The use of intangible assets as loan collateral

Maria Loumioti *

University of Southern California

Abstract

Using a sample of secured syndicated loans, I explore the use of intangible assets as loan collateral and whether this credit practice was an innovation or a negative mutation in the corporate loan market. While intangible assets were not traditionally considered as eligible collateral, I find that twenty-one percent of U.S.-originated secured syndicated loans during 1996-2005 have been collateralized by intangibles, with intangible asset collateralization significantly increasing over this time period. I hypothesize and find that intangible redeployability and borrower reputation are positively related to the probability of using intangibles as loan collateral. I further hypothesize and find that collateralizing loans by intangibles significantly increases loan pricing and credit supply to firms. Finally, loans secured by intangibles perform no worse than other secured loans. Overall, I find evidence consistent with the fact that intangible asset collateralization was a credit market innovation that partially alleviated financing frictions.

1. Introduction

In this paper, I explore the role of intangible assets in reducing financing frictions in the credit market.[1] In the recent decades, firms have increasingly invested in intangibles to enhance their uniqueness and competitive advantage (Lev, 2001; Nakamura, 2001). However, greater dependence on intangibles distorts firms' ability to raise capital in the credit market, because low redeployability, higher information asymmetry and uncertain liquidation value inherent in intangibles restrict their effective use as loan collateral (Williamson, 1988; Shleifer and Vishny, 1992; Holthausen and Watts, 2001).

To address the imbalance between the supply and demand of eligible collateral, a new largely unregulated segment in the U.S. credit market using intangible assets as a form of collateral[2] developed in mid-1990s. Using a sample of secured syndicated loans originated during 1996-2005, I find that twenty-one percent of secured syndicated loans have been collateralized by intangible assets. This credit practice has grown from eleven percent of total secured loans in 1997 to twenty-four percent in 2005 (Figure 1).[3] While the use of intangible assets as loan collateral partially alleviated borrowing constraints, this credit practice emerged in

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[1] According to UCC Article 9, intangibles are defined as "any personal property other than goods, accounts, chattel paper, documents, instruments and money." This definition of intangibles includes separate, salable, discrete intangibles with well-defined property rights. Thus, intangible assets (capitalized and off-the-balance sheet, other than goodwill), such as patents, trademarks, copyrights, trade secrets, customer lists, domain names and proprietary designs, are considered as eligible collateral.

[2] In this paper, the term "collateral" refers to lender's right to possess the asset used as collateral on borrower's subsequent default or bankruptcy, and might imply that lenders developed either a security interest (i.e., right to liquidate the asset) or a collateral assignment (i.e., possessory right on the asset, based on which a lender can sue for infringement and issue licenses).

[3] This percentage is estimated on a sample of 1,415 secured syndicated loans with complete loan characteristics to U.S.-based public firms, for which DealScan LPC includes information on the assets used as collateral. These loans are not secured by all borrower assets (see "Sample Selection"). When I use all secured loans to U.S.-based public firms reported in DealScan, this percentage drops to 9 percent of total secured loans. Taking all syndicated loans (secured and unsecured) into consideration, the percentage of loans secured by intangibles drops to 2 percent of all loans.

a period of excessive credit expansion and laxer credit standards,[4] raising questions about whether the collateralization of intangibles was an innovation or a negative mutation in the corporate loan market. Using this context, I attempt to provide evidence on the use of intangibles as loan collateral by examining the performance of loans secured by intangible assets and the criteria employed by lenders for screening and selecting on borrower and intangible characteristics to alleviate information asymmetry inherent in these assets.

Several factors are associated with the rise of this credit practice (e.g., Edwards, 2001; Ellis and Jarboe, 2010; Amable et al., 2010). First, over the past twenty years, markets for intangibles have become more liquid (IRS Report on Returns of Active Corporations, 1994–2005). As a result, companies and investors developed more sophisticated methods for measuring the value of intangible assets, which has helped make intangible value monitoring less costly (Kaplan and Norton, 2004; Gu and Lev, 2004).[5] Second, over the past few years, unregulated lenders (i.e., investment banks and institutional investors) have become an important source of credit (Ivashina and Sun, 2010). Without facing commercial banks' regulatory constraints in valuing intangible asset collateral for regulatory capital requirements, these financial intermediaries adopted different and unconventional credit practices (Carey, Post and Sharpe, 1998), and have been willing to lend to distressed borrowers by leveraging "residual" collateral (i.e. intangibles) that commercial banks had largely ignored (Edwards, 2001).[6] Overall, the interactions of recent developments in markets for intangibles and changes in credit markets

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[4] For instance, "covenant lite" loans and "payment in kind" bonds (PIK) were popular credit practices used by creditors to offer cheap and more liquidity to borrowers during the recent credit boom.

[5] Higher dependence on intangibles increased the number of court decisions on lenders' ownership on intangible asset collateral upon borrower bankruptcy. In 1998, UCC Article 9 was revised in an attempt to address the increasing use of intangible assets as loan collateral. This attempt was not successful, because "the revision could not eliminate the confusion created by the intersection of state law governing secured transactions and federal law regulating different types of intellectual property" (Lui, 2011).

[6] Thomson Media, "ABL MM Lenders look to IP Collateral for Second Lien Loans", Vol.20 No. 6; February 14, 2005.

created an opportunity for lenders to leverage borrowers' intangible assets that had been previously discounted in loan agreements (Figure 1).

I examine four hypotheses to test how economic considerations influence lenders' and borrowers' decision to use intangible assets as loan collateral. To the extent that the collateralization of intangibles is an innovation in the credit market, lenders are expected to develop screening and monitoring mechanisms to alleviate adverse selection and moral hazard in intangibles by selecting on borrower and intangible characteristics that mitigate these risks. I attempt to capture these mechanisms by exploring the cross-sectional determinants of intangible asset collateralization. Moreover, under the innovation hypothesis, lenders will extend credit on intangibles by demanding higher loan spread as compensation for intangible asset higher recovery risk and costly due diligence. Finally, to the extent that the collateralization of intangibles was a negative mutation in the corporate loan market, I expect that loans secured by intangibles will perform worse than other secured loans.

My first hypothesis predicts which intangibles will be used as loan collateral. If lending on intangibles is an innovation, I expect that liquid and redeployable intangible assets will be pledged as loan collateral. Information asymmetry and moral hazard inherent in intangible assets decrease when intangibles are actively traded and their value is determined by market prices. In addition, the liquidation value of redeployable and liquid intangible assets will not significantly deviate from the value in best use (Williamson, 1988; Shleifer and Vishny, 1992; Benmelech et al., 2005). However, to the extent that this credit practice is a negative mutation, I expect that lenders will relax their screening standards for intangibles that qualify as eligible loan collateral, without trying to alleviate the risks inherent in intangibles.

The second hypothesis predicts that reputable borrowers will be able to pledge their intangible assets as loan collateral. Strong prior lending relationships facilitate the collection of proprietary "soft" information that alleviates moral hazard in intangibles and decrease lenders' monitoring costs (Petersen and Rajan, 1994; Berger and Udell, 1995; Bharath et al., 2008). Moreover, the accumulation of "soft" information helps lenders design loan contracts tailored to relationship borrowers' characteristics (Berger and Udell, 1995). However, if the collateralization of intangibles is a negative mutation in the corporate loan market, lenders will leverage "residual" collateral that other lenders heavily discounted in an effort to gain market share from their competitors, without primarily focusing on the underlying economics of the intangibles pledged as collateral.

The third hypothesis predicts the effect of pledging intangibles as collateral on loan pricing and size. To the extent that the collateralization of intangibles is a credit market innovation, I expect that lenders will demand higher compensation for monitoring and conducting costly specialized due diligence on intangibles. While securing loans by specialized assets will rationally increase loan pricing as a signal of the underlying collateral quality, this relation will not hold if intangible collateralization is a negative mutation in the credit market. For instance, over the past few years loan underpricing offered greater and cheaper liquidity to risky borrowers and allowed financial institutions to gain market share, giving rise to a broader credit boom (Pavlov and Wachter, 2009; Economic Report of the President, 2009; Ivashina and Sun, 2011). Indeed, Bernanke (2008) argued that "the boom in subprime mortgage lending was only a part of a much broader credit boom characterized by an underpricing of risk, excessive leverage, and the creation of complex and opaque financial instruments that proved fragile under stress."

The fourth hypothesis examines the performance of loans secured by intangible assets. If the collateralization of intangibles is a negative mutation in the credit market, lenders are likely to use intangible assets as additional collateral to extend more credit to low quality borrowers that lack strong tangible asset bases. In this context, the collateralization of intangibles is negatively related to loan performance ex-post. However, if the collateralization of intangibles is an innovation in credit markets, using opaque assets as collateral (i.e. intangibles) is likely to incentivize lenders to effectively monitor loans by exerting greater effort to collect proprietary and less verifiable information from borrowers (Rajan and Winton, 1995).

Using a sample of 1,415 secured syndicated loans during 1996-2005, I find evidence consistent with the hypothesis that the collateralization of intangible assets is a credit market innovation. Intangible asset redeployability and borrower reputation increase the probability of using intangible assets as loan collateral, suggesting that this credit practice is associated with thoughtful upfront screening and selection mechanisms. Moreover, using a structural equation model to control for simultaneity bias, I find that using intangibles as collateral increases loan size by approximately 18 percent and loan pricing by 74 basis points. For an average loan of $232 million and three years maturity, this represents approximately $4.1 million in interest expenses.[7] For an average firm with assets of $1.7 billion, the increase in loan size represents three percent of total assets. Finally, I find that loans secured by intangibles are of similar quality to other secured loans, and collateralizing loans by intangibles does not predict future deterioration in loan performance. Overall, the evidence suggests that lenders engaging in

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[7] Increase in interest expense is the net present value of three annual payments using LIBOR as a discount rate. The average LIBOR rate is 4.9 percent per year during the sample period. The result suggests that the increase in loan pricing is economically significant. I further find that loans secured by intangibles perform no worse than other secured loans, thus the results altogether suggest that higher loan pricing compensates lenders for the screening and monitoring costs, and the underlying risk.

intangible collateralization rationally develop screening and control mechanisms for alleviating financing risks inherent in intangibles, and that loans secured by intangibles do not underperform other secured loans. The findings reject the negative mutation hypothesis and provide evidence consistent with the fact that adverse selection and moral hazard inherent in intangibles are not inevitably problematic in leveraging intangibles in the credit market.

Overall, I find evidence in favor of the hypothesis that the collateralization of intangible assets was a valuable innovation in the corporate loan market. There are several explanations for my findings. First, lenders that originate syndicated loans ("lead lenders") typically retain a fraction of the loan on their balance sheet. Also, my findings show that the syndication structure of loans secured by intangibles involves fewer co-syndicates ("loan participants"). Thus, credit risk is not largely diversified away, providing strong incentives to lenders for screening and monitoring these loans. Second, most lenders do not routinely value intangibles as collateral and have been reluctant to invest in these assets. As a result, loans secured by intangibles are harder to trade in the secondary loan market. Thus, credit risk cannot be easily transferred after loan origination.

To triangulate my findings from the archival study, I further conducted two field studies in a private fund and a finance company that specialize in appraising and collateralizing patents and trademarks. The field observations confirm that loans secured by intangibles required greater up-front screening and higher due diligence so that lenders could successfully mitigate adverse selection and moral hazard inherent in intangibles. Indeed, the use of intangibles as loan collateral has been limited to separable and contractible intangibles of reputable mature firms with a long cash flow history. Moreover, lenders that specialize in intangible asset

collateralization often first identified intangibles eligible for collateralization, and then made an offer to borrowers to pledge these assets as collateral and raise more credit. To mitigate conflicts of interest with less senior lenders upon borrower's bankruptcy, the collateral interest in intangibles was first-lien and usually included all separable intangibles (e.g., trademarks, customer lists, patents and/or copyrights related to a product brand or firm's operations), as well as tangible assets. However, over the last few years, some loans have been secured solely by intangibles, as this innovation proved to be valuable and lenders became more confident on estimating intangible asset liquidation value. Finally, appraisers and lenders typically increased the discount rate used to value intangibles in liquidation by demanding a risk premium ("intangible- adjusted risk premium") to lend against these assets, which varied from 30 to 60 percent. Also, lenders applied a significantly lower loan-to-value ratio on this collateral category, typically 20 to 30 percent. Overall, my findings from the field studies provide additional evidence that lenders applied highly conservative estimates and assumptions in valuing intangibles in liquidation, and have been thoughtful in selecting and screening on intangibles eligible to be pledged as loan collateral.

The results have important academic and managerial implications. While prior studies have focused on the value of intangibles for shareholders (Amir and Lev, 1996; Aboody and Lev, 1998; Lev and Zarowin, 1999), I show that under certain conditions intangible assets can potentially further increase firm value in credit markets that are the largest capital provider (Armstrong, Guay and Weber, 2010). Moreover, I contribute to the literature on the use of intangible assets in loan contracts (Frankel et al., 2006; Skinner, 2008; Beatty, Weber and Yu, 2008) by showing that lenders' incentives to write contracts on intangibles are associated with increasing the supply of credit to firms. I inform the debate on reforming accounting and

disclosure practices related to intangibles (Skinner, 2008) by providing preliminary evidence that creditors have found ways of leveraging, financing, and valuing intangible assets.

Finally, the paper provides evidence that leveraging intangibles is not inevitably problematic and could potentially benefit both borrowers and lenders. On the one side, the findings inform the business practice by exploring this unregulated segment in the credit market that remains widely unknown among the business community.[8] On the other side, an important point that emerges from the paper is that using intangibles as collateral did not significantly deteriorate lenders' credit profile. Currently, commercial banks are seeking U.S. Federal Reserve regulatory approval for counting intangible assets towards loan's security for regulatory capital assets, which they have been previously restricted from.[9] Thus, banks could reduce their estimates of expected losses upon borrowers' default and their capital requirements. My paper provides a broad overview of using intangibles as loan collateral and the potential risks associated with this credit practice, emphasizing that lenders secured by intangibles have not been worse off than other secured lenders.

The rest of the paper proceeds as follows. Section 2 presents background and examples on the use of intangible assets as collateral. Section 3 discusses the related literature and section 4 presents the hypothesis development. Section 5 discusses the data and the sample selection criteria. Section 6 outlines the research design and proxies. Section 7 presents the results. Section 8 discusses the robustness tests, and section 9 concludes.

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[8] Source: PwC Survey on "One Valuation fits all?", 2008; "Collateral Salvage", CFO.com, June 2, 2005.
[9] Source: Brooke Masters, "Banks eye intangible assets as collateral", Financial Times, June 11, 2012 (http://www.ft.com/intl/cms/s/0/80c23e56-b08f-11e1-8b36-00144feabdc0.html#axzz259tHIHiu)

2. Intangible assets as loan collateral: background and examples

Over the past few years, intangible assets have been increasingly used as collateral in the corporate loan market. Using a sample of 1,415 U.S.-originated secured syndicated loans, I find that twenty-one percent of secured corporate loans included intangibles as loan collateral during 1996-2005,[10] and this credit practice has grown from eleven percent of total secured loans in 1997 to twenty-four percent in 2005 (Figure 1).

While intangibles have been used as a "floating-charge" rate in junk bond contracts from as early as the 1980s, extending credit on intangibles by collateralizing separable and contractible intangibles emerged in mid-1990s. For example, in 2001 Bank of America underwrote a term loan of $350 million for Levi Strauss that was collateralized by company's trademarks. The deal further included a revolving credit line secured by company's inventory. The company used these funds to reduce its borrowing costs, restructure its debt and redesign its core business lines.[11] Moreover, in 2003 the company refinanced its debt by pledging again its trademarks as collateral for a new term loan of $500 million. Similarly, Astrazeneca, Ann Taylor, and GIK Worldwide are some of the companies that pledged their intellectual property to raise credit.

Prior credit market reports have described the emergence and growth of intangible asset collateralization (e.g., Edwards, 2001; Ellis and Jarboe, 2010). First, unregulated lenders primarily applied this credit practice. Over the past twenty years, unregulated financial

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[10] The percentage estimated using this sample of large corporate loans is consistent with the percentage reported in surveys that have documented trends in intellectual property financing. For example, Venkatachalam (2007) finds that 18 percent of small and medium-sized firms in New England have used intellectual property as loan collateral (http://wsbe.unh.edu/files/Survey_Summary_FINAL.pdf).

[11] Source: Levi Strauss 10-K, 2003

institutions (e.g., insurance companies, investment banks, institutional lenders and finance companies) have emerged as important capital providers in the corporate loan market. As large commercial banks expanded by acquiring regional banks and primarily focused on large corporations with strong cash flows, small and medium-sized companies with different asset structure and higher liquidity constraints were underserved. This created a great market opportunity for unregulated lenders to aggressively enter the corporate loan market. These lenders applied different credit practices (e.g., relied more on firms' assets than cash flows) and primarily focused on highly leveraged borrowers (Flannery, 1989; Carey, Post and Sharpe, 1998). Moreover, banking deregulation laws (e.g., The Gramm-Leach-Bliley Act, 1999) further accommodated the participation of unregulated financial institutions in the corporate loan market. As a result, unregulated lenders increased their participation in the credit market by leveraging high-yielding "residual" collateral (i.e., intangible assets) that commercial banks had heavily discounted (Edwards, 2001).[12]

Second, prior studies have provided ample evidence that over the past few years intangible investments have grown rapidly, and that markets for intangibles have become more liquid. Indeed, Nakamura (2001) finds that U.S. companies invest over $1 trillion in intangible assets. Moreover, Internal Revenue Service data on corporate income show that the annual growth rate of revenue from royalties for intellectual property rose by 11 percent during 1994-2005. As a result, companies and appraisers have tried to develop more sophisticated methods for measuring and monitoring the value of their intangible capital (Kaplan and Norton, 2004).

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[12] Indeed, Marc Lucier, a director at Ocean Tomo that specializes in intellectual property valuation and trading, suggests that "in talking to different classes of investors, I have noticed that second-lien investors (and institutional middle market investors) talking more about intellectual property (…) as the space is getting more competitive, people have gotten more aggressive (and) have started to think about unconventional aspects of collateral packages." (Thomson Media, "Bank Loan Report", Vol. 20, No. 6, February 14, 2005)

Moreover, as markets for intangibles became more liquid, information asymmetry on the value of these assets decreased (Gu and Lev, 2004). Similarly, transactions of bankrupt companies involving intangible asset liquidation provided more confidence to investors that intangibles retain some value upon a company's bankruptcy (e.g., Polaroid, Eddie Bauer). Overall, the interactions of recent developments in credit markets and changes in markets for intangibles created an opportunity for lenders to leverage borrowers' intangible assets that had been previously discounted in lending agreements (Figure 1).

Despite ample anecdotal evidence by credit market experts and the business press over intangible asset collateralization, whether this credit practice has been a valuable innovation in the corporate loan market remains largely unexplored. More specifically, this credit practice emerged in a period of excessive credit expansion and laxer credit standards, raising questions about whether aggressive lenders faced with higher market competition accepted intangibles as collateral to boost their credit supply, or this credit practice resulted from lenders' thoughtful economic considerations of the information risks inherent in lending on intangibles (i.e., moral hazard and adverse selection).

3. Literature review

The academic literature on the role of intangibles in reducing financing frictions in credit markets is scarce and has mostly explored legal issues on the use of intangibles as credit collateral (Bezant, 2003; Brian, 2011). Amable et al. (2010) study the effect on using patents as loan collateral on firms' savings and future innovation growth, suggesting that patent

collateralization increases the effect of innovative rents on investments. In this paper, I empirically examine the cross-sectional determinants of this credit practice and the ex-post performance of loans secured by intangibles to provide evidence about whether intangible asset collateralization has been an innovation in the credit market.

An emerging literature examines the role of intangibles in signaling timely loan repayments. Frankel et al. (2007) suggest that the use of tangible net worth covenants decreases with borrowers' goodwill. Beatty, Weber and Yu (2008) investigate the determinants of excluding intangible assets from net worth covenants, arguing that goodwill amortization makes net worth covenants more conservative. While evidence from these studies indicates that intangible assets are not ignored by debt holders, prior studies have been inconclusive on lenders' incentives to write contracts on intangibles (Beatty, Weber and Yu, 2008; Skinner, 2008). In this paper, I contribute to this literature stream by providing evidence of conditions under which lenders use intangible assets as loan collateral to alleviate financing frictions.

Collateral is an important mechanism for decreasing credit rationing and credibly signaling borrower quality (Stiglitz and Weiss, 1981; Sharpe, 1990; Boot and Thakor, 1994; Rajan and Winton, 1995). The ability to pledge collateral affects firm's investment strategy and future growth (Kiyotaki and Moore, 1997). Indeed, Gan (2007) finds that firms are less likely to raise debt after an exogenous decrease in the collateral value of their assets. Moreover, Benmelech and Bergman (2009) suggest that collateral redeployability affects cost of debt. Finally, Chaney et al. (2010) explore the effect of shocks to the value of real estate on aggregate investment and find that U.S. corporations invest 6 cents out of each additional dollar of collateral. I contribute to this literature by exploring the use of a new asset class as eligible

collateral. Also, while prior studies have widely explored the relation between the supply of credit and the liquidation risk of assets pledged as loan collateral (Benmelech et al., 2005), intangible assets differ in that their liquidation value depends on management quality (i.e., the terminal value of intangibles is highly related to managers' decisions).

Earlier research has investigated the determinants of loan collateralization. Past studies that explored the effect of lending relationships on the demand for collateral have been inconclusive. Borrowers with strong lending relationships are less likely to pledge collateral (Berger and Udell, 1992; Berger and Udell, 1995; Petersen and Rajan, 1994; Cole, 1998; Bharath et al., 2008). However, Sharpe (1990) and Rajan (1992) suggest that relationship lenders will demand more collateral to "lock-in" borrowers and increase switching costs to competitors. Other factors that affect the probability of pledging collateral include borrower riskiness, loan size, and loan maturity (Berger and Udell, 1992; Boot, Thakor and Udell, 1991; Dennis, Nanda and Sharpe, 2000). Finally, adverse selection and moral hazard models predict the effect of borrower quality on the probability of pledging collateral. Adverse selection suggests that higher quality borrowers use collateral to signal their quality to lenders (Bester, 1985; Besanko and Thakor, 1987), whereas models on moral hazard predict that collateral restricts future asset-substitution, implying that low quality borrowers will pledge their assets as collateral (Boot and Thakor, 1994). In this study, I explore the effect of borrower reputation on using specialized firm-specific assets as collateral.

4. Hypothesis development

I examine four hypotheses on economic considerations predicted to affect lenders' and borrowers' decision to use intangible assets as loan collateral. To the extent that the collateralization of intangibles is a credit market innovation, I expect that lenders will develop screening and monitoring mechanisms by selecting on borrower and intangibles characteristics that alleviate adverse selection and moral hazard in intangibles. Moreover, under the credit innovation hypothesis, lenders will demand higher compensation to conduct costly due diligence on intangibles and extend credit against these assets. Finally, to the extent that the collateralization of intangibles is a negative mutation in the corporate loan market, this credit practice will be associated with worse loan performance ex-post.

a. Determinants of the collateralization of intangible assets

The first hypothesis predicts which intangible assets are pledged as loan collateral. Under the credit innovation hypothesis, I expect that redeployable and liquid intangible assets will be used as loan collateral. Information asymmetry and moral hazard inherent in intangible assets decrease when intangibles are traded and their value is determined by market prices. In addition, the liquidation value of redeployable and liquid intangible assets will not significantly deviate from the value in best use (Williamson, 1988; Shleifer and Vishny, 1992; Benmelech et al., 2005). However, the use of intangible assets as collateral is likely to be a negative mutation in credit markets if lenders' standards for screening of qualifying intangibles as eligible collateral are lax. Hence, to the extent that the collateralization of intangibles is an innovation in the credit market, my first hypothesis is:

H1: Intangible asset liquidity and redeployability is positively related to the probability of pledging intangibles as loan collateral.

The second hypothesis predicts that reputable borrowers will be able to pledge their intangible assets as loan collateral. Strong prior lending relationships facilitate the collection of proprietary "soft" information that will alleviate moral hazard in intangibles and decrease lender's monitoring costs (Petersen and Rajan, 1994; Berger and Udell, 1995; Bharath et al., 2008). Moreover, the accumulation of "soft" information helps lenders design loan contracts tailored to relationship borrowers' characteristics (Berger and Udell, 1995). However, if this credit practice is a negative mutation in the corporate loan market, lenders are likely to accept intangible assets as collateral in an effort to increase their market share in the corporate loan market by leveraging "residual" collateral that other lenders heavily discounted. Thus, under this hypothesis, the collateralization of intangibles is driven by competitive pressures rather than thoughtful economic considerations. Hence, to the extent that the collateralization of intangibles is a credit innovation, my second hypothesis is:

H2: Borrower reputation is positively related to the probability of pledging intangibles as loan collateral.

b. The collateralization of intangible assets, loan pricing and credit availability

The third hypothesis predicts the effect of pledging intangibles as collateral on loan pricing and size. Loan pricing reflects four fundamental types of credit risk: default risk, recovery risk upon default, liquidity risk (i.e., the risk of identifying other financial institutions willing to buy the loan), and prepayment risk. To the extent that the collateralization of intangibles is an innovation in the credit market, I expect that lenders will be willing to extend credit on intangibles by

demanding higher risk compensation for undertaking higher recovery and liquidity risk because less liquid collateral have overall lower and uncertain liquidation value. Similarly, lenders will demand higher compensation to effectively screen and monitor opaque collateral since conducting due diligence on assets with more volatile and uncertain future cash flows is costlier. In this context, higher loan spreads reflect lenders' compensation for operating in a "niche" segment of the corporate loan market and provide specialized due diligence on intangible assets that other lenders traditionally refrain from. While securing loans by specialized assets with uncertain liquidation value (i.e. intangibles) will rationally increase loan pricing to signal the underlying collateral quality, this relation might not hold if lenders' decision to extend credit on intangibles is not primarily driven by economic considerations. Over the recent credit cycle upturn, the underpricing of risk had increased the supply of credit to distressed borrowers and offered financial institutions the opportunity to gain market share, giving rise to a broader credit boom (Pavlov and Wachter, 2009; Economic Report of the President, 2009; Ivashina and Sun, 2011). Hence, to the extent that the collateralization of intangibles is an innovation, my third hypothesis is:

H3: The collateralization of intangibles increases loan pricing and size, controlling for other loan and borrower characteristics.

c. The collateralization of intangible assets and loan performance

The fourth hypothesis predicts the performance of loans secured by intangible assets ex-post. Using intangibles as loan collateral is positively or negatively related to future loan performance. On the one hand, lenders may use "residual" assets as collateral to extend credit to highly leveraged borrowers that lack sufficient tangible asset base (i.e., better quality collateral).

Companies with low asset tangibility are likely to have lower performance and earnings growth after they raise financing (Campello, 2007), increasing the likelihood of low loan performance ex-post. Similarly, performance of loans secured by intangibles is likely to deteriorate ex-post, as this credit practice recently emerged as an experiment in a small sub-segment of the credit market to leverage an asset class that lenders had traditionally ignored due to its inherent risks. On the other hand, collateralizing loans by opaque assets (i.e. intangibles) increases lenders' incentive to monitor loans (Rajan and Winton, 1995) by expending greater effort to collect proprietary and less verifiable information for borrowers. Moreover, higher quality borrowers are likely to engage in actions that are costly for poor quality firms to imitate (Spence, 1985; Ross, 1977). Thus, borrowers will pledge specialized and valuable assets (i.e. intangibles) as collateral to signal their value and reputation (Bester, 1985; Besanko and Thakor, 1987). Hence, my fourth hypothesis is:

   H4: Loans secured by intangible assets are better or worse quality than other secured corporate loans.

5. Sample selection

I obtain my primary sample of secured syndicated loans from Reuters Loan Pricing Corporation DealScan which includes details on loan terms and borrower and lender characteristics. DealScan extracts information from SEC filings (13Ds, 14Ds, 13Es, 10Ks, 10Qs, 8Ks and registration statements) and financial institutions and covers 50 percent to 75 percent of all syndicated loans (Carey and Hrycay, 1999). DealScan includes 16,671 secured tranches

(facilities) organized in 10,202 loans (packages) to 6,504 U.S.-based and international borrowers in the period 1988-2005. Because collateral is determined on the loan level, I use the loan as the unit of analysis.

To construct my sample of secured loans, I eliminate 4,730 loans (7,402 tranches) with missing information on the assets pledged as collateral. Moreover, I exclude 1,376 international loans (2,459 tranches) and 1,893 overcollateralized loans (2,681 tranches).[13] I obtain information on borrowers' financials by matching DealScan with the Compustat database, which restricts my sample to 1,492 loans (2,877 tranches). Finally, I eliminate years and industries (2-digit SIC) with fewer than ten loans, and loans to financial intermediaries (banks and trading companies). My final sample includes 1,415 secured loans (2,642 tranches) to 1,208 unique companies from 43 unique lead lenders. All secured loans in the sample are senior, granting priority to lenders upon borrower liquidation. The sample selection process is summarized in Table 1.

Assets pledged as collateral are categorized as accounts receivable, inventory, agency guaranty, cash and marketable securities, ownership of options, intangible assets, real estate, and property, plant and equipment (PPE). To correct for bias in DealScan reporting of loan collateral, I collect firms' 8-K filings on EDGAR database that disclose the contracts of the loans in my sample. I identify 74 loans where assets pledged as collateral are misreported in DealScan, and 9 loans where the term "intangibles" is used instead of receivables. The final sample includes 361 loans collateralized by intangible assets (26 percent of my sample) to 343 unique borrowers from

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[13] In overcollateralized loans where lenders seize all borrowers' assets, lenders use the term "intangible assets" as a "floating charge" rate to gain exclusive rights to reorganize or liquidate firms (Djankov et al., 2008; Gennaioli and Rossi, 2010). In this context, the term "intangibles" is not related to intangible capital screening at the time of loan origination and does not directly affect the loan to value ratio. My interviews with Russell Parr, an expert in intangibles valuation, confirm this finding. Also, industry experts (e.g., Ellis and Jarboe, 2010) suggest that "intangibles have always been included in a blanket lien on all assets. In these cases, (intangible assets) are not explicitly identified or incorporated into the terms of the loan. Thus, the collateral value of the assets is not recognized, and the borrower may not receive all of the capital they could qualify for."

37 unique lead lenders. Loans secured solely by tangibles are secured by inventories and accounts receivable (27 percent), PPE (68 percent) and cash (22 percent). Loans secured by intangible assets are further secured by inventories and accounts receivable (67 percent), PPE (42 percent) and cash (17 percent). Thus, in these instances, intangible assets are used as additional collateral. Four percent of the firms in my sample have taken loans secured by tangibles only and loans secured by tangibles and intangibles during 1996-2005. Borrowers in the apparel, hotel, computer, and telecommunication industries are likely to leverage their intangibles in loan agreements (Table 2). There are 10,648 patents, 2,199 copyrights and 1,952 trademarks in my sample that borrowers used as collateral. Abstracts from syndicated loan contracts secured by intangibles are reported in appendix B.

6. Research design and proxies

a. Determinants of intangible collateralization

The first two hypotheses predict the relation between intangible and borrower characteristics and the probability of pledging intangibles as collateral. To test the hypotheses (H1 and H2), I estimate a maximum likelihood (probit) model where the dependent variable is a binary variable that equals one if a loan includes intangible assets as collateral, and zero if a loan is secured only by tangibles (*Collateral_Intangibles*).

Probability (*Collateral_Intangibles* $_i$= 1)= α +β_1 *Intangible_Liquidity$_{i,t}$* +β_2 *Intangible_Redeployability$_{i,t}$* +β_3 *Lending_Relationship$_{i,t}$* +*Controls$_{i,t}$*

I use the following proxies for intangible liquidity and redeployability based on Shleifer and Vishny (1992): *Intangible_Liquidity* is defined as a binary variable that equals one if the firm licenses its intangible assets to third parties, and zero otherwise. Data on third party licenses of intellectual property are from borrowers' 10-K filings at the year of loan origination. I employ two proxies for *Intangible_Redeployability*: *Customers* is the number of the borrower's key customers extracted from 10-K filings and the Capital IQ database. *Indirect_Competitors* is defined as the natural logarithm of the number of firms that are classified in the borrower's secondary but not primary industry (2-digit SIC), using Compustat Segment Reports. These proxies are related to the likelihood that lenders successfully sell or liquidate borrowers' intangibles upon bankruptcy. For example, the customers of a firm are likely to acquire its patents or trademarks so that they can continue commercializing or using the products associated with these intangibles. Similarly, a firm's indirect competitors are likely to purchase its intangible assets upon bankruptcy so that they can improve their operational efficiency and/ or competitive advantage.[14]

The proxies for lending relationships are defined as follows: the strength of prior lending relationships (*Lending_Relationships)* is the size of syndicated loans that a borrower raised from a lead lender during the last five years prior to loan origination, deflated by the total loan size raised in this period (Bharath et al., 2008), and *Distance* is the natural logarithm of the distance (in miles) between the capital cities of the states where borrower's and lead lender's headquarters are located (Agarwal and Hauwald, 2010). Both variables proxy for lender's ability to collect

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[14] While a firm's direct competitors are more likely to acquire and easily redeploy its intangible assets, the value of intangibles is likely to depreciate faster under strong competitive pressures, thus the firm will have to invest more in intangibles to sustain their value. As a result, the number of direct competitors would be a noisy proxy for intangible redeployability.

"soft" proprietary information for valuing borrowers' intangible assets and alleviating moral hazard inherent in these assets.

I control for transaction costs of using risky collateral. Banks face regulatory constraints on the quality of collateral used in secured lending (e.g., FDIC Risk Management Manual for Secured Lending, 2011). While commercial banks are the dominant players in the syndicated loan market, unregulated lenders, including investment banks and finance companies, have entered the leveraged loan market (S&P Report on U.S. Syndicated Loan Market, September 2010) by engaging in different credit practices to compete with commercial banks. In addition, over the past few years, institutional investors with greater risk appetite have participated in syndicated loans and acted as "lenders of last resort" for distressed firms (S&P Report on U.S. Syndicated Loan Market, September 2010). I use 8-K filings and lender data on DealScan to create two proxies for transaction costs: *Unregulated_Lead* is defined as a binary variable that equals one if the lead lender is a finance firm, investment bank, or insurance firm, and zero otherwise, and *Institutional* is a binary variable that equals one if the loan includes tranches sold to institutional investors (Term Loan B-H), and zero otherwise (Ivashina and Sun, 2011).

I control for the value of borrower's intangible assets using the following proxies: i) intangible asset intensity (*Intangibles*), defined as other intangibles, R&D and advertising expenses, deflated by total assets, ii) market to book value (*Market-to-Book*), defined as market value to book value of equity, iii) number of patents (*Patents*), defined as the natural logarithm of borrower's patents at the time of loan origination (NBER Database for Patents and Patent Citations, 2006), iv) number of trademarks and copyrights (*Trademarks_Copyrights*), defined as the natural logarithm of the number of active registered trademarks and copyrights at the time of

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loan origination (USPTO TESS Database and U.S. Copyright Office), v) G-Index (*G-Index*), defined in Gompers et al. (2003). While prior studies have shown that G-Index is related to the value of a firm, the value of specialized firm-specific assets (i.e. intangibles) is highly correlated to firm value, and as a result managerial decisions and characteristics that increase firm value will further increase the value of specialized assets.

Controls for borrower characteristics include: i) leverage (*Leverage*), defined as total debt to equity, ii) liquidity (*Liquidity*), defined as current assets to current liabilities, iii) capital assets (*Capital Assets*), defined as property, plant and equipment to total assets, iv) return on assets (*ROA*), defined as operating income to total assets, v) Herfindahl Index (*Herf_Index*), defined as firm's sales to industry sales (2-digit SIC), vi) credit rating (*Rated*), defined as a binary variable that equals one if the borrower is rated by S&P or Moody's, and zero otherwise, vii) z-score (*Z_Score_beg.*), defined as borrower's Altman z-score at the time of loan origination, vii) size (*Size*), defined as the natural logarithm of total assets. I include industry (2-digit SIC), year, lead lender and loan purpose (restructuring, refinancing and working capital/corporate purposes) fixed effects to control for persistent effects across industries, years, lenders and loan types.

Finally, I control for the following loan characteristics: i) loan amount (*Loan_Size*), defined as the natural logarithm of loan amount (in $million), ii) maturity (*Maturity*), defined as the natural logarithm of loan maturity (in months), iii) financial covenants (*Fin_Covenant*), defined as a binary variable that equals one if the loan includes a financial or (tangible) net worth covenant, and zero otherwise, iv) number of co-syndicates (*Syndicates*), and v) performance pricing (*Perfprice*), defined as a binary variable that equals one if the loan includes a performance pricing provision, and zero otherwise.

b. The collateralization of intangible assets, loan pricing, and credit availability

The third hypothesis predicts the effect of collateralizing loans by intangible assets on loan pricing and size. Because the decisions to use intangibles as collateral, loan pricing, and loan size are simultaneously determined, ordinary least squares estimates will be biased. For example, securing loans by intangibles may increase loan spread; however, lenders' appetite for higher yields may motivate lenders to extend credit on illiquid assets (i.e., intangibles). Based on prior studies (e.g., Asquith, Beatty and Weber, 2005; Wittenberg-Moerman, 2008), I jointly model the collateral choice, loan pricing, and loan size to eliminate simultaneity bias by estimating two simultaneous equations models of loan size and collateral and loan price and collateral.[15]

Probability(Collateral_Intangibles)= α +β$_1$ Intangible_Liquidity$_{i,t}$ +β$_2$ Customers$_{i,t}$

+β$_3$ LIBOR-spread$_i$ +Controls

LIBOR-spread$_i$= α +β$_1$ Competitors$_{i,t}$ + β$_2$ Collateral_Intangibles$_i$ +Controls

Probability(Collateral_Intangibles)= α +β$_1$ Intangible_Liquidity$_{i,t}$ +β$_2$ Customers$_{i,t}$

+ β$_3$ Loan_Size$_i$ +Controls

Loan_Size$_i$= α + β$_1$ Goodwill$_{i,t}$ + β$_2$ Collateral_Intangibles$_i$ +Controls

I use several instruments for the endogenous variables.[16] Specifically, I use *Intangible_Liquidity* and *Customers* as instruments for the probability of collateralizing a loan by

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[15] I do not jointly determine loan size and loan pricing because a firm's demand for capital determines the loan pricing, not vice versa (Ivashina, 2009). Thus, in my sample, the loan size will affect loan pricing through the choice of the underlying collateral.

[16] F-tests for instrument relevance show that my instruments are valid (untabulated). Moreover, I test and find that my instruments are not related to the other endogenous variables in my sample (untabulated).

intangibles because these variables are unrelated to loan size and pricing, but affect the probability of using intangibles as collateral. I use *Goodwill* (defined as goodwill to total assets) as an instrument for loan size because companies with greater future growth options are likely to take larger loans. However, goodwill is not pledged as collateral, and thus does not affect the probability of using intangibles as loan collateral. Finally, I use the natural logarithm of the number of companies with the same 2-digit SIC (*Competitors*) as an instrument for *LIBOR-spread* (the coupon spread over LIBOR on the drawn amount plus the annual fee) because competitive pressures increase firm's risk, and thus loan pricing, but are not directly associated with the probability of pledging intangibles as collateral.[17]

I control for the following borrower and loan characteristics: i) lending relationships, ii) distance between lead lender's and borrower's headquarters, iii) loan characteristics (unregulated lead lender, institutional loan, an indicator whether the loan includes a performance pricing provision, financial covenants, number of co-syndicates, loan maturity), and vi) other borrower characteristics (capital assets, leverage, liquidity, ROA, size, credit rating).

        c.   The collateralization of intangible assets and loan performance

The fourth hypothesis predicts a relation between collateralizing loans by intangible assets and loan performance. To test my fourth hypothesis (H4), I estimate an ordinary least squares model where the dependent variable is loan performance over the life of the loan:[18]

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[17] Because one of the endogenous variables is a binary variable, I correct standard errors following Maddala (1983).
[18] Because my sample of loans ends in 2005, I observe loan performance from origination to maturity date. Six percent of the loans mature in 2011, two percent in 2012 and one percent in 2013, thus I expect bias from right-censoring to be insignificant.

Loan Performance$_{i,t=1-m}$ = α +β$_1$ Collateral_Intangibles$_i$ +Borrower Characteristics$_{i,t}$ + Loan Characteristics$_i$ +Controls$_{i,t}$

I use several proxies for loan performance based on prior literature (Benmelech et al, 2011). First, I use the number of credit rating downgrades from S&P and/or Moody's over the life of the loan (*Credit_Downgrades*), adjusted to loan maturity. Data on credit ratings are extracted from the MDRS and Compustat database. All secured loans in my sample are senior, and therefore have similar priority in repayment, making ratings an appropriate measure of loan performance. Second, I use the number of covenant violations (*Covenant_Violations*) over the life of the loan from Nini, Smith and Sufi (2009), adjusted to loan maturity.[19] While covenant violations are associated with total debt outstanding, violations are an appropriate measure of loan performance as they trigger credit downgrades and are related to borrower's overall credit quality. Finally, I use the number of years that borrower's z-score (*Z-Score*) fell below 0.3 (i.e., the average z-score in the lowest two deciles during 1996-2010), adjusted to loan maturity. While z-score is an indirect measure of loan performance, it is based on accounting information and can be estimated for all borrowers in my sample.

Furthermore, I use a maximum likelihood (probit) model where the dependent variable is: i) a binary variable that equals one if borrower's credit rating was downgraded over the life of the loan, and zero otherwise (*Credit_Downgrades2*), ii) a binary variable that equals one if the borrower violated at least one financial covenant over the life of the loan, and zero otherwise (*Covenant_Violations2*), iii) an indicator that equals one if borrower's z-score fell below 0.3 over the life of the loan, and zero otherwise (*Z-score2*), iv) a binary variable that equals one if the

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[19] Because covenant violations in Nini, Smith and Sufi (2009) are quarterly reported, I define that a company violated debt covenants, if at least one covenant violation is reported in a given year. I eliminate loans with no financial or net worth covenant to companies that do not report covenant violations.

borrower filed for bankruptcy under Chapter 7 or 11 over the life of the loan, and zero otherwise (*Bankrupt*), using data from Capital IQ.

Borrower characteristics include size, ROA, leverage, liquidity, credit rating (when covenant violations and z-score are used as dependent variables), Herfindahl index and capital assets, z-score at the time of loan origination (*Z_score_beg.*), and borrower's credit rating (*Credit rating*). Loan characteristics include loan maturity, loan size, LIBOR spread, number of co-syndicates, an indicator whether the loan includes a performance pricing provision, and an indicator for financial covenants. I further control for year, industry, and loan purpose fixed effects. The variable definitions are reported in Appendix A.

7. Descriptive statistics and results

a. Descriptive statistics

Table 3 reports summary statistics for loan, borrower and intangibles characteristics used in the regressions. The average borrower size is $1.7 billion, with average intangible assets (excluding goodwill) of $272 million. The average firm in my sample has 62 patents, 9 registered active trademarks, and 5 active registered copyrights at the time of loan origination. However, there is significant variation in the number of patents, trademarks, and copyrights, with standard deviations of 568.4, 30.3, and 61.9, respectively. The average leverage ratio is 1.64 and operating income is 8 percent of total assets. The average credit rating is BB-. The average loan size is $232 million, ranging from a low of $10 million to a high of $875 million. The maturity of these loans averages 33.5 months, and the average spread over LIBOR on the drawn amount plus the

annual fee is 261 basis points. Approximately 60 percent of the loans include at least one financial or net worth covenant, and 52 percent have a performance pricing provision. Finally, 26 percent of the loans have institutional tranches and 14 percent are originated from unregulated lead lenders.

In terms of my main variables of interest, Table 3 shows that 31 percent of the firms in my sample license their intangibles to third parties. The average firm in my sample reports approximately 3 key customers and has 39 indirect competitors. The mean strength of prior lending relationships is 0.45, suggesting that firms in my sample have developed strong ties with their lenders over time. Covenant violations and credit downgrades are frequent for these firms: the mean probability of covenant violations and credit downgrades is 44 percent and 42 percent respectively, consistent with the fact that the borrowers in my sample have low credit ratings.

In Table 4, I segregate the loans in my sample based on the assets used as collateral. In the first column, I report intangible, loan, and borrower characteristics for loans secured by tangible assets. The second column provides the same information for loans secured by tangibles and intangibles. The last column reports the differences in average loan, borrower, and intangible characteristics between loans secured by tangibles and loans secured by tangibles and intangibles. The results of the univariate tests of differences in means provide strong evidence that collateralizing intangible assets is positively related to intangible liquidity, number of customers and indirect competitors, and strong lending relationships. Moreover, the results suggest that loans secured by intangibles have higher spread, shorter maturity, greater size deflated by total assets, and fewer co-syndicates.

Untabulated univariate correlations between the probability of using intangibles as loan collateral and the other variables indicate that the use of intangible assets as collateral is positively related to intangible liquidity (0.15), the number of customers (0.10), the number of indirect competitors (0.09), strong lending relationships (0.21), and loan size to total assets (0.17). The use of intangibles as loan collateral is negatively associated with the distance between lenders' and borrowers' headquarters (-0.14). Moreover, collateralizing loans by intangibles is weakly correlated to loan performance.

b. Results

i. *Determinants of the collateralization of intangible assets*

Table 5 reports marginal effects for the probit regressions of the first and second hypotheses (H1 and H2) that predict which intangibles and borrower characteristics are positively related to the probability of collateralizing intangible assets. In all specifications, the coefficients on *Intangible_Liquidity* and *Customers* are significantly positive (p-value <0.01). This is consistent with H1, supporting that liquid and redeployable intangibles are used as loan collateral. The unconditional probability of using intangibles as loan collateral is 26 percent which increases by approximately 13 percent if borrowers license their intangibles to third parties (*Intangible_Liquidity*). An increase of one standard deviation in *Customers* increases the probability of pledging intangibles as collateral by 4 percent. The coefficient on *Lending_Relationships* and *Distance* are both significantly positive (p-value ≤0.05), consistent with H2, supporting that borrower reputation is positively related to the probability of using intangibles as loan collateral. An increase of one standard deviation in *Lending_Relationships* increases the probability of pledging intangibles as collateral by approximately 5 percent.

Similarly, a decrease of one standard deviation in *Distance* increases the probability of pledging intangibles as collateral by 2.3 percent. The results hold controlling for fixed characteristics across lead lenders.

Furthermore, transaction costs significantly affect the probability of collateralizing intangibles, suggesting that lenders' risk tolerance influences the adoption of this credit practice. Specifically, borrowing from an unregulated lead lender (investment banks, finance companies, etc.) increases by 11 percent the probability of leveraging intangibles. The value of borrower intangibles does not influence the collateralization of intangibles, consistent with the fact that under certain conditions intangibles are valuable collateral and lending against intangibles is a "niche" segment in the corporate loan market. However, I do find that management characteristics that increase firm value (G-Index) positively affect the probability of using intangibles as collateral, consistent with the fact that firm value and the value of specialized assets are highly correlated. Finally, small borrowers (*Herf_Index*) with liquidity constraints (*Liquidity*) are likely to pledge their intangibles as collateral in loan agreements. Overall, I find evidence consistent with lenders' thoughtfully selecting on intangible and borrower characteristics that enhance the ability of intangibles to serve as collateral.

ii. *The collateralization of intangible assets, loan pricing and credit availability*

Table 6 reports results for the tests of my third hypothesis (H3) about whether collateralizing intangibles increases loan size and pricing. Because loan terms are simultaneously determined, I jointly model the decision of using intangibles as loan collateral, loan size, and pricing. The F-tests confirm the instrument relevance (untabulated). I find that using intangibles as collateral increases loan size by approximately 18 percent and loan pricing by 74 basis points. For an

average loan of $232 million and three years maturity, this represents approximately $4.1 million in interest expenses. For an average firm with assets of $1.7 billion, the increase in loan size represents 3 percent of total assets. Moreover, the average firm in my sample that pledged intangibles as collateral has intangible assets of $237 million (excluding goodwill), thus these borrowers successfully leveraged approximately 18 percent of the value of their intangible assets. Consistent with the multivariate results, the pricing of loans secured by intangibles remained high during the recent credit boom (Figure 2), indicating the high quality of lenders' costly due diligence when appraising intangible collateral value.

iii. The collateralization of intangible assets and loan performance

Table 7 reports results for the tests of my fourth hypothesis (H4) of whether loans secured by intangibles are better or worse quality than other secured loans. The results suggest that collateralizing a loan by intangibles does not predict deterioration in credit ratings. Using borrower's z-score, credit rating downgrades, or covenant violations as proxies for loan performance, I find no significant difference between loans secured by tangibles and loans that include intangibles as collateral. In fact, using bankruptcy rates as a proxy for loan performance I find that firms that pledged their intangibles as loan collateral are 4 percent less likely to file for bankruptcy over the life of the loan. While none of these measures are perfect, the results suggest that loans secured by intangibles are of similar quality to other secured loans, implying that lenders that accepted intangible assets were not worse off than other secured lenders. Overall, my findings are consistent with the hypothesis that the collateralization of intangibles is an economically valuable credit market innovation.

8. Further analysis

a. Robustness tests

I perform a series of robustness tests to ensure that the results are not driven by the research design choices in the primary analysis. The first eight robustness checks refer to untabulated tests. First, I use the number of borrower's suppliers as a proxy for intangibles redeployability. Because data on suppliers are not available for every firm in my sample, my sample size decreases by 60 percent. The effect of intangible redeployability on the probability of using intangibles as collateral is positive and statistically significant, but less economically significant. Second, I exclude firms in regulated industries (2-digit SIC: 40-45) because these firms have different capital needs and constraints. I further exclude loans with size in the lowest decile (loan amount<$30 million) to eliminate small and less economically significant deals. The results hold in both specifications. Third, I use the book value of assets pledged as collateral as an independent variable in the simultaneous equation model (Table 6) to control whether the effect is driven by differences in the underlying collateral value, and the results hold. Fourth, coefficient estimates from maximum likelihood models that include dummy variables to estimate fixed effects are biased (Madalla, 1987). However, the coefficient bias in these models tends to zero as the number of within-group observations increases (Wooldridge, 2002). While I constructed my sample taking a significant number of within-group observations, to further allay this concern I use a conditional logit model grouping loans by industry, year and loan purpose. The results hold in this specification.

Fifth, I test whether the effect of strong prior lending relationships on the collateralization of intangibles is driven by unobservable characteristics. Specifically, a lead lender might extend

credit to a relationship borrower without conducting a careful due diligence on borrower's assets. While syndicated loans are large corporate loans and involve a group of formal screeners, I eliminate potential bias from unobservable characteristics by defining lending relationships as the size of large loans (i.e. greater than 20 percent of borrower's assets) that a borrower raised from a lead lender over the last five years prior to loan origination, deflated by the total number of loans that the borrower raised in this period. The results hold in this specification. Sixth, I test the effect of collateralizing loans by intangibles on future loan performance (credit ratings, bankruptcy rates and z-score) using a subsample of loans that do not include financial covenants to allay the concern that loan performance is driven by lender's higher monitoring effort, and the results hold. Seventh, I test the effect of collateralizing loans by intangibles on future loan performance using industry-adjusted bankruptcy rates, and the results hold. Eighth, to explore whether economic considerations in collateralizing loans by intangibles and loan performance differ over time, I test my hypotheses using the following three subsamples: loans originated before 2000, loans originated after 2000, and loans that matured after 2007. The results in my main specification are similar across these subsamples.

Finally, I test whether selection bias affects my results, as the probability of using intangibles as collateral depends on lenders' decision to take collateral. I follow Core and Guay (1999), and I use a Heckman selection model to correct for potential bias by including unsecured loans in my sample. I increase the size of my sample by adding 2,538 unsecured loans to 1,195 unique public companies during 1996-2005. I exclude companies that took a secured loan three years after and prior to an unsecured loan. The first stage is a logit model where the dependent variable is the probability of securing a loan. The independent variables include borrower's liquidity, ROA, leverage, rating, capital assets, intangible assets, size, lending relationships, loan

size, loan purpose, financial covenants, performance pricing provisions, and loan maturity. The results hold with those alternative specifications (untabulated tests).

In my tests, I compare loans that include intangible assets as collateral to loans secured only by tangible assets. I further use two additional benchmarks. I first compare loans secured by intangibles to loans secured by tangibles and unsecured loans. Table 8 reports results of the test. I find that borrowers taking loans secured by intangibles are equally reputable to borrowers taking unsecured loans. However, these borrowers are highly leveraged small firms, consistent with the fact that lenders will demand for collateral. Moreover, I run the test on the determinants of collateralizing loans by intangible assets (H1 and H2) matching loans on the underlying value of the assets pledged as collateral. Since the loan to value ratio of the assets pledged as collateral is unobservable, I use the book value of assets pledged as collateral deflated by loan size. I include R&D and advertising expenses in estimating the collateral value of intangible assets to capture off-the-balance sheet intangibles. The matched sample includes 705 loans. The test confirms that lenders carefully select on borrower and intangible characteristics that alleviate information asymmetry in intangibles (Table 9). Similarly, I find that the collateralization of intangibles increases loan pricing by 81 basis points (untabulated test). Finally, I estimate a treatment effect model to eliminate endogeneity bias using the instruments described in section 5. The results of the test are consistent with the results of the simultaneous equation model in my primary analysis (Table 10).

b. Field study

To triangulate my results from the archival study, I conducted two field studies in a private fund and a finance company that specialize in appraising and collateralizing patents and trademarks.

The first site is a private fund that has appraised and collateralized more than twenty-five patents over the last twenty years. The second field site is a finance company with a long history of liquidating and appraising tangible assets and trademarks. During my field visits, I interviewed the senior management teams and analysts, and at the second site I had access to internal meetings and negotiations with top U.S. lead syndicates that used trademarks as collateral for a large syndicated loan. Moreover, I had access to their portfolios of past valuation and collateralization cases. Finally, I conducted phone interviews with twenty-three intellectual property appraisers and bank managers that value, trade, and acquire patents and trademarks in bankruptcy liquidations, and lend against intangibles.

The field observations and interviews confirm that loans secured by intangibles required greater up-front screening and higher due diligence so that lenders could successfully mitigate adverse selection and moral hazard inherent in intangibles. Specifically, fund managers suggested that "(collateralizing patents) is an important source of capital for intangibles-intense companies (…) we lend against royalties from mature, established patents (…) companies can use the money to innovate and invest in developing new patents." As appraisers in the finance company confirmed, "these companies had a strong brand image and their trademarks generated enormous cash flows." Moreover, lenders that specialized in intangible asset collateralization often identified first intangibles eligible for collateralization, and made an offer to borrowers to pledge these assets as collateral and raise more credit. Indeed, ""the initial screening and due diligence –sometimes before we even start our negotiations with the company- is the most important element for the deal to succeed. In most collateralization cases that failed, lenders had not identified the right intangibles that could be pledged as collateral or did not accurately forecasted future sales associated with these assets. (Thus,) our competitive edge merely relies

on this first step (...) lending against intellectual property is a "niche" market, and few borrowers have trademarks or patents that are eligible to collateralize (…) Few lenders have capabilities to collateralize loans by intangibles, identify and appraise intangibles in liquidation (…) We search for firms that have intangibles with certain characteristics, (as well as) for companies that are interested in raising debt or meet our standards and we then make them an offer for a loan." Based on this costly up-front screening, managers suggested they are reluctant to trade this debt and transfer risk after loan origination. More specifically, "(we) have invested so many resources and time into these deals that the last thing I want is to provide these high yields to another lender (co-syndicate)."

To mitigate conflicts of interest with less senior lenders upon borrower's bankruptcy, the collateral interest in intangibles was first-lien and usually included all separable intangibles (for example, trademarks, customer lists, patents and/or copyrights related to a product brand or firm's operations), as well as tangible assets. However, over the last few years, some loans have been secured solely by intangibles, as this innovation proved to be valuable, and lenders became more confident on estimating intangible asset liquidation value.

Finally, appraisers and lenders typically increased the discount rate used to value intangibles in liquidation by demanding a risk premium ("intangible- adjusted risk premium") to lend against these assets, which varied from 30 to 60 percent. Also, lenders applied a significantly lower loan-to-value ratio on this collateral category, typically 20 to 30 percent. Also, lenders usually provided short-term credit on intangibles: "If I estimate that the useful life of the patent is 20 years, I will only lend against short-term cash flows generated in the next 3-4 years (…) I will (usually) lend 20 to 30 percent of the value, but this varies across patents and

borrowers." Overall, my findings from the field studies provide additional evidence that lenders applied highly conservative estimates and assumptions in valuing intangibles in liquidation, and have been thoughtful in selecting and screening on intangibles eligible to be pledged as loan collateral.

9. Conclusion

Using a sample of syndicated secured loans in 1996-2005 and data from two field studies, I explore the role of intangible assets in reducing financing frictions in credit markets. Contrary to the predominant managerial and scholarly perspective that intangible assets are not sufficient collateral, I find that twenty-one percent of U.S.-originated secured loans from 1996-2005 include intangible assets as loan collateral, and the collateralization of intangibles has significantly increased over the last several years. This trend is related to lenders' demand for high yielding assets and changes in markets for intangibles (Figure 1).

I examine four hypotheses to test whether the collateralization of intangibles is an economically valuable market innovation or is driven by lenders' opportunistic behavior in an effort to increase the supply of credit to distressed firms. Consistent with the economically valuable lending decision hypothesis, I hypothesize and find that liquid and redeployable intangibles are likely to be used as collateral. Moreover, I hypothesize and find that borrowers with strong lending relationships will pledge their intangibles as loan collateral. Collateralizing loans by intangibles has significantly increased loan pricing and credit availability. Finally, loans secured by intangibles perform no worse than loans secured by tangibles.

The results provide a broad insight about the collateralization of intangible assets, and have important academic and managerial implications. First, an important point that emerges from the paper is that intangible assets increase firm value not only in equity markets, but in credit markets. Under certain conditions, the effective pledgeability of intangible assets has alleviated financing frictions and satisfied lenders' appetite for high yielding assets. Second, while prior literature is inconclusive over the use of intangible assets in loan contracts (Beatty, Weber and Yu, 2008; Skinner, 2008), I provide evidence that lenders' incentives to collateralize loans by intangibles are related to credit supply. Third, loans secured by intangibles are not worse quality than other secured loans, thus adverse selection and moral hazard inherent in intangibles are not inevitably problematic in securing loans by intangible assets. Finally, I inform the debate on reforming accounting and disclosure practices related to intangibles (e.g., Skinner, 2008) by providing preliminary evidence that credit markets are efficient in finding ways of leveraging and financing intangible assets.

The study has certain limitations that need to be taken into account when considering its contribution. Due to data limitations, addressing the welfare implications of lending on intangibles is not a goal of this study, and I cannot conclude whether lenders and borrowers are rational or better off using intangibles as loan collateral. Future studies could address this research question.

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Appendix A: Variable Definition

Variable	Definition
Bankrupt	Binary variable that equals one if the firm filed for bankruptcy under Chapter 7 or 11, and zero otherwise
Capital Assets	Property, plant and equipment to total assets
Collateral_Intangibles	Binary variable that equals one if intangibles are used as collateral, and zero if the loan is secured by tangible assets
Competitors	The natural logarithm of the number of companies with same 2-digit SIC
Covenant_Violations	The number of covenant violations over the life of the loan from Nini, Smith and Sufi (2009), deflated by loan maturity (in years)
Covenant_Violations2	Binary variable that equals one if a firm violated at least one covenant over the life of the loan, and zero otherwise
Credit_Downgrade2	Binary variable that equals one if borrower's credit rating was downgraded over the life of the loan, and zero otherwise
Credit_Downgrades	The number of downgrades of S&P and Moody's credit ratings over the life of the loan, deflated by loan maturity (in years)
Credit Rating	S&P (or Moody's) credit rating set equal to 1 for AAA (highest rated), and 21 for D rated companies (lowest rated)
Customers	The natural logarithm of the number of borrower's key customers reported in SEC filings
Distance	The natural logarithm of the distance (in miles) between the capital cities of the states where firm's and its lead lender's headquarters are located
Fin_Covenant	Binary variable that equals one if the loan includes a financial and/or (tangible) net worth covenant, and zero otherwise
G-Index	Governance index defined in Gompers et al. (2003)
Goodwill	Goodwill to total assets
Herf_Index	Firm's sales to industry sales (based on Fama-French 48 industry portfolios)
Indirect_Competitors	The natural logarithm of the number of firms that are classified in borrower's secondary, but not primary industry (2-digit SIC)
Institutional	Binary variable that equals one if the loan includes tranches sold to institutional investors (Term Loan B-H), and zero otherwise
Intangibles	Other intangibles, R&D and advertising expenses, deflated by total assets

Variable	Definition
Intangible_Liquidity	Binary variable that equals one if the firm licenses its intangible assets to third parties, and zero otherwise
Lending_Relationships	The size of loans that a borrower raised from a lead lender in the last five years prior to loan origination, deflated by the total loan size raised in this period
Leverage	Total debt to equity
LIBOR-spread	The coupon spread over LIBOR on the drawn amount plus the annual fee
Liquidity	Current assets to current liabilities
Loan_Size	The natural logarithm of loan amount (in $m)
Loanamt_Assets	Loan amount to total assets
Market-to-Book	Market value to book value of equity
Maturity	The natural logarithm of loan maturity (in months)
Patents	The natural logarithm of borrower's patents at the time of loan origination
Perfprice	Binary variable that equals one if the loan includes a performance increasing or decreasing term, and zero otherwise
Rated	Binary variable that equals one if the borrower is rated by S&P or Moody's, and zero otherwise
ROA	Operating income to total assets
Size	The natural logarithm of total assets
Syndicates	Number of co-syndicates
Trademarks_Copyrights	The natural logarithm of the number of active trademarks and copyrights at the time of loan origination
Unregulated_Lead	Binary variable that equals one if the lead lender is an investment bank, an insurance firm or a finance company, and zero otherwise
Z-Score	The number of years that borrower's z-score fell below 0.3 (i.e. lowest 20% of public firms in 1996-2010), deflated by loan maturity (in years)
Z_Score_beg.	Borrower's z-score at the time of loan origination
Z-Score2	Binary variable that equals one if borrower's z-score fell below 0.3 over the life of the loan, and zero otherwise

Appendix B: Examples of loan contracts secured by intangible assets

Company	Year	Abstract from 8-K filings
Silicon Graphics, Inc.	2002	**PATENT SECURITY AGREEMENT**: (...) a continuing security interest in the following property: (i) Each patent presently owned and listed on Schedule A hereto; and (ii) All proceeds of the foregoing, including without limitation any claim by Grantor against third parties for damages (to the extent not effectively prohibited by an applicable and legally enforceable license agreement) by reason of past, present or future infringement of any patent now owned or heraeafter acquired (...)
Levi Strauss & Co.	2001	**TRADEMARK SECURITY AGREEMENT**: ...(i) all rights, title and interest (including rights acquired pursuant to a license or otherwise) in and to all trademarks, service marks, designs, logos, indicia, tradenames, trade dress, corporate names, company names, business names, fictitious business names, trade styles (...), (ii) all proceeds, products, rents and profits of or from any and all of the foregoing Trademark Collateral (...)
Pharmchem, Inc.	2002	**PATENT AND TRADEMARK SECURITY AGREEMENT**: (…) (a) Any and all copyright rights, copyright applications, copyright registrations…, (b) Any and all trade secrets…, c) Any and all design rights…, d) All patents, patent applications,…, e) Any trademark and servicemark rights,...

TRADEMARK SECURITY AGREEMENT

Savvis Communications International, Inc.

THIS TRADEMARK SECURITY AGREEMENT ("Agreement") is between Savvis Communications International, Inc., a Delaware corporation ("Debtor"), and General Electric Capital Corporation, a Delaware corporation, as Agent ("Secured Party") dated as of March 8, 2002…

A. Debtor and Secured Party have entered into that certain Security Agreement dated as of March 18, 2002 (as the same may be amended, modified, supplemented, renewed, extended or restated from time to time, the "Security Agreement"; all terms defined in the Security Agreement, wherever used herein, shall have the same meanings herein as are prescribed by the Security Agreement).

B. Pursuant to the terms of the Security Agreement, Debtor has granted to Secured Party a lien and security interest in all General Intangibles of Debtor, including, without limitation, all of Debtor's right, title, and interest in, to and under all now owned and hereafter acquired Trademarks, together with the goodwill of the business symbolized by Debtor's Trademarks, and Trademark Licenses, and all products and Proceeds thereof, to secure the payment of the Obligations.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Debtor hereby grants to Secured Party a lien and continuing security interest in all of Debtor's right, title, and interest in, to, and under the following (all of the following items or types of Property being herein collectively referred to as the "Trademark Collateral"), whether presently existing or hereafter created or acquired…

(1) each Trademark, trademark registration ("Trademark Registration") and trademark application ("Trademark Application"), including, without limitation, each Trademark, Trademark Registration and Trademark Application referred to in Schedule 1 annexed hereto, together with the goodwill of the business symbolized thereby; and

(2) each Trademark License, including, without limitation, each Trademark License listed in Schedule 1 annexed hereto; and

(3) all products and proceeds of the foregoing, including, without limitation, any claim by Debtor against third parties for past, present or future (a) infringement, dilution or breach of any Trademark, Trademark Registration, Trademark Application and Trademark License, including, without limitation, any Trademark, Trademark Registration and Trademark License referred to in Schedule 1 annexed hereto, and any Trademark Registration issued pursuant to a Trademark Application referred to in Schedule 1 annexed hereto; or (b) injury to the goodwill associated with any Trademark, Trademark Registration and Trademark Application.

The lien and security interest contained in this Agreement is granted in conjunction with the liens and security interests granted to Secured Party pursuant to the Security Agreement.

Debtor hereby acknowledges and affirms that the rights and remedies of Secured Party with respect to the liens and security interests in the Trademark Collateral made and granted hereby are more fully set forth in the Security Agreement, the terms and provisions of which are incorporated by reference herein as if fully set forth herein.

IN WITNESS WHEREOF, Debtor has caused this Agreement to be duly executed by its duly authorized officer as of the date written above.

Figure 1: Intangible collateralization, 1996-2005
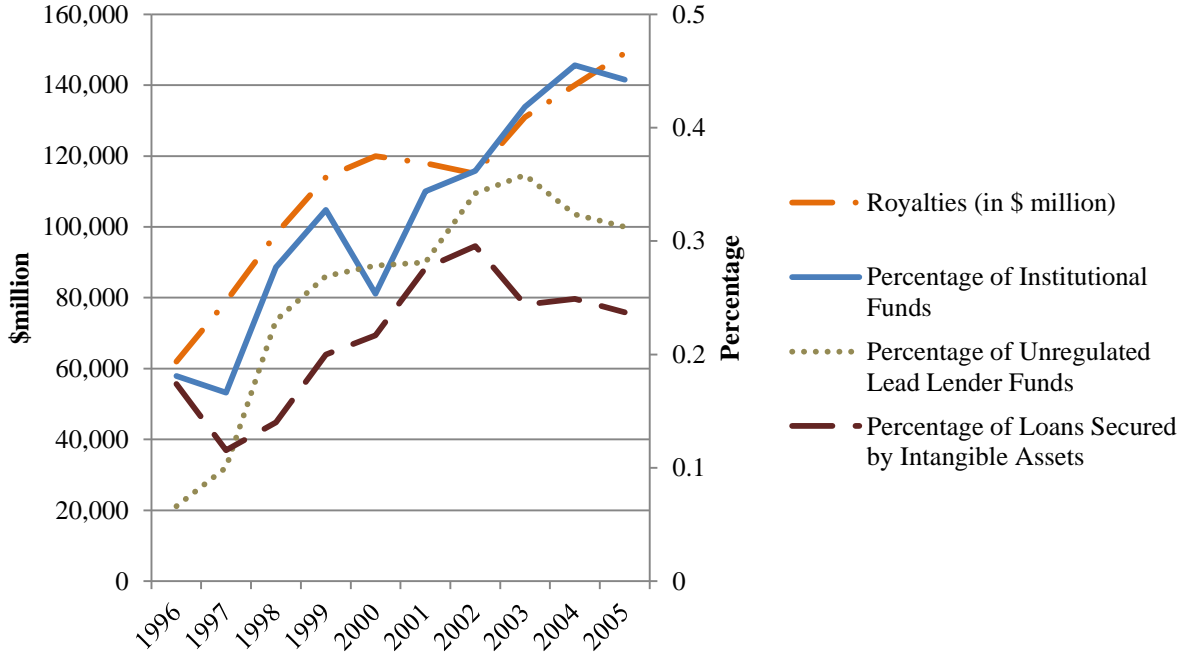
The figure shows the use of intangibles as loan collateral during 1996-2005, and the changes in credit and intangible asset markets. *Royalties* is the total size (in $ million) of income from intellectual property royalties and licensing fees as reported by IRS Statistics for corporate income, "Returns of Active Corporations 1994–2005." *Percentage of institutional funds* is the ratio of the size of institutional loans (Term Loan B-H) divided by the size of total secured loans reported by DealScan. *Percentage of unregulated lead lender funds* is the ratio of the size of loans underwritten by unregulated lead lenders (finance firms, investment banks, insurance companies) divided by the size of total secured loans reported by DealScan. *Percentage of loans secured by intangibles* is the ratio of the size of loans that include intangible assets as collateral in a sample of 1,415 secured loans, divided by the size of total secured loans in the sample.

Figure 2: Intangible collateralization and loan spread, 1996-2005
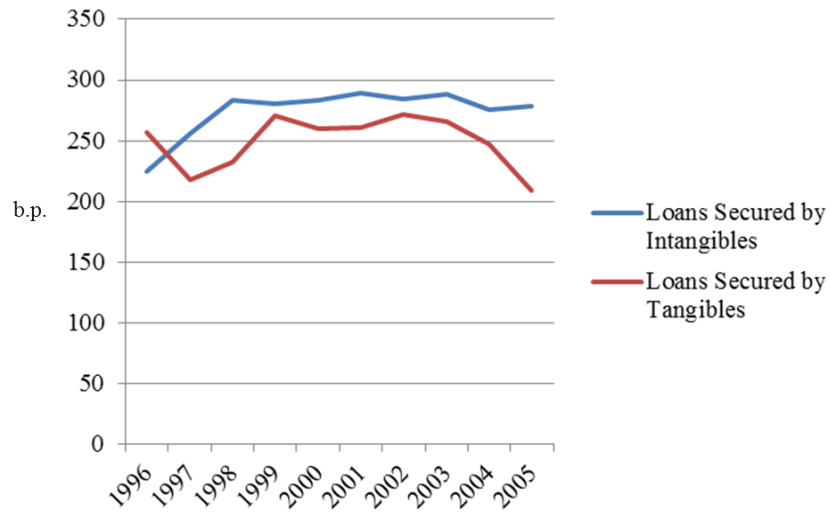
The figure shows the trend in pricing (basis points above LIBOR, including up-front fees) of loans secured by tangibles and loans that include intangibles as loan collateral. The graph shows that the pricing of loans secured by intangibles was higher and stable over time, suggesting that loan pricing was not significantly affected by laxer credit standards.

Table 1: Sample selection

	Packages	Facilities
Secured loans in DealScan (1988-2005)	10,202	16,671
Less:		
Loans where collateral is unknown	*4,730*	*7,402*
International loans	*1,376*	*2,459*
Overcollateralized loans	*1,893*	*2,681*
Loans to private firms	*711*	*1,252*
Loans to industries (2-digit SIC) with fewer than fifteen loans/ Loans to banks	*77*	*235*
Total	**1,415**	**2,642**

The table provides information on the procedures employed to identify a sample of U.S.-originated loans on the DealScan database with complete contract terms to U.S.-based public firms.

Table 2: Intangible collateralization by industry

Industry	Number of secured loans	Percentage of loans secured by intangibles
Apparel	22	62%
Restaraunts, Hotels, Motels	50	36%
Communication	50	29%
Computers	22	28%
Personal services	29	25%
Retail	136	24%
Consumer goods	54	22%
Automobiles and Trucks	25	16%

The table provides information on the intensity of using intangibles as loan collateral by industry (Fama-French 48 industry classification).

Table 3: Summary Statistics

Variable	N	Mean	S.D.	Min	0.25	Median	0.75	Max
Collateral_Intangibles	1,415	0.26	0.44	0.00	0.00	0.00	1.00	1.00
Loanamt_Assets	1,415	0.34	0.26	0.05	0.12	0.27	0.48	0.89
Intangible_Liquidity	1,415	0.31	0.46	0.00	0.00	0.00	1.00	1.00
Customers	1,415	0.62	0.78	0.00	0.00	0.62	0.69	4.01
Indirect_Competitors	1,415	3.15	1.13	0.69	2.56	3.37	3.93	4.82
Credit_Downgrades	761	0.49	0.83	0.00	0.00	0.00	0.79	4.34
Credit_Downgrade2	761	0.42	0.49	0.00	0.00	0.00	1.00	1.00
Covenant_Violations	854	0.88	1.45	0.00	0.00	0.00	0.97	5.65
Covenant_Violation2	854	0.44	0.50	0.00	0.00	0.00	1.00	1.00
Z-Score	1,415	0.37	0.97	0.00	0.00	0.00	0.00	4.29
Z-Score2	1,415	0.18	0.39	0.00	0.00	0.00	0.00	1.00
Z_score_beg.	1,415	1.23	0.82	0.12	0.64	1.09	1.63	3.64
Bankrupt	1,415	0.15	0.36	0.00	0.00	0.00	0.00	1.00
Lending_Relationships	1,415	0.45	0.32	0.00	0.19	0.33	0.70	1.00
Distance	1,415	6.68	1.98	0.00	7.02	7.32	7.32	9.21
Unregulated_Lead	1,415	0.14	0.34	0.00	0.00	0.00	0.00	1.00
Institutional	1,415	0.26	0.44	0.00	0.00	0.00	1.00	1.00
Intangibles	1,415	0.16	0.03	0.04	0.17	0.17	0.17	0.25
Goodwill	1,415	0.12	0.10	0.00	0.00	0.12	0.13	0.43
Market-to-Book	1,415	1.96	1.23	0.12	1.08	2.08	2.22	4.83
Patents	1,415	1.09	1.80	0.00	0.00	1.13	1.95	9.84
Trademarks_Copyrights	1,415	1.54	1.62	0.00	0.00	1.10	2.64	9.15

Table 3 (Continued)

Variable	N	Mean	S.D.	Min	0.25	Median	0.75	Max
G-Index	1,415	9.01	0.95	6.85	8.90	9.01	9.05	11.35
Leverage	1,415	1.64	1.28	0.10	0.40	1.25	3.06	3.49
Liquidity	1,415	1.95	0.91	0.69	1.30	1.96	2.14	4.38
Capital Assets	1,415	0.29	0.20	0.03	0.13	0.30	0.39	0.78
ROA	1,415	0.08	0.11	-0.24	0.06	0.08	0.14	0.26
Herf_Index	1,415	0.04	0.03	0.002	0.01	0.03	0.07	0.10
Rated	1,415	0.53	0.50	0.00	0.00	1.00	1.00	1.00
Credit Rating	761	13.67	2.61	6.00	12.00	14.00	15.00	21.00
Size	1,415	6.14	1.67	0.20	4.97	6.34	7.44	11.97
Competitors	1,415	3.64	1.31	0.00	2.77	3.52	4.45	6.48
Loan_Size	1,415	4.66	1.33	0.15	3.81	4.61	5.62	7.89
Maturity	1,415	3.16	0.76	2.40	2.56	2.71	4.01	5.52
Fin_Covenant	1,415	0.60	0.49	0.00	0.00	1.00	1.00	1.00
Syndicates	1,415	4.75	4.24	1.00	1.00	3.00	7.00	13.00
Perfprice	1,415	0.52	0.50	0.00	0.00	1.00	1.00	1.00
LIBOR-spead	1,415	261.61	89.21	87.50	189.74	255.00	330.00	455.00

Table 3: Summary statistics. Variables are described in Appendix A. All values of the continuous variables are winsorized at 1% and 99% level.

Table 4: Loan and borrower characteristics: tangible and intangible collateral

Variable	Loans secured by tangibles (A)	Loans secured by tangibles and intangibles (B)	t-statistic (A)-(B)
Loanamt_Assets	0.31	0.42	-6.58***
	(0.24)	(0.30)	
Unregulated_Lead	0.11	0.20	-4.42***
	(0.32)	(0.40)	
Institutional	0.22	0.28	-2.37**
	(0.41)	(0.45)	
Loan_Size	4.77	4.36	5.09***
	(1.33)	(1.27)	
Maturity	3.21	2.99	4.79***
	(0.76)	(0.72)	
Fin_Covenant	0.57	0.66	-3.07***
	(0.49)	(0.47)	
LIBOR-spread	253.63	284.90	-5.81***
	(89.66)	(83.77)	
Intangible_Liquidity	0.28	0.43	-5.40***
	(0.45)	(0.50)	
Customers	2.65	3.55	-3.52***
	(3.53)	(4.84)	
Indirect_Competitors	3.16	3.34	-2.58***
	(1.11)	(1.10)	
Credit_Downgrades	0.47	0.52	-0.61
	(0.82)	(0.84)	
Credit_Downgrade2	0.42	0.42	0.02
	(0.49)	(0.49)	
Covenant_Violations	0.83	0.99	-1.54
	(1.39)	(1.59)	
Covenant_Violation2	0.43	0.47	-1.13
	(0.50)	(0.50)	
Z-Score	0.39	0.28	1.50
	(1.01)	(0.84)	
Z-Score2	0.38	0.35	1.13
	(0.48)	(0.49)	
Bankrupt	0.16	0.13	1.29
	(0.36)	(0.33)	
Lending_Relationships	0.42	0.57	-7.72***
	(0.31)	(0.35)	

Table 4 (Continued)

Variable	Loans secured by tangibles (A)	Loans secured by tangibles and intangibles (B)	t-statistic (A)-(B)
Distance	6.80	6.31	4.14***
	(1.74)	(2.51)	
Intangibles	0.16	0.17	-1.87*
	(0.06)	(0.06)	
Market-to-Book	1.96	1.98	-0.26
	(1.20)	(1.29)	
Patents	1.12	1.02	0.86
	(1.87)	(1.60)	
Trademarks_Copyrights	1.55	1.48	0.76
	(1.63)	(1.60)	
G-Index	9.01	9.02	-0.19
	(0.96)	(0.93)	
Leverage	1.67	1.54	1.71*
	(1.26)	(1.28)	
Liquidity	1.95	1.94	0.11
	(0.91)	(0.91)	
Capital Assets	0.31	0.26	4.13***
	(0.21)	(0.18)	
ROA	0.09	0.06	4.29***
	(0.10)	(0.13)	
Herf_Index	0.04	0.03	5.3***
	(0.03)	(0.03)	
Rated	0.56	0.42	4.75***
	(0.50)	(0.49)	
Goodwill	0.12	0.10	1.88*
	(0.12)	(0.11)	
Competitors	3.60	3.71	-1.36
	(1.31)	(1.28)	
Size	6.32	5.61	7.05***
	(1.61)	(1.78)	

Variables are described in Appendix A. Standard deviations reported in parentheses. All values of the continuous variables are winsorized at 1% and 99% level. ***Significant at 1%, ** 5% and * 10% level.

Table 5: Intangible collateralization and information asymmetry

Dependent Variable: Collateral_Intangibles										
Variable	**dF/dx**	**p>|z|**	**dF/dx**	**p>|z|**	**dF/dx**	**p>|z|**	**dF/dx**	**p>|z|**	**dF/dx**	**p>|z|**
Intangible_Liquidity			**0.131 *****	**0.00**			**0.127 *****	**0.00**	**0.148 *****	**0.00**
Customers			**0.055 *****	**0.00**			**0.051 *****	**0.00**	**0.048 *****	**0.00**
Indirect_Competitors			**0.036**	**0.18**			**0.040 ***	**0.10**	**0.024**	**0.38**
Lending_Relationships					**0.171 *****	**0.00**	**0.150 *****	**0.00**	**0.162 *****	**0.00**
Distance					**-0.011 ****	**0.05**	**-0.012 ****	**0.04**	**-0.012 ****	**0.05**
Unregulated_Lead	0.122 ***	0.00	0.101 ***	0.01	0.130 ***	0.00	0.111 ***	0.01		
Institutional	0.021	0.56	0.004	0.91	0.011	0.76	-0.002	0.95	0.010	0.79
Patents	-0.009	0.36	-0.011	0.22	-0.009	0.35	-0.012	0.21	-0.015	0.13
Trademarks_Copyrights	-0.005	0.62	-0.011	0.24	-0.004	0.69	-0.010	0.28	-0.010	0.31
Intangibles	0.042	0.85	0.032	0.89	0.037	0.87	0.015	0.95	0.003	0.99
Market-to-Book	0.006	0.55	0.001	0.95	0.002	0.84	-0.002	0.83	0.002	0.88
G-Index	-0.022	0.13	-0.019	0.17	-0.026 *	0.08	-0.022 *	0.10	-0.021	0.16
Herf_Index	-3.278 ***	0.00	-3.850 ***	0.00	-3.248 ***	0.00	-3.725 **	0.00	-3.544 **	0.05
Rated	-0.032	0.35	-0.034	0.33	-0.011	0.75	-0.015	0.66	-0.007	0.85
Z_score_beg.	-0.015	0.49	0.003	0.87	-0.011	0.61	0.006	0.77	0.007	0.77
Leverage	0.005	0.76	0.009	0.16	0.005	0.38	0.009	0.14	0.009	0.18
Liquidity	-0.025 ***	0.01	-0.021 **	0.04	-0.026 ***	0.01	-0.024 **	0.02	-0.019 *	0.06
Capital Assets	-0.186 **	0.04	-0.126	0.17	-0.169 *	0.06	-0.118	0.19	-0.089	0.35
ROA	-0.088	0.48	-0.074	0.55	-0.060	0.63	-0.053	0.67	-0.027	0.85
Size	-0.012	0.35	-0.012	0.34	-0.009	0.48	-0.008	0.52	-0.008	0.53
Loan_Size	0.010	0.57	0.009	0.59	0.017	0.32	0.015	0.35	0.023	0.20
Maturity	-0.044 ***	0.00	-0.044 ***	0.00	-0.039 ***	0.00	-0.039 **	0.00	-0.048 ***	0.00
Fin_Covenant	0.037	0.26	0.041	0.21	0.035	0.30	0.038	0.25	0.023	0.50
Perfprice	-0.061 **	0.03	-0.053 *	0.06	-0.055 **	0.05	-0.052 *	0.06	-0.044	0.13
Syndicates	-0.030 **	0.03	-0.029 **	0.03	-0.022 *	0.10	-0.022 *	0.10	-0.020	0.16
Fixed effects:										
Year, Industry, Purpose	YES		YES		YES		YES		YES	
Lead lender	NO		NO		NO		NO		YES	
	N= 1,415		N= 1,415		N= 1,415		N= 1,415		N= 1,271	
	pseudo R^2= 0.13		pseudo R^2= 0.18		pseudo R^2= 0.15		pseudo R^2= 0.20		pseudo R^2= 0.26	

The dependent variable is a binary variable that equals one if the loan includes intangibles as loan collateral, and zero if the loan is secured by tangibles. Marginal effects reported. Cluster is at the borrower level and standard errors are corrected for heteroskedasticity. All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC), lead lender and loan purpose are included. Variables are described in Appendix A. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 6: Intangible collateralization, loan size and LIBOR-spread

Dependent variable:	Loan_Size		Collateral_Intangibles	
Variable	**Coeff.**	**p>|t|**	**Coeff.**	**p>|z|**
Collateral_Intangibles	**0.167 ****	**0.05**		
Loan_Size			0.207	0.14
Goodwill	0.148 ***	0.00		
Intangible_Liquidity			0.397 ***	0.00
Customers			0.151 ***	0.01
Lending_Relationships	-0.653 ***	0.00	0.423 **	0.03
Distance			-0.054 ***	0.01
Unregulated_Lead			0.476 ***	0.00
G-index			-0.055	0.22
Herf_Index	10.540 ***	0.00	-8.312	0.69
Institutional	0.224 ***	0.00	0.117	0.49
Syndicates	0.136 ***	0.00	0.005	0.95
Rated	0.446 ***	0.00	0.086	0.77
Fin_Covenant	-0.233 ***	0.00	0.127	0.44
Perfprice	0.286 ***	0.00	-0.056	0.76
Z_score_beg.	-0.044	0.22	0.072	0.28
Leverage	0.011	0.35	0.029	0.21
Liquidity	-0.044	0.13	-0.060	0.34
Capital Assets	0.106	0.44	-0.199 *	0.09
ROA	-0.139	0.57	-0.476	0.26
Maturity	-0.156 ***	0.00	-0.129	0.24
Size	0.123 ***	0.00	0.009	0.90
Constant	4.026 ***	0.00	0.370 *	0.06
	N= 1,415		N= 1,415	
	R^2= 0.65		pseudo R^2= 0.13	
Endogenous variables: Loan_Size, Collateral_Intangibles				
Instruments: Goodwill, Intangibles_Liquidity, Customers				

Table 6 (Continued)

Dependent variable:	LIBOR-spread		Collateral_Intangibles	
Variable	**Coeff.**	**p>|t|**	**Coeff.**	**p>|z|**
Collateral_Intangibles	**73.872 ****	**0.04**		
LIBOR-spread			0.010 *	0.07
Competitors	10.925 ***	0.00		
Intangible_Liquidity			0.441 ***	0.00
Customers			0.138 ***	0.01
Z_score_beg.	0.628	0.83	0.077	0.16
Loan_Size	-5.481 *	0.07	0.225	0.15
G-index			-0.035	0.41
Maturity	3.827 *	0.07	-0.131 *	0.06
Lending_Relationships	-27.788 ***	0.01	0.391 ***	0.00
Distance	0.502	0.67	-0.039 ***	0.01
Unregulated_Lead	-2.091	0.79	0.444 ***	0.00
Institutional	43.398 ***	0.00	0.114	0.33
Syndicates	-1.192	0.12	-0.025 *	0.10
Rated	-11.692 **	0.03	0.010	0.92
Herf_Index	-87.940	0.63	-11.860 ***	0.00
Fin_Covenant	12.572 **	0.03	0.127	0.25
Perfprice	-22.435 ***	0.00	-0.170	0.14
Leverage	9.214 ***	0.00	0.042	0.18
Liquidity	-1.775	0.51	-0.020	0.16
Capital Assets	12.708	0.33	-0.299	0.19
ROA	-123.446 ***	0.00	-0.406	0.23
Size	-6.401 ***	0.00	-0.066	0.11
Constant	0.628	0.83	0.077	0.16
	N= 1,415		N= 1,415	
	R^2= 0.28		pseudo R^2= 0.13	
Endogenous variables: LIBOR-spread, Collateral_Intangibles				
Instruments: Competitors, Intangibles_Liquidity, Customers				

The jointly determined dependent variables are the LIBOR-spread and the probability of using intangibles as collateral (Panel A), and the loan size and the intangible collateral probability (Panel B). All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC) and loan purpose are included. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 7: Intangible collateralization and loan performance

Dependent Variable:	Credit_ Downgrades		Credit_ Downgrades2		Covenant_ Violations		Covenant_ Violations2	
Variable	**Coeff.**	**p>|t|**	**dF/dx**	**p>|z|**	**Coeff.**	**p>|t|**	**dF/dx**	**p>|z|**
Collateral_Intangibles	**-0.018**	**0.65**	**0.028**	**0.66**	**-0.024**	**0.84**	**-0.038**	**0.44**
Syndicates	0.000	0.72	0.000	0.95	-0.008	0.27	-0.003	0.48
Loan_Size	0.157 ***	0.00	0.080 **	0.02	-0.011	0.88	-0.004	0.92
Maturity	-0.330 **	0.05	0.017	0.74	-0.590 ***	0.00	-0.018	0.75
Fin_Covenant	0.049	0.33	-0.020	0.78				
LIBOR-spread	0.001 **	0.04	0.001 **	0.02	0.001 **	0.05	0.001 *	0.09
Perfprice	0.004	0.87	0.045	0.45	0.135	0.30	0.050	0.35
Credit rating	0.025	0.77	-0.001	0.94				
Rated					-0.539 ***	0.00	-0.075	0.25
Z_score_beg.	-0.015	0.31	-0.050	0.37	-0.182 *	0.08	-0.027	0.51
Herf_Index	2.168	0.51	0.492	0.79	-1.404	0.72	-1.538	0.36
Leverage	-0.051 ***	0.00	-0.031 **	0.02	0.092 ***	0.01	0.037 ***	0.01
Liquidity	-0.013	0.99	-0.011	0.76	-0.117 **	0.05	-0.052 **	0.03
Capital Assets	-0.105	0.49	0.053	0.77	0.418	0.30	0.243	0.12
Intangibles	1.879 **	0.03	1.217	0.11	1.610	0.28	0.318	0.62
Market-to-Book	0.069 *	0.07	0.043 *	0.07	-0.127 ***	0.01	-0.036 **	0.05
ROA	1.057	0.37	0.477	0.25	-1.588 ***	0.01	-0.221	0.32
Size	0.035	0.74	0.056	0.13	-0.009	0.90	-0.055 ***	0.05
Constant	-1.400 ***	0.00			3.044 ***	0.00		
Fixed effects: Year-Industry-Loan purpose								
	N= 761		N= 761		N= 854		N= 854	
	R^2= 0.24		pseudo R^2= 0.19		R^2= 0.28		pseudo R^2= 0.18	

The dependent variable in column I is the number of credit rating downgrades over the life of the loan (adjusted to loan maturity), the dependent variable in column II is the probability of a credit rating downgrade, the dependent variable in column III is the number of covenant violations (adjusted to loan maturity) and the dependent variable in column IV is the probability of a covenant violation. Column I and III report OLS estimates, column II and IV report marginal effects. Cluster is at the borrower level and standard errors are corrected for heteroskedasticity. All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC) and loan purpose are included. Variables are described in Appendix A. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 7 (Continued)

Dependent Variable:	Z-Score		Z-Score2		Bankrupt	
Variable	Coeff.	p>|t|	dF/dx	p>|z|	dF/dx	p>|z|
Collateral_Intangibles	**0.053**	**0.31**	**0.001**	**0.30**	**-0.036 ***	**0.09**
Syndicates	0.000	0.95	0.000	0.14	-0.001	0.63
Loan_Size	0.020	0.53	0.000	0.12	-0.036 ***	0.00
Maturity	-0.182 ***	0.00	0.000	0.70	-0.057 ***	0.00
Fin_Covenant	-0.005	0.94	0.000	0.62	-0.026	0.33
LIBOR-spread	0.000	0.99	0.000	0.52	0.001 ***	0.00
Perfprice	0.050	0.37	-0.001	0.33	-0.021	0.34
Rated	0.109	0.12	0.000	0.59	0.118 ***	0.00
Z_score_beg.	0.251 ***	0.00	0.015 ***	0.00	0.010	0.58
Herf_Index	-0.098	0.97	-0.024	0.16	-0.828	0.28
Leverage	-0.014	0.33	0.000	0.66	0.016 **	0.02
Liquidity	0.042	0.21	0.001 *	0.06	-0.008	0.47
Capital Assets	0.211	0.36	0.000	0.86	0.158 **	0.04
Intangibles	-0.718	0.19	0.005	0.33	-0.547	0.13
Market-to-Book	0.018	0.35	0.000	0.89	-0.012	0.16
ROA	-0.938 ***	0.00	-0.004 *	0.10	-0.205 **	0.04
Size	0.015	0.61	0.000 *	0.06	0.003	0.73
Constant	0.970 ***	0.00				
Fixed effects: Year-Industry-Loan purpose						
	N= 1,415		N= 1,415		N= 1,415	
	R^2= 0.48		pseudo R^2= 0.25		pseudo R^2= 0.22	

The dependent variable in column I is number of years that Z-score fell below 0.3 over the life of the loan (adjusted to loan maturity), the dependent variable in column II is the probability of this event and the dependent variable in column III is the probability of borrower's filing for bankruptcy. Column I reports OLS estimates, column II and III report marginal effects. Cluster is at the borrower level and standard errors are corrected for heteroskedasticity. All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC) and loan purpose are included. Variables are described in Appendix A. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 8: Secured and unsecured loans: multinomial logistic regression

Dependent variables:	Collateral_Tangibles		Collateral_Intangibles		Collateral_Tangibles		Collateral_Intangibles	
Variable	**Relative risk ratio**	**z**	**Relative risk ratio**	**z**	**Relative risk ratio**	**z**	**Relative risk ratio**	**z**
Intangible_Liquidity					1.75	1.16	3.09 *	1.79
Customers	0.22 ***	-2.33	0.28 *	-1.70	0.94 ***	-2.23	1.21	0.71
Indirect_Competitors	0.48	-1.05	0.16	-0.93	0.85	-0.50	1.18	0.47
Lending_Relationships	0.00 ***	-2.78	0.67	-0.57	0.01 ***	-5.18	0.47	-0.85
Unregulated_Lead	2.04	0.39	5.51	0.93	0.67	-0.68	1.68	0.86
Institutional	9.82 ***	2.29	13.02 ***	2.45	2.81 *	1.78	3.74 *	1.84
Patents	0.79	-0.76	0.78	-0.80	0.94	-0.56	0.91	-0.73
Trademarks_Copyrights	2.02 *	1.70	2.04 *	1.71	1.06	0.31	1.03	0.17
Intangibles	0.04	-0.69	0.07	-0.58	0.09	-1.36	0.11	-1.10
Market-to-Book	0.74	-1.00	0.74	-0.98	0.99	-0.09	0.99	-0.07
G-Index	0.19 ***	5.05	0.16	1.34				
Herf_Index	0.01	-0.18	0.01	-0.62	0.00	-1.02	0.01 ***	-2.13
Rated	6.73	1.47	2.49	0.70	8.43	3.29	3.07	1.55
Leverage	4.55 ***	4.27	5.21 ***	4.34	5.29 ***	7.02	6.90 ***	7.20
Liquidity	0.73	-0.53	0.55	-0.99	1.15	0.78	0.88	-0.65
Capital Assets	0.03 ***	-4.93	0.01 ***	-5.18	0.03 ***	-6.77	0.00 ***	-7.00
ROA	0.01	-0.95	0.01	-0.94	0.00 ***	-3.36	0.00 ***	-3.06
Size	0.03 ***	-4.70	0.03 ***	-4.42	0.13 ***	-6.45	0.16 ***	-5.57
Maturity	0.01 ***	-4.86	0.01 ***	-5.12	0.12 ***	-6.95	0.10 ***	-7.82
Fin_Covenant	0.01 ***	-3.10	0.01 ***	-3.02	0.16 ***	-3.60	0.17 ***	-3.43
Perfprice	10.60 **	1.90	10.09 **	1.85	4.92 ***	2.51	4.66 ***	2.41
Syndicates	0.46 *	-1.62	0.51	-1.39	0.75	-1.43	0.82	-0.89

Fixed effects: Year-Industry

N=2,523

pseudo R^2= 0.77

Fixed effects: Year-Industry

N=2,098

pseudo R^2= 0.68

The dependent variable equals zero if the loan is unsecured, one if the loan is secured by tangibles, and two if the loan includes intangibles as collateral. The base outcome is the probability of taking an unsecured loan. Relative risk ratios reported. Relative risk ratio reports how the relative probability changes relative to the base outcome. Sample size varies in the availability data. G-index, loan size, and loan purpose excluded because the log likelihood does not converge after one thousand iterations. Cluster is at the borrower level. All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year and industry (2-digit SIC). Variables are described in Appendix A. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 9: Intangible collateralization and information asymmetry: matched sample

Dependent Variable: Collateral_Intangibles			
Variable	**dF/dx**		**p>|z|**
Intangible_Liquidity	0.210	***	0.00
Customers	0.074	***	0.01
Indirect_Competitors	0.024		0.58
Lending_Relationships	0.166	**	0.04
Distance	-0.021	**	0.05
Unregulated_Lead	0.113	*	0.06
Institutional	0.005		0.94
Patents	-0.021		0.22
Trademarks_Copyrights	-0.016		0.30
Intangibles	0.107		0.81
Market-to-Book	0.006		0.78
G-Index	0.003		0.92
Herf_Index	-4.813	***	0.01
Rated	-0.052		0.40
Z_score_beg.	0.005		0.91
Leverage	0.001		0.59
Liquidity	-0.033	*	0.08
Capital Assets	-0.251	*	0.10
ROA	0.210		0.36
Size	-0.001		0.96
Loan_Size	0.013		0.14
Maturity	-0.066	***	0.00
Fin_Covenant	0.022		0.71
Perfprice	-0.098	**	0.05
Syndicates	-0.039		0.13
Fixed effects:			
Year, Industry, Purpose			
	N= 705		
	pseudo R^2= 0.18		

The dependent variable is a binary variable that equals one if the loan includes intangibles as loan collateral, and zero if the loan is secured by tangibles. Marginal effects reported. Loans are matched on the loan to value ratio. Cluster is at the borrower level and standard errors are corrected for heteroskedasticity. Variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC), lead lender and loan purpose are included. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.

Table 10: Intangible collateralization, loan size and spread: Treatment-effects model

	First Stage Test		Second Stage Tests			
Dependent variables:	Collateral_Intangibles		Loan_Size		LIBOR-spread	
Variable	Coeff.	p>|z|	Coeff.	p>|z|	Coeff.	p>|z|
Collateral_Intangibles			**0.149 *****	**0.00**	**67.331 *****	**0.00**
Goodwill			0.047 ***	0.01		
Competitors					15.284 ***	0.00
Intangible_Liquidity	0.346 ***	0.00				
Customers	0.129 ***	0.00				
Lending_Relationships	0.563	0.25	-0.536 ***	0.00	-30.622 ***	0.00
Distance	-0.048 ***	0.01			-1.014	0.17
Unregulated_Lead	0.438 ***	0.00			-7.397	0.31
G-index	-0.063	0.17				
Herf_Index	-11.075 ***	0.00	11.237 ***	0.00	-120.087	0.47
Institutional	0.455	0.14	0.207 ***	0.00	38.639 ***	0.00
Syndicates	-0.007	0.62	0.111 ***	0.00	-1.730 ***	0.01
Rated	-0.040	0.71	0.330 ***	0.00	-2.550	0.64
Fin_Covenant	0.118	0.29	-0.192 ***	0.00	7.591	0.18
Perfprice	-0.049 *	0.10	0.321 ***	0.00	-17.680 ***	0.00
Z_score_beg.	0.033	0.65	0.020	0.62	-0.952	0.80
Leverage	0.038 *	0.08	-0.013	0.29	9.296 ***	0.00
Liquidity	-0.074	0.15	-0.008	0.79	-1.472	0.58
Capital Assets	-0.279	0.34	-0.139	0.39	16.170	0.27
ROA	-0.150	0.65	0.025	0.92	-94.357 ***	0.00
Maturity	-0.029 ***	0.00	-0.122 ***	0.00	4.837 ***	0.02
Loan_Size					1.797	0.11
Size	-0.048	0.11	0.224 ***	0.00	-5.900 ***	0.00
Constant	0.267	0.39	2.931 ***	0.00	188.020 ***	0.00

Fixed effects: Year-Industry-Loan purpose

N= 1,415   N= 1,415

Log likelihood= -2163.6   Log likelihood= -1706.1

rho= -0.28   rho= -0.40

Wald test of independent equations

Prob>chi2= 0.02   Prob>chi2= 0.02

The first stage test of the effect of using intangibles as collateral on LIBOR-spread includes the size of the loan (untabulated). Cluster is at the borrower level. All values of the continuous variables are winsorized at 1% and 99% level. Fixed effects for year, industry (2-digit SIC) and loan purpose are included. ***Significant at 1%, ** 5% and * 10% level, two-tailed tests.