt in forming industry-adjusted leverage net of cash, (7) the sample is limited to firms without a consolidation companion on Amadeus, or (8) standard errors are clustered at the four-digit NAICS industry level.

$$(2)\ \text{No disclosure} = f\left(\begin{array}{c}\beta_0 + \beta_1 \times \text{Industry–adjusted leverage net of cash} \\ + \beta_2 \times \text{Industry–adjusted leverage net of cash} \times \text{CS variable} \\ + \text{Controls} + \varepsilon\end{array}\right).$$

There are two differences between Equation (1) and Equation (2). First, I drop the quadratic term for industry-adjusted leverage net of cash from the specification to avoid including interactions with quadratic terms. Including these interactions would force the relation between financial constraint and disclosure avoidance to be quadratic, even at representative values of the cross-sectional variables where I do not expect the relation to be quadratic (e.g., for firms substantially larger than rivals).

Second, I add the interaction of industry-adjusted leverage net of cash with cross-sectional variables that proxy for relative size (industry-adjusted natural log of total assets), relative operating profitability (industry-adjusted ROA), public firm presence (public rival), or the propensity for ex ante sales contracting (ex ante contracting). The interactive effects of each of these variables with industry-adjusted leverage net of cash test H2–H5. Industry-adjusted ROA and public rival are defined as in Equation (1), and industry-adjusted natural log of total assets is the natural log of total assets minus the average of this variable by four-digit NAICS code. Ex ante contracting equals one for firms in manufacturing industries (NAICS codes 31–33) that produce "differentiated products" based on the product homogeneity classification scheme in Rauch (1999) and zero otherwise. This proxy for the propensity to rely on ex ante sales contracts is based partly on the work of Rajgopal et al. (2003) and Costello (2013), who show that order backlog and long-term supply contracts are particularly common among manufacturing firms. Rajgopal et al. (2003) show that more than 80% of firms with order backlog disclosures are manufacturers, and Costello (2013) shows that manufacturers make up roughly 69% of her sample of long-term supply contracts, even though they only constitute

roughly 28% of the Compustat universe.[15] Nonetheless, because the propensity for ex ante sales contracting is likely muted for firms that produce more homogenous goods, ex ante contracting equals one only for manufacturing firms whose goods are not reference priced either in trade journals or on organized exchanges.[16]

Table 4 presents the results of estimating Equation (2), where, due to the inclusion of the interactions, I make no prediction regarding the sign of the main effect of financial constraint. For expositional convenience, I focus the discussion on Figure 4, where I plot estimated margins and corresponding 95% confidence intervals for [–3 standard deviations, +3 standard deviations] of financial constraint at representative values of the cross-sectional variables, based on the estimates presented in columns 1–4 in Table 4. For the tests of H2 (Panel A) and H3 (Panel B), I separately plot estimated margins at the 10$^{th}$ and 90$^{th}$ percentiles of relative size and relative operating profitability, respectively. For the test of H4 (Panel C), I separately plot estimated margins for firms without and with public rivals. For the test of H5 (Panel D), I separately plot estimated margins based on the firm's propensity to rely on ex ante sales contracts.

<TABLE 4>

The results plotted in Figure 4 are strongly consistent with hypotheses H2–H5. Panel A shows that the positive relation between financial constraint and disclosure avoidance is concentrated among firms that are smaller than rivals; this result is consistent with prior findings

[15] Long-term contracting is especially common among German manufacturers. For example, Lane and Bachman (1996) examine contracting in Britain and Germany in two manufacturing industries. They write: "[I]n Germany, long-term relations with customers and suppliers are the rule. … German managers not only show a stronger commitment to long-term relationships, but are also significantly more likely to enter into long-term contracts." Burchell and Wilkinson (1997) reach a similar conclusion, noting that "security, strategic reasons, specific investment and the exchange of confidential information" are motives for long-term relations in Germany.

[16] Rauch (1999) classifies traded goods as "differentiated," "reference priced," or "homogenous" separately by SITC code. Because the mapping between SITC codes and NAICS codes is not one to one, I approximate the level of product homogeneity for each NAICS code by assigning a value of two to SITC codes with "homogeneous" goods, a value of one to SITC codes with goods that are "reference priced," and a value of zero to "differentiated" goods. I then find the median value across the SITC codes that correspond to each NAICS code (based on the "conservative" classification scheme in Rauch (1999)). Ex ante contracting equals one for manufacturers for which this median value equals zero.

that relatively small firms are more common targets for predation, ceteris paribus (e.g., Chevalier, 1995; Scott Morton, 1997). Panel B provides evidence that, consistent with prior work, the proprietary costs of disclosure for more profitable firms are greater, on average, than those for less profitable ones (e.g., Dedman and Lennox, 2009). However, Panel B also shows the probability of disclosure avoidance is not statistically different among relatively profitable and relatively unprofitable firms at high levels of financial constraint, consistent with predation risk imposing additional costs of disclosure for relatively unprofitable firms with high levels of financial constraint.[17] Panel C shows that the effect of financial constraint on disclosure avoidance is stronger in industries that include at least one public firm, consistent with higher predation risk in industries with (1) at least one relatively sophisticated rival with easier access to external financing (Brav, 2009) and (2) lower investment uncertainty (Badertscher et al., 2013). Finally, Panel D shows that the positive relation between disclosure avoidance and financial constraint is muted among firms that are more likely to rely on ex ante sales contracts. This result is consistent with the idea that ex ante contracting can discourage predation (e.g., Scott Morton, 1997).

In column 5 of Table 4, I include all four of the interactions in a single regression to test whether any cross-sectional effect is subsumed by the others. The coefficients on all of the interactions remain significant in the predicted direction.

<FIGURE 4>

[17] In untabulated tests, I examine the importance of the relative-to-rival adjustments to the empirical tests of H2 and H3. Specifically, I add the interaction of industry-adjusted leverage net of cash and the natural log of total assets to the estimation in Table 4, column 1, and the interaction of industry-adjusted leverage net of cash and ROA to the estimation in Table 4, column 2, where ROA equals the firm's operating profits, scaled by total assets, without industry adjustment. The interactions of industry-adjusted leverage net of cash with industry-adjusted natural log of total assets and industry-adjusted ROA remain negative and statistically significant ($p < 0.01$, $p < 0.10$, respectively) in these alternative specifications.

*6.3. Supplemental tests*

*6.3.1. First disclosure and the determinants of disclosure avoidance*

If firms subject to high levels of predation risk postponed disclosure during the implementation of the EHUG enforcement regime, then firms that first filed for their fiscal years ending between December 31, 2006, and December 30, 2007, should have higher levels of financial constraint than firms that first filed for their fiscal years ending between December 31, 2005, and December 30, 2006, all else equal. However, a potential limitation of tests of this prediction is that the firms that postponed as long as possible were also most likely to take financing actions to reduce their financial constraint and thereby mitigate predation risk (Haushalter et al., 2007).

In column 1 of Table 5, Equation (1) is re-estimated excluding firms that first file December 31, 2006–December 30, 2007; in column 2, the equation is re-estimated excluding firms that first file December 31, 2005–December 30, 2006. Thus, whereas column 1 compares the characteristics of firms that first file December 31, 2005–December 30, 2006 against those that did not avoid disclosure, column 2 compares the characteristics of firms that first file December 31, 2006–December 30, 2007 against those that did not avoid disclosure. As expected, the coefficients on the linear and quadratic terms for industry-adjusted leverage net of cash are positive and significant in both estimations. I use chi-square tests to examine the equality of these coefficients between the two estimations. While the coefficient on the linear term for industry-adjusted leverage net of cash is not statistically different between estimations ($p = 0.45$), the coefficient on the quadratic term is significantly larger in column 2 than column 1 ($p < 0.01$), consistent with the most financially constrained firms postponing disclosure when EHUG was initially implemented.

<TABLE 5>

*6.3.2. Dimensions of market structure and disclosure avoidance*

Consistent with prior work, I expect at least two dimensions of industry market structure affect predation risk. The first is product substitutability. High levels of substitutability can lower the costs of preying, as firms in industries with high product substitutability can simply cut prices to capture business from a competitor. In contrast, firms need to make a variety of specific investments in intellectual property, machinery and other equipment, human capital, sales relationships, and other factors to prey on the producer of a highly differentiated product. This intuition is supported by prior evidence that suggests that predation risk is higher when firms have more similar operations and share growth opportunities (Haushalter et al., 2007). Thus, I expect the relation between disclosure avoidance and financial constraint is stronger in industries with higher levels of substitutability.

The second dimension of market structure is the cost of entry. High costs of entry can raise predation risk, as predation is more likely when entrants cannot easily compete away abnormal profits that a firm might earn after preying on rivals (Bolton et al., 2000; Ordover and Willig, 1981). To the extent predation is predominately motivated by incentives to build and maintain market power (as opposed to, say, acquire rivals at lower cost), the relation between disclosure avoidance and financial constraint should be stronger in industries with higher costs of entry.

Because sales data are not available for many of the sample firms, I calculate an adjusted form of the Lerner index to proxy for product substitutability. Specifically, I proxy for product substitutability as the negative of the weighted-average operating return on assets of firms by four-digit NAICS code, where weights are based on firm size (total assets). I proxy for costs of

entry as the weighted-average capital intensity of firms by four-digit NAICS code, calculated as the weighted-average ratio of fixed assets to total assets.[18] I then separately estimate Equation (2) using the proxies for substitutability and costs of entry as cross-sectional variables.

The results are presented (with coefficients on the control variables omitted for brevity) in Table 6. I find that the interaction of substitutability and industry-adjusted leverage net of cash is positive and statistically significant ($p < 0.01$), consistent with a stronger relation between disclosure avoidance and financial constraint in industries with higher substitutability. I also find that the interaction of cost of entry and industry-adjusted leverage net of cash is positive and statistically significant ($p < 0.05$), consistent with a stronger relation between disclosure avoidance and financial constraint in industries with greater costs of entry. To test the robustness of these results, I add both interactions to the model estimated in Table 4, column 5. I find that the interaction of substitutability and industry-adjusted leverage net of cash remains significantly positive, the interaction of cost of entry and industry-adjusted leverage net of cash becomes statistically insignificant, and the interactions of the main cross-sectional variables (discussed in Section 3.2.) with industry-adjusted leverage net of cash remain significant in the predicted directions.

<TABLE 6>

*6.3.3. Financial constraint, disclosure avoidance, and ex post performance*

Although the empirical analyses above examine evidence of disclosure avoidance to mitigate predation risk, it is also possible to examine evidence of predation after the "forced" disclosure of private firm financial statements. I emphasize ex ante evidence in the main analyses for two reasons. First, even a small risk of predation could lead an owner-manager to avoid

[18] See Bens et al. (2011) and Karuna (2007) for similarly constructed measures of product substitutability and costs of entry. Results are not sensitive to using the log of the average level of fixed assets by four-digit NAICS code as an alternative proxy for costs of entry.

disclosure, so the rate of predation is likely to be lower (and more difficult to detect) than the rate of disclosure avoidance to mitigate this risk. Second, the timing of the enforcement change in Germany means that evidence of predation necessarily coincides with the 2008 financial crisis and ensuing recession. Differentiating predatory effects from the effects of the broader downturn is empirically challenging. The tests below should be interpreted accordingly.

To examine ex post evidence of predation, I estimate the following equation using ordinary least squares:

$$(3)\ \text{Ex post performance} = f\begin{pmatrix} \beta_0 + \beta_1 \times \text{Industry–adjusted leverage net of cash} \\ + \beta_2 \times \text{Industry–adjusted leverage net of cash} \times \text{No disclosure} \\ + \beta_3 \times \text{No disclosure} + \text{Controls} + \varepsilon \end{pmatrix}.$$

I consider four measures of performance: an indicator variable equal to one if the firm remains on the Amadeus database in the post period and zero otherwise, the percentage change in cash holdings, the percentage change in fixed assets, and the percentage change in industry market share (measured based on total assets and four-digit NAICS codes). These proxies capture changes in observable performance along multiple dimensions examined in the predation literature, including the firm's liquidity, capital base, and market share (e.g., Campello, 2006; Chevalier, 1995; Haushalter et al., 2007). I include the binary survival proxy to capture the most extreme outcomes of predation (i.e., bankruptcy and liquidation), although I caution that the measure is imperfect—other factors, such as legal form changes, can also cause a firm's subsequent exclusion from the Amadeus database. Each variable is measured between the firm's filing between December 31, 2006, and December 30, 2007, and its filing (or lack thereof) two or three years later, and each continuous dependent variable is replaced with its decile rank to minimize the effects of outliers.[19] The control variables in Equation (3) include measures of the

[19] The German accounting literature shows that most firms wait as long as possible (that is, 12 months after fiscal year-end) to disclose (e.g., Bauer and Bigus, 2014; Kaya, 2010). Indeed, some firms incurred significant penalties to

firm's size (the natural log of total assets), year incorporated, and tangibility, which equals the ratio of fixed assets to total assets (e.g., Zingales, 1998). The controls also include an indicator variable that equals one for firms with negative operating profitability and the mean disposable income of the district in which the firm is located.

The primary empirical prediction is $\beta_2 < 0$. Financial constraint should be more negatively associated with the probability of survival and changes in liquidity, capital base, and market share for firms that previously avoided disclosure due to predation risk. Table 7 presents the results of this analysis. The estimated coefficients on the interactions of industry-adjusted leverage net of cash and no disclosure are negative and statistically significant for at least one period for three of the four measures. Overall, the results are consistent with greater decreases in liquidity, fixed assets (e.g., due to asset dispositions), and market share for more constrained firms that first disclose their financials due to the enforcement change. However, there is no evidence that the survival rate is lower for more financially constrained firms that previously avoided disclosure compared to those that previously disclosed. This result could reflect the fact that predation results in a variety of outcomes (market share losses, exit from a specific segment, etc.), where bankruptcy is the most extreme and likely the least frequent. The null result could also stem from error in measuring failure based on data availability in the Amadeus database or noise introduced by the effects of the financial crisis and recession.

<TABLE 7>

The analyses provide several other interesting results. First, I find that the main effect of disclosure avoidance is negative and significant (i.e., $\beta_3 < 0$) in the survival, fixed asset, and

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delay disclosure even beyond the 12-month filing deadline after the EHUG enforcement regime began (e.g., Henselmann and Kaya, 2009). Because competitors cannot observe the firm's financial information for at least one year after the fiscal year-end, ex post measures of performance cover the two or three years following the enforcement change (see e.g., Zingales, 1998).

market share tests, consistent with mandated disclosure imposing proprietary costs on disclosing firms. These costs could include predation to the extent predation facilitated by the enforcement change does not strictly target more financially constrained firms. Second, I find that, while financial constraint has a significantly negative relation with survival and changes in fixed assets and market share (e.g., Zingales, 1998), it has a significantly *positive* relation with changes in cash holdings. This result is consistent with more financially constrained firms (specifically, those that did not go bankrupt or leave the sample for other reasons) using asset sales and other capital sources to raise cash in response to the crisis.

Finally, in untabulated tests, I use UK limited liability firms as an alternative control group in Equation (3); that is, I use them in place of German private firms that disclosed before the enforcement change. I replace no disclosure in Equation (3) with UK firm, an indicator variable for UK limited liability firms that meet analogous sample selection criteria as those required for German limited liability firms in the main analyses. I find that the results are generally stronger when I use this alternative control group. Indeed, the interaction of UK firm and industry-adjusted leverage net of cash is positive and statistically significant for each dependent variable and ex post period examined in Table 7. Though these results should be interpreted with caution due to differences in capital financing practices and economic conditions between the UK and Germany, they are consistent with the relation between financial constraint and ex post performance being worse for German firms that previously avoided disclosure than otherwise similar UK firms, which did not face a change in disclosure enforcement.

*6.4. Discussion of alternative interpretations*

My results show financial constraint is positively associated with disclosure avoidance and this relation is generally stronger for firms with characteristics that reflect higher levels of

predation risk. Together with the results of the supplemental tests, this evidence suggests the risk of predation makes disclosure more costly for financially constrained firms. However, I acknowledge that alternative interpretations of the evidence cannot be fully ruled out.

One possible alternative interpretation is that the relation between financial constraint and disclosure avoidance is due, at least in part, to a change in data coverage on Amadeus roughly concurrent with the enforcement change. If a change in data coverage is systematically associated with certain firm characteristics (such as financial constraint), the tests could conflate disclosure avoidance with a lack of database coverage. To address this possibility, I conduct a falsification test in the spirit of Badertscher et al. (2013) and estimate an analog of Equation (1) for UK limited liability private firms. Mandatory disclosure requirements have been enforced in the UK since the 1960s. If there had been a change in data coverage on Amadeus between 2004 and 2006, presumably it would not have been limited to German firms. After imposing selection criteria for UK private firms analogous to those for German firms, I obtain a sample of 38,532 observations. Untabulated results show that prior disclosure avoidance is extremely uncommon among UK private firms and has no significant relation with financial constraint.[20]

Alternatively, industry-adjusted leverage net of cash may be capturing a construct other than financial constraint—observable leverage ratios are endogenous and reflect a variety of characteristics related to a firm's borrowing capacity (e.g., Lemmon et al., 2008). However, it is not clear which alternative construct the proxy captures if not financial constraint, particularly given the cross-sectional evidence that suggests the relation between disclosure avoidance and

[20] Articles in the German accounting literature that use data *directly from commercial registers* also show that compliance with public disclosure requirements in Germany was minimal (approximately 10%) before the enforcement change, but improved dramatically (to approximately 90%) thereafter (e.g., Henselmann and Kaya, 2009). These proportions of compliance map closely to the increase in available observations on Amadeus in 2004 versus 2006 and onward (see Table 3 Panel B in Bernard et al., 2015), suggesting that the improved data availability is primarily due to firms' improved compliance with public disclosure requirements, not a decision by Amadeus to dramatically change its data coverage.

financial constraint depends strongly on other factors that also determine predation risk. The proxy also relates negatively to several performance outcomes, including the probability of survival and changes in market share. These results are consistent with industry-adjusted leverage net of cash capturing a firm's financial constraint, on average.

Another possibility is that managers of financially constrained firms avoid public disclosure to external parties other than competitors. Perhaps managers try to hide negative information about performance or financial position from counterparties, consistent with evidence that high levels of indebtedness worsen terms of trade and deter customers (Maksimovic and Titman, 1991; Opler and Titman, 1994). Although this explanation could partly explain the relation between disclosure avoidance and financial constraint, there are three reasons to doubt that it is the dominant effect. First, some counterparties, such as employees represented by a works council, have well-enforced information rights under German law, so they are unlikely to rely on public disclosures. Second, it is unclear why firms with public competitors would be significantly more likely to try to hide bad news from counterparties. Third, high levels of financial constraint can raise contracting costs even if a firm withholds disclosure. It is unlikely that a rational counterparty, such as a creditor, would enter a material contract without first obtaining assurances regarding the firm's financial health. Similarly, a counterparty is likely to demand periodic assurances regarding the firm's financial health to mitigate risks of moral hazard. If a firm chooses to avoid public disclosure, its counterparties are likely to demand private disclosure, and the firm's refusal to privately provide financial information or other assurances would itself be informative (e.g., Grossman, 1981).

Other alternative explanations include the possibility that managers of constrained firms were simply too busy ensuring their firms' survival to comply with unenforced disclosure

requirements. This explanation is inconsistent with highly profitable firms being more likely to avoid disclosure and is difficult to reconcile with the cross-sectional tests. The relation between financial constraint and disclosure avoidance could also reflect the broad result in the literature that poorly performing firms tend to disclose less (e.g., Miller, 2002). This explanation stems from the idea that managers of better performing firms have capital market incentives to disclose more. However, it is not clear how this bears on the German private firm setting, where private financial statement disclosure to owners is required by law, so there is little incentive for firms to *publicly* disclose information to capital providers (e.g., Irani and Oesch, 2014).[21]

## 7. Conclusion

This paper provides evidence of a previously unexamined proprietary cost of disclosure: the risk of product market predation. The empirical analysis exploits a setting in which (1) there are likely to be few nonproprietary costs of disclosure (such as agency costs) that could explain disclosure avoidance, (2) disclosed information is reliable, and (3) disclosure avoidance is likely to substantially affect the amount of financial information available to competitors. The results show strong evidence of an increasingly positive relation between financial constraint and disclosure avoidance, and cross-sectional tests show that this relation is stronger for firms with other characteristics that are associated with predation risk. Supplemental tests generally corroborate my interpretation of the results.

Collectively, these findings provide novel evidence of proprietary costs of financial statement disclosure and the determinants and consequences of predation risk. The evidence suggests that financially constrained firms can minimize the cost associated with predation risk

[21] Before 2006, private disclosure requirements to shareholders were subject to substantially stronger enforcement than public disclosure requirements. Shareholders possessed well-enforced information rights regarding important planning decisions (e.g., investment decisions) and specific documents (e.g., contracts) in addition to the firm's financial statements. See, for example, Oberlandesgericht Thüringen, Sept. 14, 2004 (Case 6 W 417/04).

by avoiding disclosure and preserving information asymmetries with potential predators. The results also build on prior studies that examine the relation between proprietary costs and profitability. Although prior work generally finds that more profitable firms incur higher proprietary costs of disclosure (e.g., Dedman and Lennox, 2009), my results suggest that this association is weaker among more financially constrained firms, consistent with the notion that less profitable, more financially constrained firms have higher predation risk.

Future research can extend the findings in several ways. One way is to further explore evidence of predation following disclosure changes, which would extend the literature on the real effects of accounting and disclosure decisions (e.g., Badertscher et al., 2013). Future research could also explore the role of predation in the decision to go public, which is accompanied by extensive disclosures, or other disclosures of public companies that reveal important product market information. Another avenue would be to examine whether predation risk motivates firms to keep debt off the balance sheet.

**Appendix**

*Disclosure and audit requirements in 2006 and 2007*

This appendix summarizes the public disclosure and external audit requirements for German private limited liability firms in 2006 and 2007. Under the German Commercial Code, each firm is classified as small, medium, or large, and this classification determines its disclosure and audit requirements. Size classification is based on three variables: year-end total assets, annual sales, and average number of employees during the fiscal year. Firms are assigned to a larger size category when the values of two (or more) of the three size variables exceed bright-line thresholds set by the German government over two successive years. For example, a small firm becomes a medium firm as soon as at least two of three size variables exceed the threshold separating the small and medium classifications for two consecutive years. Similarly, a medium firm does not move down to the small class until at least two of three size variables remain below the small-medium threshold for two consecutive years (Bernard et al., 2015). The small-medium bright-line size thresholds for German limited liability private firms in 2006 and 2007 were €4,015,000 in total assets, €8,030,000 in sales, and 50 employees. The medium-large bright-line size thresholds were €16,060,000 in total assets, €32,120,000 in sales, and 250 employees.

| | |
|---|---|
| Small firms | |
| Balance sheet | Required in abbreviated format (e.g., several subcategories of items—such as current and long-term liabilities—can be aggregated) |
| Income statement | *Not required* |
| Notes | Required in abbreviated format (items related to income statement accounts and details about balance sheet accounts can be omitted) |
| Director's report | *Not required* |
| External audit | *Not required* |
| Medium firms | |
| Balance sheet | Required in expanded abbreviated format (e.g., some subcategories of items can be aggregated) |
| Income statement | Required in abbreviated format (items such as sales, other operating income, and cost of materials can be aggregated to gross profit) |
| Notes | Required in expanded abbreviated format (certain items related to aggregated accounts can be omitted) |
| Director's report | Required in full format |
| External audit | Required |
| Large firms | |
| Balance sheet | Required in full format |
| Income statement | Required in full format |
| Notes | Required in full format |
| Director's report | Required in full format |
| External audit | Required |

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**Figure 1**

*Evolution of the disclosure environment in Germany*

This figure presents a timeline of significant events and law changes related to limited liability private firms' public disclosure requirements in Germany. Double vertical bars mark periods of time not to scale with the rest of the timeline.

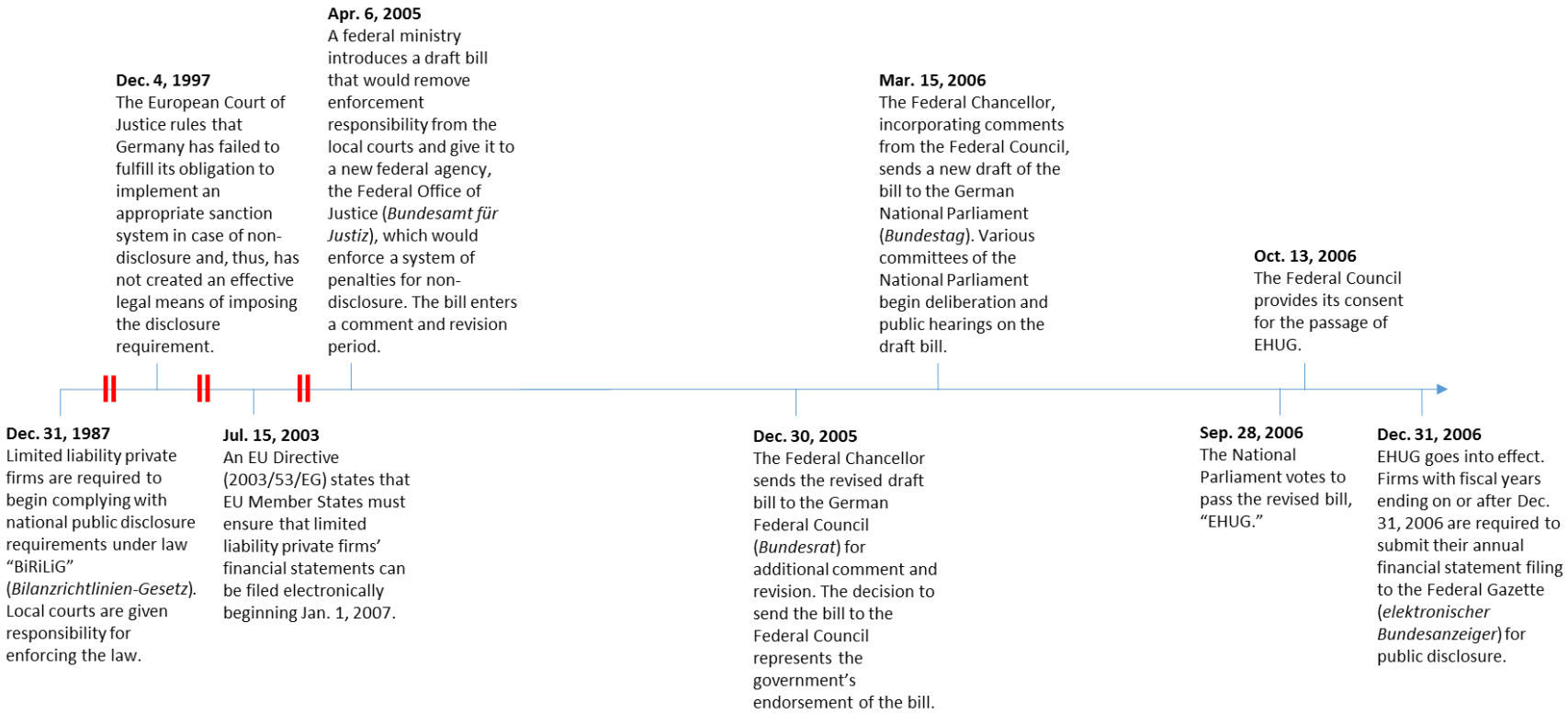

**Figure 2**

*Disclosure avoidance and financial constraint*

This figure plots estimated margins and corresponding 95% confidence intervals of prior disclosure avoidance (no disclosure) for [−3 standard deviations, +3 standard deviations] of financial constraint (industry-adjusted leverage net of cash). No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. Estimated margins are computed based on Equation (1), as estimated in Table 3, column 6.

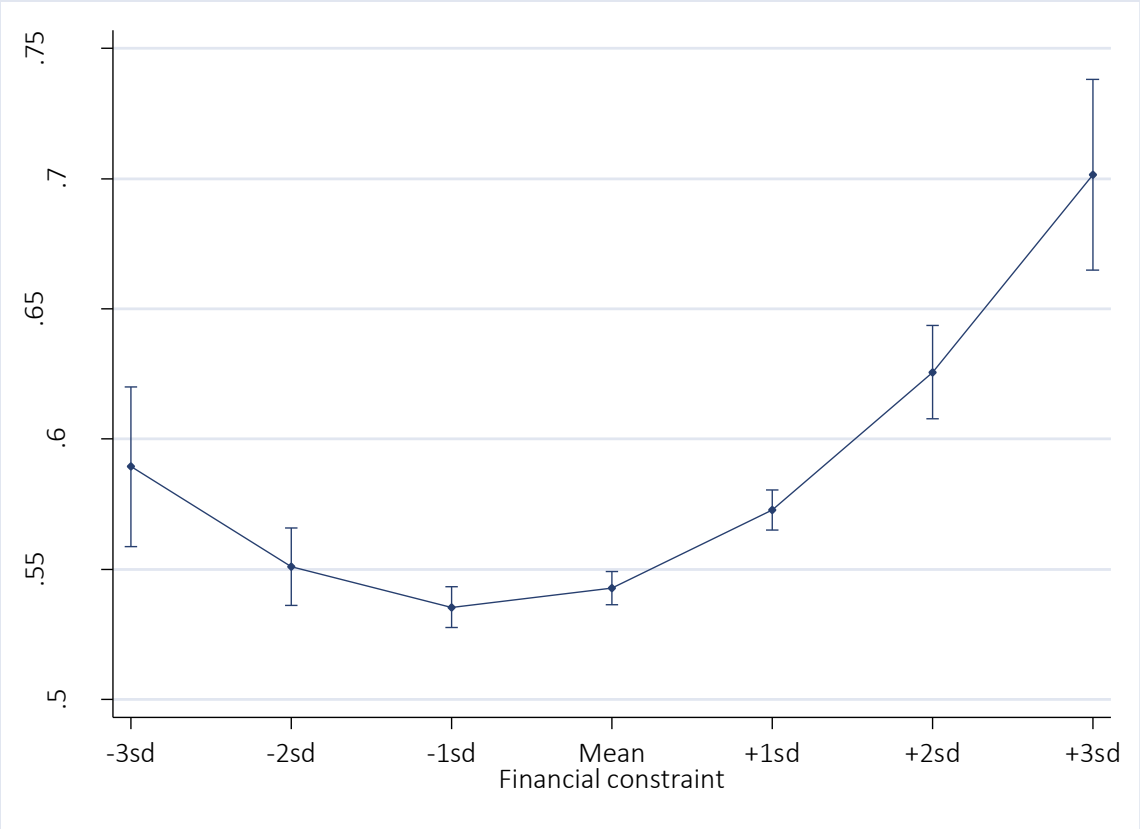

**Figure 3**

*Disclosure avoidance and other costs and benefits of disclosure*

This figure plots estimated margins and corresponding 95% confidence intervals of prior disclosure avoidance (no disclosure) for [−3 standard deviations, +3 standard deviations] of relative operating profitability (industry-adjusted ROA), intangibility (intangibles), market concentration (Herfindahl-Hirschman index), and firm size (natural log of total assets). No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Intangibles equals the firm's intangible assets, scaled by total assets. The Herfindahl-Hirschman index is formed by four-digit NAICS code and constructed using total assets of German firms with publicly disclosed financial statement information. All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. Estimated margins are computed based on Equation (1), as estimated in Table 3, column 6.

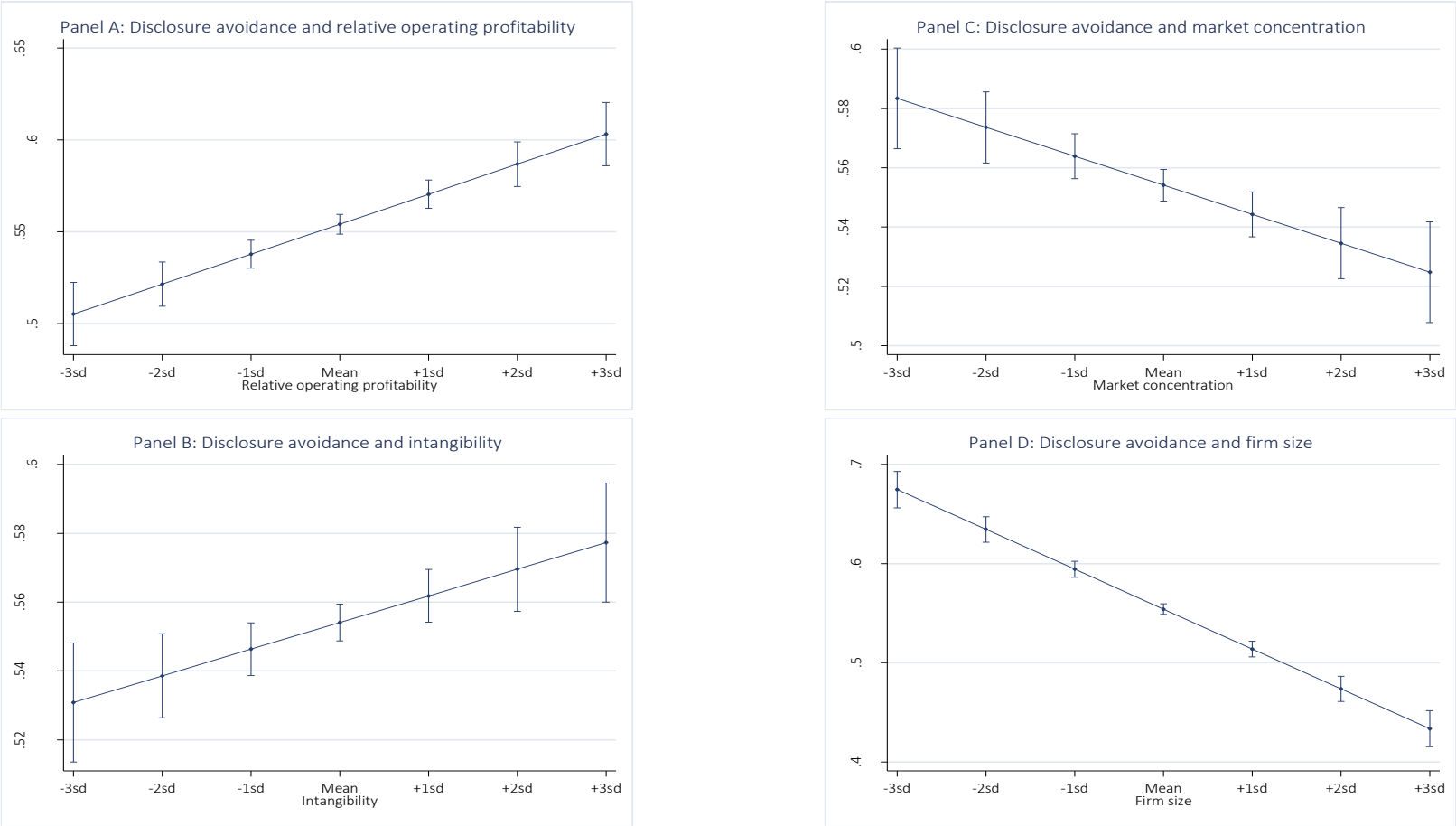

**Figure 4**

*Disclosure avoidance and interactive effects with financial constraint*

This figure plots estimated margins and corresponding 95% confidence intervals of prior disclosure avoidance (no disclosure) for [−3 standard deviations, +3 standard deviations] of financial constraint (industry-adjusted leverage net of cash) at representative values of relative size (10th and 90th percentiles of industry-adjusted natural log of total assets), relative operating profitability (10th and 90th percentiles of industry-adjusted ROA), public firm presence (public rival equals zero or one), and the propensity for ex ante sales contracting (ex ante contracting equals zero or one). No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Industry-adjusted natural log of total assets equals the natural logarithm of the firm's total assets, minus the mean of the natural logarithm of private limited liability firms' total assets in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. Ex ante contracting is an indicator variable equal to one if the firm is in a manufacturing industry (NAICS codes 31–33) that produces "differentiated products" based on the product homogeneity classification scheme in Rauch (1999) and zero otherwise. All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. Estimated margins are computed based on Equation (2), as estimated in Table 4, columns 1−4.

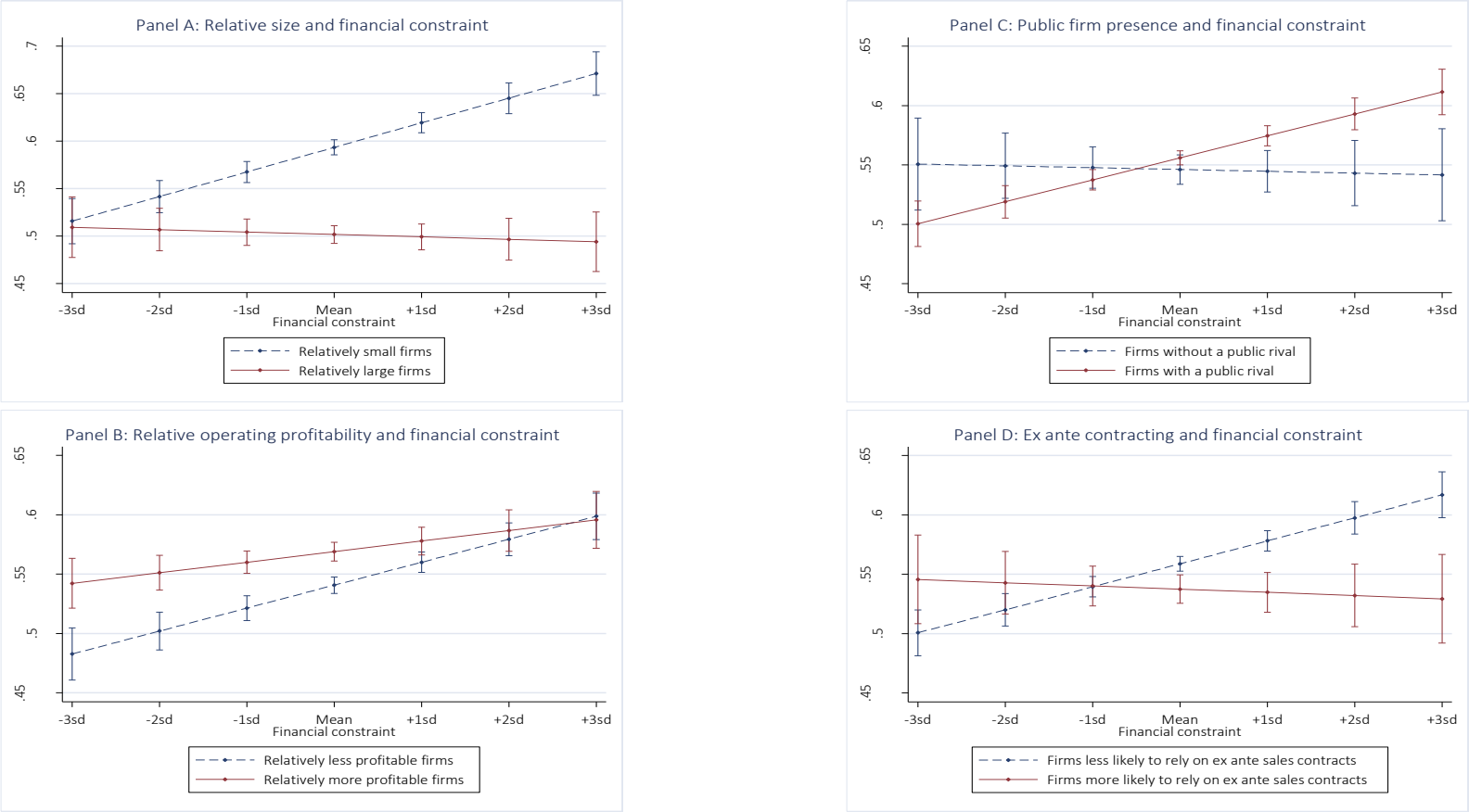

**Table 1**

*Sample selection*

This table presents the sample selection procedure. Data are obtained from the January 2012 version of Bureau van Dijk's Amadeus database.

| | |
|---|---|
| German firm observations with fiscal year-ends December 31, 2006–December 30, 2007: | 932,037 |
| Less observations of firms: | |
| without limited liability | (91,975) |
| without region, industry, or incorporation data | (5,177) |
| with total assets less than or equal to €4,015,000 | (767,834) |
| missing balance sheet or operating profit data | (34,023) |
| incorporated in 2005 or later | (1,993) |
| Final sample | 31,035 |

**Table 2**
*Descriptive statistics*

This table presents descriptive statistics on the sample. Panel A presents the mean level of prior disclosure avoidance (mean of no disclosure) and the number of observations (N) in the final sample by industry (two-digit NAICS code). Panel B presents summary statistics on the independent variables included in Equations (1) and (2), including the continuous variables before they are standardized to have a mean equal to zero and a standard deviation equal to one. Panel C presents summary statistics on the continuous variables after standardization. Panel D presents Pearson correlations. No disclosure is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Intangibles equals the firm's intangible assets, scaled by total assets. The Herfindahl-Hirschman index is formed by four-digit NAICS code and constructed using total assets of German firms with publicly disclosed financial statement information. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. High labor enforcement is an indicator variable equal to one if the firm operates in an industry subject to additional scrutiny under German labor laws (i.e., industries in the three-digit NAICS codes 113, 236, 237, 238, 481, 482, 483, 484, 485, 486, 487, 488, 721, and 722, as well as the four-digit NAICS codes 3116, 5612, and 5617) and zero otherwise. Sales missing is an indicator variable equal to one if the firm does not report sales and zero otherwise. East German is an indicator variable equal to one if the firm is located in the former East Germany and zero otherwise. Income per capita equals the average disposable income of residents in the district where the firm is located (in thousands). Industry-adjusted natural log of total assets equals the natural logarithm of the firm's total assets, minus the mean of the natural logarithm of private limited liability firms' total assets in the same four-digit NAICS code. Ex ante contracting is an indicator variable equal to one if the firm is in a manufacturing industry (NAICS codes 31–33) that produces "differentiated products" based on the product homogeneity classification scheme in Rauch (1999) and zero otherwise. All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one.

| Panel A: Mean of prior disclosure avoidance and observation count by industry | Mean | N |
|---|---|---|
| Agriculture, forestry, fishing and hunting | 0.56 | 59 |
| Mining, quarrying, and oil and gas extraction | 0.57 | 46 |
| Utilities | 0.28 | 892 |
| Construction | 0.48 | 1,586 |
| Food and textile manufacturing | 0.56 | 1,131 |
| Wood product, chemical, and nonmetallic mineral manufacturing | 0.54 | 2,440 |
| Metal, machinery, electronics, transportation, and furniture manufacturing | 0.54 | 5,397 |
| Wholesale trade | 0.61 | 6,113 |
| Motor vehicle, furniture, electronics, materials, food, health, and clothing retail | 0.62 | 995 |
| Sporting goods, general merchandise, miscellaneous, and non-store retail | 0.61 | 241 |
| Transportation | 0.56 | 1,243 |
| Delivery services and warehousing and storage | 0.39 | 64 |
| Information | 0.55 | 469 |
| Finance and insurance | 0.55 | 249 |
| Real estate and rental and leasing | 0.50 | 2,092 |
| Professional, scientific and technical services | 0.57 | 2,017 |
| Management of companies and enterprises | 0.61 | 2,144 |
| Administrative and support and waste management and remediation services | 0.54 | 1,159 |
| Educational services | 0.53 | 161 |
| Health care and social assistance | 0.56 | 1,508 |
| Arts, entertainment, and recreation | 0.45 | 246 |
| Accommodation and food services | 0.54 | 173 |
| Other services (not including public administration) | 0.58 | 508 |
| Public administration | 0.37 | 102 |
| Total sample | 0.55 | 31,035 |

| Panel B: Unstandardized variables | 10% | 25% | Median | 75% | 90% | Mean |
|---|---|---|---|---|---|---|
| Industry-adjusted leverage net of cash | -0.43 | -0.19 | 0.03 | 0.20 | 0.32 | -0.01 |
| Industry-adjusted ROA | -0.12 | -0.07 | -0.02 | 0.05 | 0.14 | -0.01 |
| Intangibles | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.02 |
| Herfindahl-Hirschman index | 0.01 | 0.01 | 0.03 | 0.07 | 0.21 | 0.07 |
| Natural log of total assets | 15.41 | 15.71 | 16.30 | 17.24 | 18.34 | 16.63 |
| Income per capita | 15.23 | 16.27 | 17.98 | 19.42 | 20.84 | 18.05 |
| Year incorporated | 1967 | 1979 | 1990 | 1998 | 2002 | 1986 |
| Industry-adjusted natural log of total assets | -1.12 | -0.76 | -0.23 | 0.53 | 1.45 | -0.01 |
| Public rival | 0 | 1 | 1 | 1 | 1 | 0.81 |
| High labor enforcement | 0 | 0 | 0 | 0 | 1 | 0.10 |
| Sales missing | 0 | 0 | 0 | 1 | 1 | 0.35 |
| East German | 0 | 0 | 0 | 0 | 1 | 0.13 |
| Ex ante contracting | 0 | 0 | 0 | 0 | 1 | 0.22 |

| Panel C: Standardized continuous variables | 10% | 25% | Median | 75% | 90% | Mean |
|---|---|---|---|---|---|---|
| Industry-adjusted leverage net of cash | -1.38 | -0.61 | 0.13 | 0.68 | 1.10 | 0 |
| Industry-adjusted ROA | -0.79 | -0.40 | -0.05 | 0.39 | 1.04 | 0 |
| Intangibles | -0.33 | -0.33 | -0.30 | -0.17 | 0.33 | 0 |
| Herfindahl-Hirschman index | -0.58 | -0.56 | -0.43 | 0.01 | 1.26 | 0 |
| Natural log of total assets | -1.03 | -0.77 | -0.28 | 0.52 | 1.44 | 0 |
| Income per capita | -1.16 | -0.73 | -0.03 | 0.57 | 1.15 | 0 |
| Year incorporated | -1.16 | -0.43 | 0.25 | 0.74 | 0.98 | 0 |
| Industry-adjusted natural log of total assets | -1.03 | -0.69 | -0.20 | 0.51 | 1.37 | 0 |

| Panel D: Pearson correlation table | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No disclosure | - | | | | | | | | | | | | | |
| 2 | Industry-adjusted leverage net of cash | 0.02 | - | | | | | | | | | | | | |
| 3 | Industry-adjusted ROA | 0.05 | -0.21 | - | | | | | | | | | | | |
| 4 | Intangibles | 0.00 | 0.05 | -0.04 | - | | | | | | | | | | |
| 5 | Herfindahl-Hirschman index | -0.02 | 0.00 | 0.02 | 0.02 | - | | | | | | | | | |
| 6 | Public rival | 0.00 | 0.00 | -0.04 | 0.02 | -0.04 | - | | | | | | | | |
| 7 | Natural log of total assets | -0.15 | -0.01 | -0.11 | 0.12 | 0.02 | 0.09 | - | | | | | | | |
| 8 | High labor enforcement | -0.02 | 0.00 | 0.03 | -0.06 | -0.11 | -0.16 | -0.09 | - | | | | | | |
| 9 | Sales missing | 0.22 | -0.08 | 0.09 | -0.09 | -0.02 | -0.04 | -0.35 | 0.00 | - | | | | | |
| 10 | East German | -0.11 | -0.05 | -0.04 | -0.05 | 0.02 | -0.03 | -0.03 | 0.03 | -0.06 | - | | | | |
| 11 | Income per capita | 0.04 | 0.01 | 0.03 | 0.05 | -0.01 | 0.06 | 0.06 | -0.04 | 0.01 | -0.49 | - | | | |
| 12 | Year incorporated | 0.06 | 0.04 | -0.01 | 0.07 | -0.01 | 0.02 | -0.09 | -0.03 | 0.00 | 0.17 | -0.07 | - | | |
| 13 | Industry-adjusted natural log of total assets | -0.14 | 0.00 | -0.08 | 0.10 | 0.00 | 0.00 | 0.91 | 0.00 | -0.30 | -0.03 | 0.04 | -0.13 | - | |
| 14 | Ex ante contracting | 0.00 | 0.00 | 0.04 | 0.00 | 0.23 | 0.01 | -0.06 | -0.18 | 0.08 | 0.01 | -0.03 | -0.09 | 0.00 | - |

**Table 3**

*Determinants of disclosure avoidance*

This table presents the results of estimating Equation (1) using ordinary least squares. No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Intangibles equals the firm's intangible assets, scaled by total assets. The Herfindahl-Hirschman index is formed by four-digit NAICS code and constructed using total assets of German firms with publicly disclosed financial statement information. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. High labor enforcement is an indicator variable equal to one if the firm operates in an industry subject to additional scrutiny under German labor laws (i.e., industries in the three-digit NAICS codes 113, 236, 237, 238, 481, 482, 483, 484, 485, 486, 487, 488, 721, and 722, as well as the four-digit NAICS codes 3116, 5612, and 5617) and zero otherwise. Sales missing is an indicator variable equal to one if the firm does not report sales and zero otherwise. East German is an indicator variable equal to one if the firm is located in the former East Germany and zero otherwise. Income per capita equals the average disposable income of residents in the district where the firm is located (in thousands). All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. T-statistics (in parentheses) are calculated using heteroskedastic-consistent Huber-White standard errors. Statistical significance at the 1%, 5%, and 10% (two-tailed) levels are denoted with ***, **, and *, respectively.

| Model | Predicted sign | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Industry-adjusted leverage net of cash | (+) | 0.009*** | 0.012*** | 0.015*** | 0.015*** | 0.015*** | 0.019*** |
| | | (3.26) | (4.31) | (5.26) | (5.21) | (5.53) | (6.53) |
| Industry-adjusted leverage net of cash$^2$ | (+) | | | | 0.018*** | 0.011*** | 0.011*** |
| | | | | | (9.50) | (6.00) | (6.21) |
| Industry-adjusted ROA | (+) | | | 0.016*** | | | 0.016*** |
| | | | | (5.59) | | | (5.88) |
| Intangibles | (+) | | | 0.008*** | | | 0.008*** |
| | | | | (2.80) | | | (2.76) |
| Herfindahl-Hirschman index | (?) | | | -0.010*** | | | -0.010*** |
| | | | | (-3.58) | | | (-3.56) |
| Public rival | (+) | | | 0.010 | | | 0.010 |
| | | | | (1.39) | | | (1.38) |
| Natural log of total assets | (–) | | -0.042*** | -0.041*** | | -0.041*** | -0.040*** |
| | | | (-14.15) | (-13.88) | | (-13.85) | (-13.54) |
| High labor enforcement | (–) | | -0.043*** | -0.045*** | | -0.043*** | -0.044*** |
| | | | (-4.83) | (-4.91) | | (-4.76) | (-4.83) |
| Sales missing | (+) | | 0.190*** | 0.190*** | | 0.189*** | 0.189*** |
| | | | (31.29) | (31.11) | | (31.18) | (30.98) |
| East German | (?) | | -0.161*** | -0.157*** | | -0.160*** | -0.156*** |
| | | | (-16.86) | (-16.40) | | (-16.76) | (-16.28) |
| Income per capita | (?) | | -0.003 | -0.003 | | -0.004 | -0.004 |
| | | | (-0.85) | (-1.02) | | (-1.09) | (-1.27) |
| Year incorporated | (+) | | 0.034*** | 0.033*** | | 0.033*** | 0.032*** |
| | | | (12.29) | (11.92) | | (11.91) | (11.53) |
| Constant | (?) | 0.554*** | 0.514*** | 0.505*** | 0.536*** | 0.503*** | 0.494*** |
| | | (196.40) | (129.48) | (71.00) | (157.74) | (115.00) | (67.23) |
| $R^2$ | | 0.000 | 0.068 | 0.070 | 0.003 | 0.069 | 0.071 |
| N | | 31,035 | 31,035 | 31,035 | 31,035 | 31,035 | 31,035 |

**Table 4**

*Cross-sectional tests of disclosure avoidance*

This table presents the results of estimating Equation (2) using ordinary least squares. In columns 1 and 5, natural log of total assets is replaced with industry-adjusted natural log of total assets to ensure any main effect of industry-adjusted natural log of total assets does not bias the interaction term. For similar reasons, the main effect of ex ante contracting is included in columns 4 and 5. No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Industry-adjusted natural log of total assets equals the natural logarithm of the firm's total assets, minus the mean of the natural logarithm of private limited liability firms' total assets in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. Ex ante contracting is an indicator variable equal to one if the firm is in a manufacturing industry (NAICS codes 31–33) that produces "differentiated products" based on the product homogeneity classification scheme in Rauch (1999) and zero otherwise. Intangibles equals the firm's intangible assets, scaled by total assets. The Herfindahl-Hirschman index is formed by four-digit NAICS code and constructed using total assets of German firms with publicly disclosed financial statement information. High labor enforcement is an indicator variable equal to one if the firm operates in an industry subject to additional scrutiny under German labor laws (i.e., industries in the three-digit NAICS codes 113, 236, 237, 238, 481, 482, 483, 484, 485, 486, 487, 488, 721, and 722, as well as the four-digit NAICS codes 3116, 5612, and 5617) and zero otherwise. Sales missing is an indicator variable equal to one if the firm does not report sales and zero otherwise. East German is an indicator variable equal to one if the firm is located in the former East Germany and zero otherwise. Income per capita equals the average disposable income of residents in the district where the firm is located (in thousands). All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. T-statistics (in parentheses) are calculated using heteroskedastic-consistent Huber-White standard errors. Statistical significance at the 1%, 5%, and 10% (two-tailed) levels are denoted with ***, **, and *, respectively.

| Model | Predicted sign | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Industry-adjusted leverage net of cash | | 0.014*** | 0.015*** | -0.002 | 0.019*** | 0.003 |
| | | (4.83) | (5.29) | (-0.24) | (6.21) | (0.45) |
| Industry-adjusted leverage net of cash × Industry-adjusted natural log of total assets | (–) | -0.012*** | | | | -0.012*** |
| | | (-4.22) | | | | (-4.23) |
| Industry-adjusted leverage net of cash × Industry-adjusted ROA | (–) | | -0.006** | | | -0.007*** |
| | | | (-2.54) | | | (-2.93) |
| Industry-adjusted leverage net of cash × Public rival | (+) | | | 0.020*** | | 0.019*** |
| | | | | (2.90) | | (2.72) |
| Industry-adjusted leverage net of cash × Ex ante contracting | (–) | | | | -0.022*** | -0.021*** |
| | | | | | (-3.30) | (-3.16) |
| Industry-adjusted ROA | (+) | 0.017*** | 0.015*** | 0.016*** | 0.015*** | 0.017*** |
| | | (6.13) | (5.52) | (5.60) | (5.51) | (5.95) |
| Intangibles | (+) | 0.007*** | 0.008*** | 0.008*** | 0.008*** | 0.007*** |
| | | (2.64) | (2.80) | (2.79) | (2.82) | (2.64) |
| Herfindahl-Hirschman index | (?) | -0.010*** | -0.010*** | -0.010*** | -0.008*** | -0.009*** |
| | | (-3.75) | (-3.62) | (-3.57) | (-2.82) | (-3.21) |
| Public rival | (+) | 0.002 | 0.010 | 0.010 | 0.010 | 0.002 |
| | | (0.27) | (1.38) | (1.39) | (1.43) | (0.26) |
| Industry-adjusted natural log of total assets | (–) | -0.038*** | | | | -0.038*** |
| | | (-13.14) | | | | (-13.03) |
| Natural log of total assets | (–) | | -0.041*** | -0.041*** | -0.042*** | |
| | | | (-13.72) | (-13.88) | (-14.08) | |
| High labor enforcement | (–) | -0.035*** | -0.045*** | -0.045*** | -0.050*** | -0.039*** |
| | | (-3.87) | (-4.90) | (-4.90) | (-5.35) | (-4.18) |
| Sales missing | (+) | 0.195*** | 0.189*** | 0.190*** | 0.191*** | 0.196*** |
| | | (32.56) | (31.09) | (31.12) | (31.23) | (32.56) |
| East German | (?) | -0.157*** | -0.156*** | -0.157*** | -0.156*** | -0.157*** |
| | | (-16.47) | (-16.33) | (-16.43) | (-16.37) | (-16.38) |
| Income per capita | (?) | -0.004 | -0.003 | -0.003 | -0.004 | -0.004 |
| | | (-1.11) | (-1.03) | (-1.02) | (-1.12) | (-1.21) |
| Year incorporated | (+) | 0.032*** | 0.033*** | 0.033*** | 0.032*** | 0.032*** |
| | | (11.57) | (11.84) | (11.96) | (11.58) | (11.28) |
| Ex ante contracting | (–) | | | | -0.021*** | -0.015** |
| | | | | | (-3.07) | (-2.22) |
| Constant | (?) | 0.509*** | 0.504*** | 0.505*** | 0.510*** | 0.511*** |
| | | (71.19) | (70.69) | (71.04) | (70.25) | (70.06) |
| $R^2$ | | 0.070 | 0.070 | 0.070 | 0.070 | 0.071 |
| N | | 31,035 | 31,035 | 31,035 | 31,035 | 31,035 |

**Table 5**

*First disclosure and the determinants of disclosure avoidance*

This table presents the results of estimating Equation (1) using ordinary least squares, where column 1 excludes firms that first file December 31, 2006–December 30, 2007 and column 2 excludes firms that first file December 31, 2005–December 30, 2006. No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Intangibles equals the firm's intangible assets, scaled by total assets. The Herfindahl-Hirschman index is formed by four-digit NAICS code and constructed using total assets of German firms with publicly disclosed financial statement information. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. High labor enforcement is an indicator variable equal to one if the firm operates in an industry subject to additional scrutiny under German labor laws (i.e., industries in the three-digit NAICS codes 113, 236, 237, 238, 481, 482, 483, 484, 485, 486, 487, 488, 721, and 722, as well as the four-digit NAICS codes 3116, 5612, and 5617) and zero otherwise. Sales missing is an indicator variable equal to one if the firm does not report sales and zero otherwise. East German is an indicator variable equal to one if the firm is located in the former East Germany and zero otherwise. Income per capita equals the average disposable income of residents in the district where the firm is located (in thousands). All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. T-statistics (in parentheses) are calculated using heteroskedastic-consistent Huber-White standard errors. Statistical significance at the 1%, 5%, and 10% (two-tailed) levels are denoted with ***, **, and *, respectively.

| Model | Predicted sign | 1 | 2 |
|---|---|---|---|
| Industry-adjusted leverage net of cash | (+) | 0.017*** | 0.020*** |
| | | (5.26) | (5.69) |
| Industry-adjusted leverage net of cash$^2$ | (+) | 0.008*** | 0.016*** |
| | | (3.89) | (6.90) |
| Industry-adjusted ROA | (+) | 0.017*** | 0.011*** |
| | | (5.58) | (3.68) |
| Intangibles | (+) | 0.005* | 0.010*** |
| | | (1.68) | (2.82) |
| Herfindahl-Hirschman index | (?) | -0.007** | -0.011*** |
| | | (-2.42) | (-3.82) |
| Public rival | (+) | 0.007 | 0.015* |
| | | (0.88) | (1.89) |
| Natural log of total assets | (–) | -0.046*** | -0.015*** |
| | | (-14.73) | (-4.97) |
| High labor enforcement | (–) | -0.050*** | -0.022** |
| | | (-5.06) | (-2.19) |
| Sales missing | (+) | 0.193*** | 0.177*** |
| | | (27.97) | (22.39) |
| East German | (?) | -0.158*** | -0.105*** |
| | | (-15.73) | (-10.77) |
| Income per capita | (?) | -0.006* | -0.003 |
| | | (-1.82) | (-0.98) |
| Year incorporated | (+) | 0.027*** | 0.032*** |
| | | (8.82) | (10.44) |
| Constant | (?) | 0.417*** | 0.213*** |
| | | (52.23) | (25.95) |
| $R^2$ | | 0.073 | 0.058 |
| N | | 25,895 | 18,979 |

**Table 6**

*Dimensions of market structure and disclosure avoidance*

This table presents the results of estimating Equation (2) using ordinary least squares. In columns 1 and 2, CS variable is replaced with measures of product substitutability and cost of entry, respectively. In column 3, the interactions for substitutability and cost of entry with industry-adjusted leverage net of cash are added to the estimation tabulated in Table 4, column 5. No disclosure, the dependent variable, is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Substitutability equals the negative of weighted-average operating return on assets of firms by four-digit NAICS code, where weights are based on firm size (total assets). Cost of entry equals the weighted-average capital intensity of firms by four-digit NAICS code, calculated as the weighted-average ratio of fixed assets to total assets. Industry-adjusted natural log of total assets equals the natural logarithm of the firm's total assets, minus the mean of the natural logarithm of private limited liability firms' total assets in the same four-digit NAICS code. Industry-adjusted ROA equals the firm's operating profits, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. Public rival is an indicator variable equal to one if the firm's four-digit NAICS code includes at least one public German firm and zero otherwise. Ex ante contracting is an indicator variable equal to one if the firm is in a manufacturing industry (NAICS codes 31–33) that produces "differentiated products" based on the product homogeneity classification scheme in Rauch (1999) and zero otherwise. All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. For brevity, the coefficients and tests of statistical significance for control variables are suppressed in all columns. T-statistics (in parentheses) are calculated using heteroskedastic-consistent Huber-White standard errors. Statistical significance at the 1%, 5%, and 10% (two-tailed) levels are denoted with ***, **, and *, respectively.

| Model | Predicted sign | 1 | 2 | 3 |
|---|---|---|---|---|
| Industry-adjusted leverage net of cash | | 0.014*** | 0.014*** | 0.001 |
| | | (4.98) | (4.98) | (0.20) |
| Industry-adjusted leverage net of cash × Substitutability | (+) | 0.010*** | | 0.007** |
| | | (3.67) | | (2.10) |
| Industry-adjusted leverage net of cash × Cost of entry | (+) | | 0.007** | 0.001 |
| | | | (2.46) | (0.20) |
| Industry-adjusted leverage net of cash × Industry-adjusted natural log of total assets | (–) | | | -0.012*** |
| | | | | (-4.13) |
| Industry-adjusted leverage net of cash × Industry-adjusted ROA | (–) | | | -0.007*** |
| | | | | (-2.96) |
| Industry-adjusted leverage net of cash × Public rival | (+) | | | 0.018** |
| | | | | (2.54) |
| Industry-adjusted leverage net of cash × Ex ante contracting | (–) | | | -0.013* |
| | | | | (-1.67) |
| Constant | (?) | 0.508*** | 0.506*** | 0.512*** |
| | | (70.96) | (70.96) | (70.15) |
| $R^2$ | | 0.070 | 0.070 | 0.071 |
| N | | 31,035 | 31,035 | 31,035 |

**Table 7**

*Financial constraint, disclosure avoidance, and ex post performance*

This table presents the results of several tests of ex post performance. Columns 1 and 2 examine the probability of survival; columns 3 and 4 examine the percentage change in cash holdings; columns 5 and 6 examine the percentage change in fixed assets; and columns 7 and 8 examine the percentage change in industry market share (measured based on total assets and four-digit NAICS codes). All changes are measured between the firm's filing between December 31, 2006, and December 30, 2007, and its filing two or three years later. Survival is an indicator variable equal to one if the firm remains on the Amadeus database and zero otherwise. Values for %ΔCash, %ΔFixed assets, and %ΔMarket share are replaced with their respective decile ranks to mitigate the effects of outliers. Industry-adjusted leverage net of cash equals the firm's total debt net of cash, scaled by total assets, minus the mean of this ratio for all other private limited liability firms in the same four-digit NAICS code. No disclosure is an indicator variable equal to one if the firm's first financial statement filing included in the Amadeus database is for its fiscal year-end on or after December 31, 2005, and zero if before. Loss equals one for firms with negative operating profitability and zero otherwise. Tangibility equals the ratio of fixed assets to total assets. Income per capita equals the average disposable income of residents in the district where the firm is located (in thousands). All continuous variables are winsorized at the 1st and 99th percentiles and standardized to have a mean equal to zero and a standard deviation equal to one. T-statistics (in parentheses) are calculated using heteroskedastic-consistent Huber-White standard errors. Statistical significance at the 1%, 5%, and 10% (two-tailed) levels are denoted with ***, **, and *, respectively.

| Model<br>Dependent variable | Predicted sign | 1<br>Survival<br>2 yrs | 2<br>Survival<br>3 yrs | 3<br>%ΔCash<br>2 yrs | 4<br>%ΔCash<br>3 yrs | 5<br>%ΔFixed assets<br>2 yrs | 6<br>%ΔFixed assets<br>3 yrs | 7<br>%ΔMarket share<br>2 yrs | 8<br>%ΔMarket share<br>3 yrs |
|---|---|---|---|---|---|---|---|---|---|
| Industry-adjusted leverage net of cash | (–) | -0.013*** | -0.027*** | 0.211*** | 0.239*** | -0.148*** | -0.151*** | -0.085*** | -0.153*** |
| | | (-5.92) | (-7.80) | (8.22) | (8.61) | (-5.52) | (-5.23) | (-3.34) | (-6.56) |
| Industry-adjusted leverage net of cash × No disclosure | (–) | 0.004 | -0.000 | -0.071** | -0.109*** | -0.050 | -0.081** | -0.034 | -0.077** |
| | | (1.23) | (-0.02) | (-2.11) | (-2.99) | (-1.42) | (-2.13) | (-1.00) | (-2.46) |
| No disclosure | (–) | -0.010*** | -0.030*** | -0.043 | -0.047 | -0.081** | -0.101*** | -0.045 | -0.065** |
| | | (-3.68) | (-6.71) | (-1.23) | (-1.25) | (-2.38) | (-2.76) | (-1.40) | (-2.19) |
| Loss | (–) | -0.030*** | -0.054*** | -0.045 | -0.248*** | -0.802*** | -0.724*** | -0.687*** | -0.579*** |
| | | (-6.88) | (-8.10) | (-0.89) | (-4.45) | (-16.32) | (-13.40) | (-14.60) | (-13.26) |
| Natural log of total assets | (+) | -0.016*** | -0.029*** | -0.076*** | -0.127*** | 0.072*** | 0.074*** | -0.141*** | -0.096*** |
| | | (-9.77) | (-11.91) | (-4.21) | (-6.46) | (4.21) | (4.01) | (-8.47) | (-6.19) |
| Year incorporated | (–) | -0.007*** | -0.023*** | -0.077*** | -0.076*** | -0.052*** | -0.044** | -0.048*** | -0.032** |
| | | (-5.09) | (-10.77) | (-4.48) | (-4.15) | (-3.27) | (-2.57) | (-3.12) | (-2.28) |
| Tangibility | (?) | 0.010*** | 0.024*** | 0.096*** | 0.066*** | -0.500*** | -0.518*** | -0.112*** | -0.050*** |
| | | (6.71) | (9.79) | (5.22) | (3.27) | (-29.11) | (-27.68) | (-6.41) | (-3.10) |
| Income per capita | (?) | -0.002 | -0.011*** | -0.030* | -0.032* | -0.080*** | -0.100*** | -0.030* | 0.000 |
| | | (-1.47) | (-4.69) | (-1.75) | (-1.73) | (-4.66) | (-5.38) | (-1.81) | (0.03) |
| Constant | | 0.948*** | 0.833*** | 5.522*** | 5.561*** | 5.670*** | 5.666*** | 5.929*** | 6.575*** |
| | | (466.55) | (248.66) | (206.69) | (194.16) | (220.63) | (205.45) | (242.64) | (294.14) |
| $R^2$ | | 0.010 | 0.020 | 0.006 | 0.007 | 0.048 | 0.049 | 0.017 | 0.020 |
| N | | 31,035 | 31,035 | 28,024 | 24,270 | 28,281 | 24,510 | 28,620 | 24,780 |