Intellectual Property as Loan Collateral: Evidence from France*

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We use novel administrative data from France to provide first systematic evidence on the use of intellectual property (IP) rights, i.e., trademarks, patents, and designs, as business loan collateral, and study how formal IP right publications affect collateralization by mitigating information frictions associated with IP rights' uncertainty. We show that the majority of IP-backed loans involve trademarks and are granted to SMEs. We document a large positive effect of IP pledges on firms' use of debt and subsequent real economic activities. We exploit the launch of online repositories at the French IP office in 2006 as an exogenous shock to accessing publication information for trademarks. We find a positive effect on the timing of collateralization, the effect being more salient for firms operating in highly competitive environments, with competitors located in regions with better ex-ante broadband internet access, and for informationally opaque borrowers. Our results highlight that uncertainty over IP can delay its use to secure loans and disclose new evidence on the ability of IP rights to enhance access to finance.

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1 Introduction

The ability to access external financing affects investment strategies and firm-level growth. Providing assets as loan collateral is a prominent strategy of firms to secure debt. While traditionally tangible assets constituted the prime type of collateral (Shleifer and Vishny, 1992; Rampini and Viswanathan, 2013), intangible assets dominate the composition of firm value in today's knowledge-based economies (Falato *et al.*, 2020; Brynjolfsson *et al.*, 2021) affecting the ability of firms to obtain debt (Dell'Ariccia *et al.*, 2021). Recent literature shows that intangible assets (e.g. Peters and Taylor, 2017) and in particular intellectual property (IP) rights, such as patents (Hochberg *et al.*, 2018; Mann, 2018), are increasingly used as loan collateral, significantly raising firms' debt capacity.

Yet, literature on IP collateralization is still in its infancies, as it has mostly focused on specific subsets of firms and patents as one distinct type of IP. Little is known on the use of various types of IP as loan collateral, as well as on the determinants of IP collateralization. In this study, we use a novel source of data to disclose new and systematic insights along these two essential dimensions.[1]

One potential reason for the scarcity of empirical evidence is the limited availability of data on IP collateralization. IP-backed loan agreements are private contracts, for which a consistent public disclosure is not warranted. In many jurisdictions worldwide, there are no consistent registration requirements of IP collateralization (see Kieninger (2020) for an overview). Moreover, private small and medium sized enterprises (SME), for which external debt financing is typically considered to be particularly relevant (e.g. Berger and Udell, 2006), are subject to limited financial reporting requirements and thus more informationally opaque. In combination, these aspects impede data collection on IP collateralization.

In the present study, we overcome these issues by exploiting previously undisclosed data from official sources on the use of different IP types (trademarks, patents, and designs) as loan collateral in France since the 1990s. The French legal setting ensures the consistent registration of IP collateralization, allowing us to provide first systematic evidence on the use of different types of IP (trademarks, patents, and designs) as loan collateral. We link IP collateral information to financial and IP-level data of a broad, representative sample. First descriptive evidence shows that the majority of IP-backed loans in France between 1995 and 2018 involve trademarks (84%) and are granted to SMEs (77%).

We then go beyond the mere descriptive analysis, and study how the official publication

[1]This is important, because non-patent IP rights, such as trademarks and designs, constitute a major share of IP-intensive sectors. For example, trademarks might be of particular importance for firms that sell goods or services, whereas patents are key for firms with technological inventions. Consistent with this, trademark-intensive industries contribute to 88-74% of US and EU employment in IP-intensive industries in 2016 (USPTO, 2016; EPO-EUIPO, 2019). For a direct comparison of trademark, design, and patent-intensive industries in France and other selected economies, see Figure IA1 (Appendix B).

of an IP right may facilitate its private use as collateral. Publication provides the first authorized specification of the conferred legal rights. Hence, it mitigates the uncertainty regarding the validity and (legal) boundaries of IP, i.e., incomplete information about IP rights, which is likely to constitutes an obstacle to collateralization (e.g. Jaffe and Lerner, 2011; Mezzanotti, 2021). Indeed, prior studies have shown the importance of IP publications for facilitating financial transactions involving patent rights (Hegde and Luo, 2018; Hegde *et al.*, 2022). As a key contribution, we first extend this idea to non-patent IP rights (i.e., trademarks), and second apply it in the context of debt financing. Our results show that both trademarks and patents are significantly more likely to be pledged shortly after their publication.

To identify the effects of IP right publications on IP collateralization, we exploit the launch of online repositories at the French IP office (INPI) in 2006 as an exogenous source of variation in the importance of IP publication for trademarks. Following the general internet roll-out in France in the early 2000s, INPI introduced free online access to IP-related events not subject to secrecy, such as IP publications. The publication of the registration is an important step in obtaining a trademark in France. As such, the publication of registration follows after an opposition period, during which third parties can to veto an application.[2] The publication of a trademark registration thus mitigates uncertainty regarding the mere existence, but also the scope, of the associated rights.

While publications could originally only be accessed in physical INPI offices, the launch of the online repository in 2006 drastically eased access to trademark registration information. Under the assumption that an easier and more timely access to trademark registration reduces information frictions, we hypothesize that the probability of trademark collateralization right after publication increases comparing pre- and post 2006 pledge rates. Moreover, we use additional cross-sectional variation in the pre-2006 degree of competition faced by individual firms to identify the causal effect of IP publications on the timing of IP pledges.

We find robust evidence that IP collateralization is associated with a strong increase in firms' debt capacity. We use a two-staged matching approach, and compare the evolution of debt use and real economic activities between firms that actually engaged in IP collateralization with a set of comparable firms. We estimate a disproportional increase of 31% in firms debt ratios in the years after the IP pledge, relative to comparable firms that did not use an IP-backed loan. Our results are consistent with previous findings on patent pledges by US listed-firms (Mann, 2018). We show that similar effects apply to French non-listed firms, and that they hold for both firms using patents and trademarks as loan collaterals. This is important, as trademark pledges by far constitute the most frequent mode of IP collateralization in France. We exploit heterogeneity in firms' characteristics,

[2]Indeed, IP examiners check the formal requirements of a trademark application, but do not consider potential infringements with earlier rights in their decision to accept the application.

and show that these effects are stronger for i) innovation-intensive firms, ii) small and private firms, and iii) firms with limited access to external financing sources. Moreover, we provide suggestive evidence on the benefits of using IP collateral: IP pledges are associated with a subsequent increase in asset growth, investment, and employment.

Next, we study the effect of trademark and patent publications on the timing of IP collateral events. We use granular information on IP publications for more than 20,000 first-time IP pledges to estimate changes in the hazard rates on the probability of IP pledges around the date of IP publication. Conditional on the absence of an information shock (i.e., without an IP publication event), IP collateralization event are evenly distributed across time. Importantly, we find that the time right after the publication of IP rights is associated with a significantly higher pledge probability as compared to the time right before publication. This publication effect is more pronounced compared with other important events in the lifecycle of trademarks and patents. Hence, the publication date marks an important shift in the hazard of an IP right to be collateralized. In line with the idea that firms which are more informationally opaque should disproportionally respond to the release of information, we find the positive effect of IP publication on the hazard rate of collateralization to be stronger for IP rights held by SMEs.

We then use a difference-in-difference strategy, and exploit the 2006 launch of online repositories at INPI as a plausibly exogenous source of variation reducing information frictions associated with trademark uncertainty. Comparing trademarks held by firms in high versus low competitive environments, before and after 2006, our estimates show a 43% differential change in the probability of a trademark collateralization within the first 12 months after publication. Furthermore, we exploit heterogeneity in the penetration of broadband internet access across France at the time of the online launch in 2006. We find robust evidence that our baseline results are stronger for firms whose competitors are located in regions with higher ex-ante internet penetration. Our results show that online publications are especially relevant for small private firms, which usually have a relatively strong reliance on external debt financing. Results moreover suggest that IP owners in a relationship with knowledgeable intermediaries which can act as an important moderator of information asymmetries (such as relationship bank and specialized law firms) are less affected by the shock. As a placebo test, we show that the online publications of trademarks have no statistically significant effect on the timing of patent pledges. This finding is in line with our identifying assumption, since patents are kept secret until the publication of application and patent examination should not be affected by changes in ex post online disclosure. Overall, our findings provide novel evidence on the ability of formal IP rights to enhance access to finance by mitigating information costs.

The remainder of the paper is organized as follows. Section 2 provides a literature review, including our main contributions, and institutional information on IP collateral-

ization. Section 3 introduces the data and displays detailed descriptive evidence on IP collateral in France. Section 4 explains and provides empirical evidence on the relationship of IP publications and the timing IP pledges. Section 5 introduces our identification strategy. Section 6 presents the main results and mechanisms. Section 7 concludes.

2 Institutional background

2.1 Related literature and contributions

Our study relates to different branches of literature. Most generally, we contribute to the literature on the role of collateral in debt financing. Since debt financing is prone to agency costs, the role of collateral is to reduce these costs (Bester, 1985; Stiglitz and Weiss, 1981). Benmelech and Bergman (2009) provide empirical evidence that the ability to pledge redeployable collateral lowers the cost of external financing and increases firms' debt capacities. Further contributions shed light on how the structure of corporate assets shape leverage decisions (Norden and van Kampen, 2013) and how collateral value affects the investment decisions of firms (Chaney *et al.*, 2012). We contribute to this literature by disclosing novel evidence that multiple types of IP - trademarks, patents, and designs - serve the function as loan collateral. The granularity of our data allows us to show which firm and IP characteristics are associated with firms' decision to pledge their IP and to estimate the economic implications of IP pledges for respective firms.

We contribute to the literature that investigates how firms can deploy their intellectual property to enhance financing. Farre-Mensa *et al.* (2020) find that obtaining a first patent facilitates access to funding from venture capitalists, banks, and public investors. Along these lines, patents' function as a quality signal plays a important role in attracting venture capital (VC) financing (Conti *et al.*, 2013; Haeussler *et al.*, 2014). Similarly, literature shows a positive effect of trademarks on start-up valuations by VC investors (Block *et al.*, 2014; Chemmanur *et al.*, 2020). While IP can be a useful quality signal to ease the access to equity financing, our study adds specifically on the literature on debt financing. In this context, Chava *et al.* (2017) find that banks consider patents as a quality signal, which is why patenting-intensive firms are charged lower loan spreads by lenders. Saidi and Žaldokas (2021) show that patenting helps firms to switch lenders, resulting in lower cost of debt, and facilitates their access to syndicated-loans and public capital markets. Our study provide new insights on the role of IP rights in attracting debt financing by exploiting unique information on IP pledges in France over a time span of almost 25 years. This unique setting allows us to consider the most commonly used types of IP (i.e., trademarks, patents, and designs) and the implications for firms' real economic activities.

As a main contribution, we provide new insights into the literature on financial eco-

nomics that studies trademarks. Compared to the literature on patents and finance, this stream of literature is less developed but growing. It might not be surprising that literature is therefore not unambiguous about the actual relevance of trademarks for firm performance. For example, Hsu *et al.* (2022) shows that stronger trademark registrations are associated with higher firm profitability and stock returns. In contrast, Heath and Mace (2020) study the effects of trademarks for firms' profits and strategy and argue that stronger protection is detrimental for innovation. Our study provides novel evidence regarding trademarks and finance along various dimensions. We are first to study trademarks for a large sample of predominantly non-listed firms in Europe. We further investigate the effects of trademark publications on one of the most important sources of external financing of smaller firms, i.e., bank financing. In addition to this, we study how shifts in information asymmetries between trademarks owners and other market participants, such as lenders, affects this relationship. Our analysis underscores the importance of trademark protection granted by public authorities in this context.

More specifically, we contribute to the literature on how IP rights can be directly deployed as collateral in corporate lending. For instance, firms use their patents as loan collateral to raise debt, which affects their savings and R&D investments (Amable *et al.*, 2010; Mann, 2018). While Mann (2018) only focuses on large public firms, Hochberg *et al.* (2018) show that start-ups can use IP-backed loans to lengthen the venture capital cycle. Furthermore, Caviggioli *et al.* (2020) show that patent quality, lender characteristics, as well as lenders' selection capabilities are positively affecting the likelihood of a pledge. In case of bankruptcy, Ma *et al.* (2021) find that creditors exercise their control rights to sell off technologically critical and valuable, rather than peripheral, pledged patents. Graham *et al.* (2018) provide a descriptive overview on trademark transactions in the USPTO trademark assignment dataset including trademark collateral. We extend this strand of the literature along several dimensions, as we provide evidence on the use of multiple IP types, namely patents, trademarks, and design. Doing this, we are the first to study non-patent IP rights used as collateral in loan contracts as well as the combination of multiple IP types within one loan agreement. Moreover, we are the first to investigate the usage of IP as collateral across sectors, firm sizes, and over a relatively long period of time. Further, our study contributes by studying IP collateral in the context of a bank based economy since previous studies focus on the market based economy in the US.

As a main contribution, we extend the growing strand of the literature that studies the effects of access to existing knowledge and the disclosure of information. Current research highlights the relevance of access to knowledge via physical accessibility to patent offices/ libraries (Iaria *et al.*, 2018; Furman *et al.*, 2021), via access rights to scientific publications (Biasi and Moser, 2021; Bryan and Ozcan, 2021), via repositories (Furman and Stern, 2011), and via broadband (Arts *et al.*, 2020; Malgouyres *et al.*, 2021). More specifically, we

contribute to the literature on the effects of information disclosure along two dimensions. First, our identification strategy utilizes the introduction of web-based services at the French IP office as a plausibly exogenous source of variation significantly improving access to IP-related information. We are therefore first to study the effect of online services of public authorities on the (financing) activities of market participants. Second, as one main contribution, our analysis provides new insights into the effects of standardized IP publications on firm-level activities, namely the timing of debt financing activities. More generally, Kim and Valentine (2021) provide evidence that patent disclosures can generate both an increase in innovation via spillover benefits and a decrease in innovation via proprietary costs. Hegde *et al.* (2022) investigate the adoption of the American Inventor's Protection Act of 1999 which marked an information shock about patented technologies, aligning the US patent publication system to those in most major jurisdictions worldwide, such as the European. The authors show that the enactment raised the importance of patent publications in the application process, overall increasing knowledge diffusion. Further, patent disclosure can reduce firms' cost of debt (Hoffmann *et al.*, 2019).

A distinct part of this literature that we contribute to shows how market frictions intrinsic to IP rights affect the timing of IP based financing decisions. Gans *et al.* (2008) show that patent grants reduce uncertainties associated with patents and therefore facilitate earlier patent licensing. Similarly, Hegde and Luo (2018) study the effect of patent applications on the timing of licensing deals. However, these studies focus on patent licensing, which constitutes one mode of IP financing with regard to one specific type of IP, patents. Our study is first to document the patent publications on the timing of IP collateralization in business loans. By doing so, we provide novel evidence on the ability of IP disclosure to enhance access to finance.

In addition to this, we introduce a new perspective by studying information disclosures in the context of the most commonly deployed IP right: trademarks. To the best of our knowledge, literature on these aspects is scarce. For trademarks filed in the US, Graham *et al.* (2018) finds that the ending of the opposition phase is an important event. It grants the applicant a Note of Allowance, which allows trademark owners to enforce the rights attached to a mark against competitors.[3] Our analysis is thus the first one to empirically assess the effects of trademark registration publications on the use of trademarks in financial transactions.

We contribute to the literature by providing novel evidence on the use of IP rights to obtain debt financing. We are first to show that different types of IP rights can be used as loan collateral in one empirical setting. Our analyses find that firms that actually engage in these transactions benefit not only from a higher debt capacity but that this increased use of debt has real economic effects by helping firms to grow. Second, we

[3]González-Pedraz and Mayordomo (2012) shows that positive abnormal returns in financial markets can be associated with trademark registration of US commercial banks.

answer the question why firm are hesitant to engage in these kind of transactions despite their beneficial outcomes. Specifically, we are first to isolate one central aspect that affects IP pledgeability, i.e., information frictions associated with IP rights.

2.2 IP collateral: legal and conceptual background

This section specifies legal characteristics for the most common types of IP rights (trademarks, patents, and designs) in the context of IP collateralization. While some studies show the use of patents as business loan collateral (Hochberg *et al.*, 2018; Mann, 2018), it is a priori not evident why other IP types such as trademarks and designs are not pledged in a similar manner.

Table IA1 (Appendix A) presents basic characteristics of the three most common types of IP rights: patents, trademarks, and designs. A commonality all IP rights share is that they grant its owner with an exclusive legal right to use the protected object, product, or service. Further, their common goal is to promote economic activity in terms of inventive processes (patents) or product quality and differentiation (trademarks and design). Yet, IP rights differ with respect to their subject matter as well as other central aspects, such as the requirements for obtaining the respective rights, the administrative steps that are required to activate protection, and the duration of protection. The most crucial difference is that patents require a standardized examination process, whereas trademarks and designs are not facing a comparable examination process. Due to this, trademarks and designs allow for a more immediate use since they are valid much faster. In the case of trademarks, the opposition period can be considered as a quasi-examination since third parties can oppose applications prior to the final registration. Due to the probabilistic nature of IP rights regarding their uncertain scope and claims (Lemley and Shapiro, 2005), the standardized and formal procedure of passing the examination (patents) and opposition period (trademarks, designs) is key in reducing these IP inherent uncertainties (Hegde and Luo, 2018). In general, IP characteristics rights may play a crucial role in its deployability in IP financing.

The three discussed IP rights can all in principle be used as a mean to access external financing. While we we focus on the use of IP rights as collateral in business loans within the realm of this study, the following section briefly touches on three major strategies of IP financing. The three main ways to deploy IP rights as financing tools are (1) selling, (2) licensing, and (3) securitizing the respective IP right. Each mode of IP financing is associated with certain benefits and costs. (1) Selling an IP right off allows for efficiency gains while receiving a lump sum. On the downside, the firm hands over the IP right itself and therefore looses the right to exploit the respective IP. (2) Licensing of patents is generally associated with a risk to reveal knowledge outside of the IP right since most licensing contracts demand additional trade secrets on how to produce the protected in-

vention (Gans *et al.*, 2008). (3) Securitization of an IP right, most commonly as collateral, allows the borrower to receive a lump sum (similar to 1), but without handing over the IP right itself (different to 1). In contrast to (2) licensing, (3) collateralization does not bear the risk to reveal knowledge outside of the IP right itself. To sum up, the use of IP as collateral allows the firm to keep the IP right without the risk of knowledge leakage while receiving a lump sum.

Since our study is exploiting the unique institutional setting in France, it is key to touch on the environment governing IP pledges in France. Appendix C describes the French legal framework of IP collateral and its recording in detail. In sum, the French legal framework is in principal well suited for the use of IP loans. It allows for securitization of patents, trademarks (except collective trademarks), and designs under the same legal regime.[4] Moreover, it defines relatively precisely the establishment and resolution of IP-backed loan contracts as well as rights and duties for the time the contract is active. The collateralization of IP assets can be registered at the national patent and trademark office. While it is not mandatory in France to do so, timely registration provides the involved parties with large benefits. Hence, the specific legal setting in France is likely to provide the involved parties with strong incentives to register IP collateral transactions in a timely manner. This allows for a unique institutional setting to study the collateralization of various IP types.

Following from this, firms aiming to collateralize their IP portfolio, might weight benefits and disadvantages of each respective IP right to develop a suitable strategy for their individual business needs. Hence, it is reasonable to assume that certain key factors determine the pledging decisions of firms. This could include firms' size and industry as well as the composition of their IP portfolio. Specifically, SMEs may be more likely to pledge their IP portfolio than large listed firms since under usual circumstances public firms are not in need for debt financing. Additionally, firms' industry affiliation and the composition of their IP portfolios are interrelated. In general, trademarks and designs are closer related to the commercialized product compared with a patent. For example, firms in retail are more likely to have larger trademark portfolios with little to no patents while the average manufacturing firms should be more patent- and less trademark oriented. As a notable exception, in pharmaceutical and chemical industries even single-item products are often protected both by trademarks and patents. Hence, in the majority of cases, firms may pledge trademarks and patents as strategic substitutes depending on their sector affiliation. In sectors associated with both high trademark and patent intensity, we would assume similar pledging patterns for both IP types (strategic complements). Furthermore, the function of IP as a quality signal could play an important role in its

[4]In contrast, the US does not provide an harmonized IP collateral law due to different legal regimes governing patents, trademarks and designs with the additional challenge of discrepant court rulings regarding the registration of IP pledges Jacobs (2011).

ability to be used as collateral. However, the signaling strength (which accounts for much of why patents are used) is much weaker in their case.

Moreover, it is ex ante not clear whether firms deploying their IP actually benefit from this. While the findings of Mann (2018) show that large listed firms in the US increase their R&D investments post patent pledge, it could also be the case that results look different for SMEs or trademark pledging entities. While patents are filed by rather specific innovative firms, trademarks are relevant for a larger share of market participants (see, e.g., Figure IA1 in Appendix B), allowing for a broader spectrum of firms to take IP-backed loans. However, the question arises what are reasons why firms do not collateralize their IP. Since, in intuitively firms should be able to deploy their valuable assets (IP rights are often firms' most valuable assets), characteristics inherent to IP rights could impede IP collateralization.

3 Data and descriptive evidence

3.1 Construction of the data set

We collect data on individual IP rights and their owners in France from various sources. The French national IP office, INPI, collects the exact dates of any changes in the legal status of all trademarks, patents, and design rights that have been active in France since 1975. Most important for our analysis, this includes all dates relevant for the activation of the IP rights (e.g., application, registration, grant), transfers of ownership, and the use of respective IP rights as loan collateral.[5] These information constitute the basis for our data sets and we scrape these information from the INPI website. Next, we add bibliographic IP right information that we obtain directly from INPI and the European Patent Office's patent database (PATSTAT). This data contains IP-level information describing the characteristics of the respective IP rights and their owners. Since INPI only records IP ownership at the time of registration (for trademarks and designs) and application (for patents), if necessary, we manually adjusted the ownership information to obtain the actual IP owners at the time of the pledge. Further, the INPI data contains a unique identifier on the respective event, a unique identifier for each individual IP right, and an official identifier for French businesses that is provided by public authorities, the so-called SIREN number. The SIREN number allows us to directly combine the IP-level data with our firm-level database which is Bureau van Dijk's ORBIS database. ORBIS includes detailed firm-level information on French firms, including annual financial data.

To avoid truncation issues regarding firms' IP, we exclude all observations after 2018. We further exclude observations prior to 1995 due to a relatively low coverage in ORBIS for these years, such that our sample spans all years from 1995 until 2018. We remove any

[5] Figure IA2 (Appendix B) displays the form sheet used by INPI to collect respective information.

pledges made by individuals, non-French firms, or any cases of missing SIREN numbers. In total, French firms engage in 2,876 IP collateral events including 23,717 event-IP rights observations.[6] We use this data set for descriptive statistics and augment it further for the empirical analyses.

Specifically, for the empirical analyses that require financial data, we aggregate the IP-level data in an unbalanced firm-year panel that includes annual balance sheet and profit and loss data from ORBIS. We keep all balance sheet years of firms incorporated in France (country code "FR") for the years 1995 until 2018. We remove any observations with zero, negative, or missing total assets. The final firm-level data set contains 17,764 firm-year observations on 1,817 individual French firms.

For the empirical analyses on the timing of IP pledges, we use a separate data set that contains detailed information on trademarks and patents that are used as loan collateral by French firms at any point in time between 1995 and 2018. The dataset is structured as an cross-sectional IP-level data set, in which we measure all time-related information relative to the initial application of trademarks and patents. To study the effects of IP publications, we consider only the first time pledges of any given IP right. The final IP-level data set comprises information on the first-time pledges of 12,156 trademarks and 3,084 patent rights.

3.2 Descriptives: IP- and firm-level determinants

In this section, we document the use of different trademarks, patents, and designs as loan collateral in France between 1995 and 2018. First, we answer the questions what type of IP rights are pledged in France. We observe 13,451 individual trademarks, 6,037 individual patents, and 370 design rights that are pledged at least once and in a total of 3,838 pledge events. Panel A of Figure 1 displays the annual count of individual IP-pledge events and shows a relatively constant rate of IP collateral events. Except of the two years prior to the Financial Crisis (2006 and 2007), which exhibit a slightly higher number of pledge events, annual rates are close to the average rate of 160 pledges per year throughout the entire sample timeframe. Panel B illustrates the composition of these pledge events distinguishing pledges that exclusively use i) trademarks, ii) patents, or iii) any combination of the three IP types. Notably, we find that none of the pledge events exclusively use design rights. This reflects the idea that designs are strategic complements to both technologies and branded products. Within our sample timeframe, pledges that exclusively use trademarks are on average the most common type (75%) followed by patents (18%), while only 7% of pledges include multiple IP types. This

[6] We deliberately exclude all patents and trademarks that were pledged by Alcatel-Lucent in 2013. Alcatel faced significant financial trouble and pledged its entire IP portfolio consisting of thousands of patents and trademarks in a fire-sale manner. We consider this as an exceptional event and thus exclude respective IP rights from our sample.

pattern is generally stable over time.

Overall, we observe 2,451 legal entities that pledge IP rights registered in France (see Panel C). Among these entities, we consider all French firms for which we can potentially obtain financial data for our main analyses, which excludes foreign firms, French individuals/entrepreneurs, and French firms with missing or erroneous SIREN. This includes 1,817 unique firms that engage in 2,876 IP pledge events (1.6 per firm).

- Insert Figure 1 here -

Second, we answer the question what are the basic characteristics of the pledged IP rights. For patents, literature has shown that more valuable patents have a higher likelihood to be used as loan collateral compared to relatively less valuable patents (e.g. Caviggioli *et al.*, 2020). We therefore compare characteristics of collateralized TMs relative to those that are not collateralized. Consistent with previous findings on patent pledges, we find that collateralized TMs are on average more valuable and of higher technological quality. More specifically, Table 1 shows that trademarks are more likely to be pledged which have a higher number of technology classes, are renewed more often, are licensed more frequently, and those with more ownership transfers.[7] Previous literature finds these categories to be value relevant (Sandner and Block, 2011; Nasirov, 2020).

- Insert Table 1 here -

Third, we answer the question what are the basic characteristics of IP-pledging firms.[8] In total, we observe 1,817 individual French, IP-pledging firms. Panel A of Figure 2 displays the sectoral affiliation of these firms and distinguishes trademark- and patent-pledging firms according to the NACE main categories. The graph displays the five largest sectors and indicates the fraction all French firms across these sectors. Overall, the sectoral affiliation of trademark and patent pledging firms varies considerably. While the largest fraction of both firm types are manufacturing firms (32% for trademark- and 60% for patent pledging firms), trademark pledging firms operate much more often in wholesale and retail trade (26% versus 9%) or information and communication sectors (12% versus 3%), patent pledging firms operate more often in scientific and technical services (7% versus 14%).

- Insert Figure 2 here -

[7] Arguably, the licensing event collected by INPI are probably incomplete since it is not mandatory for the involved parties to file a licensing event with INPI.

[8] For several pledges that occur in 2015 or later, we observe the lending institution, which are predominantly French banks. The top three providers of IP loans (Crédit Agricole, Banque Populaire (BPCE), and Crédit Mutuel - Banque CIC) provide more than 55% of all IP loans. However, since these information are not consistently documented we chose not to analyze them in more depth.

Panel B of Figure 2 shows the composition within the manufacturing sector (2-digit NACE class C), which is represented for both trademarks and patents most frequently. The distributions are again very different comparing trademark and patent pledging firms. For example, trademark pledging firms most commonly operate in food, wearing apparel, or beverages industries, whereas patent pledging firms operate in machinery or equipment, computer, and electronics. As a notable exception, considerable overlap between the two firm types exists only in chemical and pharmaceutical products. Overall these differences in sectoral affiliations highlights the complementary character of the two IP types. These observations are consistent with the idea that IP pledging firms appear to collateralize valuable IP rights, i.e., those that are central for their business activities.

Panel C of displays the location of the headquarters of IP-pledging firms, differentiating among trademark- and patent-pledging firms. Locations are concentrated to a certain extent on the major centers surrounding the cities of Paris, Marseille, Lyon, Lens, and Bordeaux. This distribution is plausible, given the economic activities in these areas. Still, there are also more rural areas in which IP-pledging firms are located, such as Brittany or the Occitania region. Overall the geographical distribution of firms that use IP collateral are fairly similar among trademark- and patent-pledging firms.

To provide a more detailed perspective on the type of firms that collateralize their IP, Table 2 shows summary statistics on key features of IP pledging French firms. The majority of these firms are SMEs (77%) and private firms (95%) but fairly well-established with a mean age of 22 years and 280 employees. While patent pledging firms are significantly more often SMEs, there is no statistically significant difference in the employee count. Conversely, trademark pledging firms are more likely to be private firms as compared to patent pledging firms. Along several balance sheet characteristics, the two IP-pledging firm types are statistically not different; exceptions are profitability and cash flows, which are significantly lower for patent pledging firms compared to trademark pledging firms. These differences may mirror differences in the sectoral affiliation, since profitability, cash flows, and legal types are often considered as industry-specific.[9] Compared with French IP holding firms that are sampled in the ORBIS database, IP pledging firms differ along most dimensions, which is likely to occur because of the strong representation of small firms in the true business landscape. Subsequent empirical analyses that include non-pledging firms therefore account for these observable differences in firm characteristics.

- Insert Table 2 here -

[9]In Table IA2 (Appendix A), we confirm this using logistic estimations that explain the pledging probability of IP holding firms: including industry fixed effects removes the effects on virtually all observable firm-level characteristics between trademark and patent pledging firms (see Column IV).

3.3 IP collateralization and firms' use of debt

We now turn to the actual implications of IP pledges for the pledging firms by studying the effect of an IP pledge on firms use of debt. Our empirical strategy for this step aims at answering the question how firms would have evolved, if they had not pledged IP. Specifically, we construct a counterfactual scenario in which we compare the use of debt between an IP-pledging firm to the use of debt of a matched control group. Our data is well-suited for this, since it provides a very large group of potential matching candidates, i.e., in the full ORBIS data we identify 159,226 individual IP owning firms out of which only 1,123 actually pledge their IP. This way, we are able to construct a group of firms that share very similar observable characteristics, which is important as it controls for observable differences between IP pledging and non-pledging firms that might explain differences in loan supply and demand of the focal firms. Arguably, this does not allow us to make any causal inference on the effects of IP pledges, however, our goal in this step is much more modest: We aim to document the measurable effects of IP pledges on firms' use of debt.

The relatively large group of potential matching candidates allows us to use very granular matching criteria regarding time-variant and time-invariant firm characteristics. To match pledging and non-pledging firms, we use a combination of exact matching and Coarsened Exact Matching (CEM). Specifically, we deploy an exact match for firms industry, legal type (private versus public corporation) age, and IP ownership, in which we impose matching partners to have similar IP portfolios in terms of composition (trademarks and patents) and size. Further, we match firms using CEM based on their use of debt (total debt and long-term debt ratios), firm size (log. assets), cash flow, and asset tangibility (share of tangible assets among total assets) as time-variant matching criteria. The rationale for choosing these criteria is that they are all found to be capital structure determinants (see Frank and Goyal (2003) for an overview). For consistency and to avoid reverse-causality issues, we impose firms to be similar along these dimensions during the three years prior to the first IP pledge of the pledging group. We keep one matching partner in each strata, to obtain a balanced sample of pledging and non-pledging firms.

Our matching procedure yields a matched sample containing 554 pledging firms and 554 non-pledging counterparts from France, resulting in 21,446 firm-year observations for 1995 until 2018. Panel A of Table 3 confirms the validity of our matching approach and shows that there are no statistically significant differences in means for several observable firm characteristics comparing pledging and matched, non-pledging firms. We use the matched sample to provide descriptive evidence that IP pledges are associated with economically large increases in the use of debt. Panel B of Table 3 illustrates the use of long-term debt relative to the year of the initial IP pledge (t) and distinguishes IP pledging firms and their matched counterpart. Confirming our matching strategy, there is no statistically

significant difference in the use of debt for these two firm types during the entire pre-pledge period ($t < 0$), suggesting that these group of firms move in parallel trends prior to the pledge. Beginning with the year of the pledge, these paths clearly diverge. On average, the long-term debt to asset ratio of pledging firms increases by 2.33 percentage points (44%) from 5.31 to 7.63% (t-value: 3.68) comparing the pre-pledge year ($t-1$) with the pledging year ($t = 0$). In contrast, there is no statistically significant change in debt ratios for non-pledging firms.[10] To show that this observation is not driven by the specific measurement of debt use, Panel C of Table 3 plots the issuance rates of new long-term debt for the two firm categories. Again, there is a significant spike in issuance rates for IP pledging firms in the year of the pledge, whereas debt growth rates remain unchanged for their non-pledging counterparts.

- Insert Table 3 here -

As a next step, we test these findings using multivariate analyses. Our methodology follows previous work (e.g. Petersen, 2009) by including a set of fixed-effects and adjusting the standard errors for correlations within clusters. In all estimations, we report standard errors clustered at the firm level. Using our matched sample, we estimate the following set of equations on a symmetrical time window of six years around the IP pledge:

$$Y_{it} = \alpha_t + \phi X_{it} + \delta_1 IP_i + \delta_2 Post_{it} + \delta_3 (IP_i \times Post_{it}) + u_{it} \tag{1}$$

$$Y_{it} = \alpha_t + \gamma_i + \phi X_{it} + \beta (IP_i \times Post_{it}) + u_{it} \tag{2}$$

$$Y_{it} = \alpha_t + \gamma_i + \phi X_{it} + \beta_1 (_{IP_i} \times Pre_{it}^{\text{-2,-1}}) + \beta_2 (_{IP_i} \times Post_{it}^{0,1}) + \beta_3 (_{IP_i} \times Post_{it}^{\geq 2}) + u_{it} \tag{3}$$

where Y_{it} is the long-term debt ratio of firm i in year t; X_{it} is a vector of firm-level control variables (i.e., firm size, profitability, tangibility, liquidity, cash flow); IP_i is a dummy variable, which is equal to one for firms that eventually collateralize their IP in a loan agreement and zero otherwise; $Post_{it}$ is a firm-pair-specific indicator, which equals one for all years after the pledging firm (i.e., $IP_i = 1$) within matched couple pledges an IP right. Equations (1) and (2) include the interaction of these two indicators and thus resemble a difference-in-differences estimation strategy. These interaction terms (δ_1 and β) estimate the average additional effect of an IP pledge on firms' debt capacity. Equation (3) introduces $Pre_{it}^{\text{-2,-1}}$, which is an indicator equal to one for any observations within the two year prior to the IP pledge (for both $IP_i = 1$ and $IP_i = 0$ in a common strata).

[10] Panel A of Figure IA3 (Appendix B) shows that this pattern is similar when using total debt ratios instead of long-term debt ratios. In contrast, repeating the analysis for short-term debt shows no distinct changes in debt patterns (see Panel B). Hence, in line with previous findings (e.g. Mann, 2018) on patent pledges in the US, IP rights appear to work as collateral to secure longer-termed loan agreements, i.e., with a maturity of one year or longer.

This variable is interacted with the dummy IP_i and thus β_1 captures the difference in debt-ratios between IP pledging firms and their non-pledging counterparts. As another component in Equation (3), we decompose $Post_{it}$ into i) the initial effect of an IP pledge for the first two years of the IP-collateral event, i.e., the years $t = 0$ and $t = 1$, and ii) the medium- to long-termed effect for the five subsequent years, i.e., the years $t = [2, 6]$). All interactions measure the average difference in debt ratios between IP pledging firms and their matched partners, *relative* to the years t = [-6,-3]. In all specifications, α_t denote time fixed effects and, if applicable, γ_i denote firm fixed effects. These estimations provide a detailed perspective on the distribution of the pledging events' effects around the actual pledge and assess potential differences in pre-trends.

Table 4, Panel A displays estimates on the regression specifications (1) through (3), in Columns I-III, respectively. The coefficients $Post$ and IP are statistically not significant (Column I) suggesting no differences in debt use between IP pledging firms and their matched counterparts before the IP pledge. However, the interaction of the two indicators is statistically significant on the one percent level. The coefficient (0.018) suggests an economically significant increase of debt-ratios for the average IP pledging firm by 34% relative to the matched control group after the treatment. This finding is robust to introducing firm- and year fixed-effects (Column II) and to splitting the pledge-indicator into separate components (Column III). To mitigate concerns that the years of the Financial Crisis (2008 and 2009) potentially confound these results, we exclude the respective years from the estimations in Column IV and show that this does not affect the main results.

- Insert Table 4 here -

To assess the timing of the effects more detail, we study the pledge effect in an event-study type approach. We decompose the pledge-indicator into $Post_{it}^S$ and Pre_t^S, which are equal to one for all observations in S years after (Post) and prior to (Pre) the IP collateral event, where $S = [0, 6]$ (S = [-6,-2]). Here, the last year prior to the IP collateral event is the reference time period. Figure 3 plots the year-dummy variables interacted with the indicator IP_i and displays the regression equation. In Panel A, we use the full sample of and confirm our previous estimations in that there is a positive shift in the use of long-term debt by IP pledging firms in the year of the pledge. Again, the insignificant and stable coefficients during the pre-pledge period suggest that IP pledging firms and their non-pledging counterparts move in parallel trends prior to IP collateral event. Moreover, it shows that this shift is persistent over the medium term. In Panel B, we distinguish IP pledges that use trademarks and patents as loan collateral and show that the effects are fairly consistent for both types of IP pledges. Overall, our analyses thoroughly document the positive effect of IP pledges on firms' use of debt. To the best of our knowledge, we are first to show these effects using different IP types as loan collateral, i.e., both patents

and trademarks.[11]

- Insert Figure 3 here -

3.4 The implications of IP-backed borrowing

Previous results suggest a strong average increase in firms' use of debt after the IP pledge, relative to their matched counterpart. As another important dimension, we document heterogeneity in these effects along different firm-level characteristics. To study this, we repeat estimations of Equation (1) and (2) for different subgroups. Specifically, we distinguish IP pledging firms along three dimensions: i) innovation-intensity, ii) firm size and legal status, and iii) degree of financing constraints. Results are summarized in Table 5. First, we find effects to be more pronounced for innovation-intensive firms (Columns I-II). As such, the results are strongest for firms with a relatively high share of intellectual property among intangible assets prior to the pledge and firms from technology and science sectors (NACE classes C and M), suggesting that firms benefit most, if IP are likely to relate to their core business strategy. Second, we find effects to be strongest for SMEs and private firms (Columns III-IV). This is consistent with the idea that debt is a more relevant source of financing (Freixas and Rochet, 2008) and highlights the potential of IP to help these firms to attract debt. Third, estimates are particularly pronounced for firms that are dependent on external financing and those previously financially constrained (Columns V-VI). We measure dependence on external finance using the RZ score as proposed by Rajan and Zingales (1998). Alternatively, we show that results are more pronounced for firms with relatively few tangible assets (i.e., alternative sources of collateral). Again, these estimates suggest that IP collateralization helps financially constrained firms to obtain debt financing. Overall, these findings are in line with theoretical considerations and emphasize the strategic importance of IP pledges, in particular, for firms with limited access to financing.

- Insert Table 5 here -

As a final piece of descriptive evidence, we show that the increased use of debt has real economic implications for the pledging firms. To begin with, we provide evidence that pledging firms use the obtained debt to finance investment in assets, in particular, into intangible assets. We exploit the event study setting from the previous section but use the year-to-year asset growth rate as dependent variable. Panel A of Figure 4 plots the estimates on the interactions of year-dummy variables with the indicator IP_i as defined above. IP pledging firms and non-pledging counterparts move almost identical

[11] Estimations displayed in Table IA3 Appendix A show that the effect of IP pledges are similar when distinguishing along relatively high and low numbers of IP rights included in the pledge.

paths along the six years before and after the IP pledge. For IP pledging firms, however, in the year after the pledge the coefficient spikes and is statistically different to the counterfactual group, suggesting a disproportional increase in asset growth in the year of the IP pledge. We decompose this effect in Panel B of Figure 4 and show that firms increase their holdings of intangible assets whereas the ratio of tangible assets is not affected by the IP pledge.[12] Hence, these observations show that IP pledging firms are associated with an increased investment in assets at the year of the pledge. Again, we do not argue for a causal relationship at this point.

- Insert Figure 4 here -

Moreover, we document that there is a strong positive association between IP firms' increased use of debt and other real economic outcomes. Panel C of Figure 4 displays estimations on the baseline regression estimating Equations (1) and (2) but using a set of different dependent variables: firm size (log. assets), sales (log. sales), and employment (log. number of employees). Consistent across these specifications, the interaction terms ($IP \times Post$) are positive and statistically significant. The coefficients suggest that IP pledges are associated with a disproportional increase in firm growth (by 19%), sales (by 28%), and employment (by 8%) for IP pledging firms (referring to Columns II, IV, and VI, respectively). The findings in this section show the large economic potential of IP pledges for the pledging firms. We show that IP pledges lead to higher use of debt particularly for financially constrained, innovation-intensive firms and that this is related to higher levels of growth and employment for respective firms.

4 IP publications and the pledgeability of IP in France

4.1 Uncertainty and IP publications

In this section, we establish the relationship between IP publications and the timing of IP pledges. We begin by proposing the relevance of incomplete information for IP pledgeability. We base this proposition on previous findings, which show that certainty about the boundaries of an IP asset is essential in any transaction that affects the legal ownership of IP rights (Jaffe and Lerner, 2011; Mezzanotti, 2021). Firms can use their IP without official documentation of ownership without obtaining the authorized right on an idea, technology, or brand.

It is important to note that loan contracts are private agreements between legal entities such that it is generally possible to collateralize any form of IP at any stage of the publication process, unless it is explicitly prohibited by law. Hence, it is generally

[12] This is robust to using the logarithm of intangible assets and tangible assets (undisplayed).

possible to use unregistered trademarks and patent applications that are not published or granted as loan collateral. Consistent with this, we observe pledges of patents and trademarks prior to publication in our data (see Panel A of Figure IA4 (Appendix B).[13] This observation is in line with previous literature, demonstrating that IP can indeed be used in loan contracts already prior to publication. More specifically, literature on both patents (e.g. Haeussler *et al.*, 2014) and trademarks (e.g. González-Pedraz and Mayordomo, 2012) shows that IP applications already carry a signaling value and increase the odds of obtaining financing.

However, before publication, owners do not have any official, objective validation on the (legal) boundaries of their IP. In addition, they cannot enforce ownership rights against any other parties that use or copy their IP. Obtaining an exclusive right mitigates these uncertainties. IP publications represent a very likely specification of the conferred legal right, specifying the scope of protection, i.e., the legal boundaries of IP. On top of this, as formally conferred IP rights provide exclusive ownership rights to their owners that can be enforced through the legal system. These two aspects emphasize the role of IP publications as a mediator for problems arising from incomplete information.

In the following, we describe the formal application process of trademarks and patents in France in order to illustrate more directly how IP publications mitigate the issue of incomplete information. Panel A and B of Figure 5 illustrates the most relevant steps for our analysis in their application processes. In Panel C, we show that our dataset very precisely reflects these stylized patterns.[14]

- Insert Figure 5 here -

4.2 Trademarks: The publication of registration

To obtain ownership of a trademark right in France, interested parties must file an application at INPI that identifies and describes the trademark, including a list of goods and services for which the registration is requested (the so-called Nice classes). The INPI examines whether the application satisfies the formal requirements. However, INPI does not assess the distinctiveness or the existence of prior rights that are in conflict with the application and thus does not comprise a thorough examination of the validity of the trademark. All eligible applications are then published ('publication of application' in Panel A of Figure 5), approximately six weeks after their receipt at INPI.

With the publication of the application, the trademark becomes observable for the public. The publication explicitly states the option offered to third persons to formulate

[13] Furthermore, Panel B of Figure IA4 (Appendix B) displays the distribution of pledges across IP age using all IP pledges in France since 1995. Note that using the full data biases the distribution towards earlier pledges, resulting from a censoring of the data towards more recent years.

[14] See Bouche (2020) for a detailed description of the procedural steps, current legislation, and administrative requirements of IP rights in France.

an opposition against the registration. Opponents are asked to specify the grounds upon which the application should be refused. Oppositions have to be filed within two months following the publication of the application. They can be filed on the basis of any prior trademark valid in France and by other trademark owners or governmental bodies, in particular, the National Institute of Origin and Quality (INAO).[15] In case of oppositions, the trademark filing party is informed and granted the option to reply to the allegations. Eventually, the INPI decides upon the opposition based on these correspondences where the parties may exchange their arguments. Only if the application is not withdrawn or refused during these proceedings, the trademark is registered by entry into the National Register of Trademarks ('publication of registration' in Panel A of Figure 5). Taken together, the opposition period allows for a de facto examination by third parties.

In France, the first-to-file principle applies, which stipulates that only the official registration of a trademark and not its first-time use grants the owner of a mark with the exclusive right to use it in commerce (Bouche, 2020). This is different to other jurisdictions, such as the US where the first-to-use principle applies. The publication of trademark registration thus marks a particularly important event regarding the validity of a trademark in France. The date of publication of the registration makes the right effective against third parties. Moreover, the publication of the registration also mitigates potential concerns of the applicant about scope of the trademark. For example, trademarks are registered only for certain goods and services, which are indicated by the Nice classes that are listed in the trademark registration. Oppositions may be filed against the specific classes mentioned, such that only the registration of the publication ascertains the scope of protection of the trademark. These considerations are in line with Hsu *et al.* (2022) who show that greater trademark protection enhance the generation of new trademarks.

We therefore hypothesize that the publication of the trademark registration is an important determinant for the pledgeability of trademarks. This argument follows previous literature, which shows that patent publications facilitate transactions in the market for ideas, i.e., licensing agreements (e.g. Hegde and Luo, 2018). We build on this idea and expect similar effects not only for trademarks but also in the context of debt financing.

4.3 Patents: The publication of applications

The patent grant procedure at INPI starts with an application that must contain a description of the invention defining one or more independent claims for which protection is sought. Further, the applicant is asked to provide a detailed description on the technical

[15]Firms have a strong monetary incentive to realize the option of opposition. Opposition costs 325 Euros and are to be paid by the opposing party. This amount is negligible compared to the potential court costs of IP litigation trials (e.g. Hall *et al.*, 2014).

field and the way of carrying out the invention. It is mandatory to include references to prior art that are "known to the applicant" (Article R. 612-13). In many cases, however, a significant share of references will be included by patent examiners during the examination process, just like in other jurisdictions (e.g. Alcácer *et al.*, 2009).

All patent applications are subject to a technical examination by the INPI, in which the application can be refused in case of an obvious lack of novelty. Throughout the examination procedure, examiners prepare a documentary search draft designed to reveal prior art that is likely to affect the patentability of the invention. There is no way to bypass this search procedure unless the applicant withdraws the application or transforms it to a utility application. Further, the documentary search draft includes an examiner's opinion on the patentability of the invention. If the draft search report shows an obvious lack of novelty, INPI may order the modification of claims.

The draft report is published together with the patent application at a fixed period 18 months after the initial filing ('publication of application' in Panel B of Figure 5). Even if the search report lists a number of prior art documented, the report does not produce legal consequences for the applicant; it has mainly an informative function as to the validity of the patent. Again, the publication of patent applications marks an important event mitigating legal uncertainty associated with the patent application. First, the publication date provides the applicant with provisional protection, given that the application will eventually be granted. Thus, the exclusive right takes effect as from the date of application and not from the date of grant (Bouche, 2020). Second, the publication informs the applicant about the probability of grant by providing the draft documentary search. This is central, because the publication marks not only the first disclosure of the technological invention to the public time but it is also the first time that the applicant receives a detailed, standardized, and official description by competent authorities on the likelihood of the grant to occur. The publication of a patent application therefore lowers uncertainty about the validity of patent claims. These arguments regarding the shift in information available for both patent applicants and other market participants, such as potential loan providers, are similar to the information update of trademark registrations. Hence, we hypothesize that the publication of patent applications should positively affect the likelihood of collateralization.

4.4 The probability of IP pledges and publications

In the following we provide first evidence on the relevance of formally conferring IP rights via publications for the potential of IP to be used as loan collateral. We use a sample of trademarks and patents including the most relevant dates during their application process on a daily basis. Most importantly, this includes the application dates and the publication dates of both the patent application and the trademark registration. Both

publication dates mark the decisive date for providing the IP owner a likely specification on the legal boundaries of the IP right and granting (provisional) protection as well as legal enforceability. To test whether IP publication dates are relevant for the timing of IP collateral events, we analyze about 20,000 individual IP rights deployed in first-time pledges in France between 1995 and 2018.[16]

As a key proposition, we assume that IP pledges are evenly distributed across time i) under full information and ii) on the short-term. First, in a perfectly informed market, the standardized publication process via an official authority should not delay the occurrence of IP pledges. In other words, under full information transactions should occur right away, whereas incomplete information may delay the pledge of IP rights. Second, against this background IP pledges should be evenly distributed across time, but only on the short-term. This is because differences in the age of an IP right only relate to the value of IP rights, if they are sufficiently large.[17] Following these two considerations, we can test whether official documentation via IP publications reduce these delays, i.e., increases the probability of IP collateralization shortly after publication. More specifically, we can test the competing hypothesis claiming that IP pledge events should be evenly distributed across time in the short term, if IP publication does not matter for collateralization.

Panel A of Figure 6 displays the hazard rates (Kaplan-Meier failure estimates) of the probability of an IP pledge in the short-term time window of one year around the publication of IP rights in our data. Since the time gap between application and publication varies across IP types, we normalize the publication date and calculate the relative time gap between publication and pledge. In this graph, we only consider IP rights that were collateralized during the symmetric time window of 0.5 years before until 0.5 years after the respective IP publications. We use a symmetric scale on both axis such that the hazard rates should follow the dashed 45-degree line, if the publication date does not affect the rate of IP pledges. The gradient of the hazard is much lower during the 0.5 years prior to the publication, whereas it increases right after the publication. This observation is consistent with our idea that publications are important determinants for IP collateralization. Additionally, the picture is consistent with the idea that IP publications facilitate the use of IP in market transactions by reducing incomplete information (e.g. Hegde and Luo, 2018) and provides first evidence on this mechanism for non-patent IP and in the context of debt financing.

- Insert Figure 6 here -

[16] Again, we consider all IP rights pledged by firms headquartered in France except of Alcatel Lucent.

[17] In perfectly informed markets it should not be decisive whether the IP right application was filed at time t or at t+τ, given that τ is small enough. However, this changes once τ becomes larger. For example, older patents have a lower option value compared to younger patents, because of their maximum lifespan of 20 year. Conversely, older trademarks may be considered as particularly valuable, since age signals their use in commerce.

Panel A of Figure IA5 (Appendix B) shows that life-cycle effects indeed play a role for the timing of trademark and patent pledges when considering a longer-termed time window. Using a 10- year window post application, we observe pledges to be skewed towards earlier years. Consistent with the fact that patents have a predetermined maximum lifespan, this effect is stronger for patents than for trademarks. Panel B stacks the timing of patent pledges in a one year symmetric time window around both publications and grant. The graph shows that grants also have an additional effect on the pledge rates of patents. More generally, Panel C of the same figure illustrates the timing of patent grants, publications, and pledges for the entire sample. Statistics from Panels B and C provide a very consistent picture: i) There is a 'grant effect' which is in line with previous literature on patent licensing (e.g. Gans *et al.*, 2008) but ii) this effect is significantly smaller as compared to the effect associated with the publication of the application. This is plausible, considering that the publication of the application marks the first-to-the-world appearance of a patent. On top of this, the publication already provides a fairly reliable evaluation of the patent examiners on the validity of patent claims.

Next, we demonstrate that IP pledge rates are evenly distributed on the short-term, in the absence of systematic information updates. To do so, we exploit institutional differences across trademarks and patents. For patents, the publication of applications takes places at a predetermined time, i.e., 18 months after filing. This is different for trademarks, which are published typically within the first 6 months after initial application (see Panel C of Figure 5). We use exploit these differences and estimate the hazard rates of IP pledges for trademarks and patents in a time frame 0.5 years until 2.5 years after the filing of the IP application. Again, the intuition is that in the absence of an information update, the pledge rates should follow a 45 degree line.

Panel B of Figure 6 shows that the rate of trademark pledges indeed follows a 45 degree line over the course of the respective two years. This finding is consistent with the fact that the vast majority of trademarks is already published half a year after the application. Hence, within this time span no systematical information update is expected. In contrast to this, the timing of the patent publication at 18 months after initial filing clearly delays the pledge rate. Hence, the differentiated pattern mitigates concerns that omitted factors related to the exact timing of the pledge explain the shape of the hazard rates.

As another robustness test, we provide evidence that the observed pattern reflects a strategic decision of the pledging entities. As such, we conduct a placebo analysis in which we show that the pattern cannot be established in a case in which the IP owner does not act strategically with regard to the timing of the publication. To study this, we exploit the case of Alcatel Lucent, a French multinational telecommunication equipment manufacturer. After seven consecutive years of significant financial trouble, in 2013 the company obtained a 1.6 billion Euro loan that was secured by its IP portfolio in order to

finance a restructuring program. Our main sample excludes these pledges, which would otherwise constitute to about 19% of all IP-level observations. Alcatel pledged its IP portfolio in a lump sum fashion. This implies that their loan providers were not sensitive about the validity of the claims in each individual IP right, i.e., the publication status of the IP rights should not matter. We exploit this setting to conduct a placebo analysis. We therefore estimate the hazard rates analogue to Panel A but use only the pledged IP portfolio of Alcatel. Results displayed in Panel C of Figure 6 show that we can clearly not replicate the previously observed pattern. For both trademarks and patents the confidence intervals of the hazard rates overlap with the 45 degree line across the short term time window. Statistics in Figure IA6 (Appendix B) on the distributions of the relative timing between application and IP pledges of Alcatel confirm this result.

To highlight the potential mechanism behind the above observations, we repeat the baseline case for different subsets of firms. Specifically, we distinguish among firms that can be expected to react disproportionally to an information update that accompanies the IP publication. Previous literature that compares SMEs to larger companies finds SMEs to be informationally opaque (e.g. Berger and Udell, 2006). Consistent with the idea that publications provide valuable IP-related information for all market participants, IP rights owned by more opaque firms should respond more strongly to the publication as compared to those owned by larger firms. Panel D of Figure 6 recasts the graph from Panel A but differentiates among IP rights owned by SME or large firms. Underlining our mechanisms, the verification effects of IP publication are indeed significantly stronger for IP held by SME.[18] Again, this emphasizes the important role of IP publications as a determinant of IP collateralization.

5 The launch of web-based TM publications

5.1 Institutional background

Empirically isolating the effect of information disclosure via IP publications on the pledgeability of IP is difficult, because firms may anticipate the publication to use the IP rights as loan collateral. Our empirical analysis exploits the launch of web-based publications by French authorities in 2006 as an exogenous source of variation in the relevance of the IP publications for trademarks. Specifically, the INPI started to display its weekly bulletins, the so-called BOPIs, on their homepage on January 2006.

The BOPIs contain information on all IP-related publications and procedural steps that are not subject to secrecy. In the context of trademarks and patents, this includes all steps of the application process and changes in the legal structure of an IP right

[18] Figure IA7 (Appendix B) shows that this pattern is consistent when distinguishing different SME subgroups and time horizons.

('*demande d'inscription*'), i.e., ownership, licensing, or pledge information. According to INPI employees, the online launch was advertised via different channels, such that market participants are likely to have known about the change in communication. We argue that the launch of web-based services at INPI made IP-related information more visible to market participants.

To illustrate the relevance of the introduction of a web-based access to IP-related information, one can compare the situations before and after the adoption of the online services. Accessing information regarding changes in the legal structure of IP was fairly difficult prior to the online publications. Before 2006, anyone interested in IP-related information had a restricted number of options. Charge free, on-site access was possible only at any of the regional INPI libraries located in Paris, Bordeaux, Lyon, Marseille, and Strasbourg. Alternatively, it was possible to order BOPI subscriptions on a a weekly, monthly, or annual basis. Archival queries were not possible, but users could directly order single BOPI publications or access archives at the INPI library in Paris.

During the early 2000s, the European Commission pushed towards digital transformation in the economy. This plan included the idea to provide all citizens and companies in the European Union with easier access to the public sector. Already in 2002, the Commission called all member states to give citizens easier online access to administrative information and services. For example, in May 2002, the Commission published the so-called eEurope 2005 Action Plan (EC COM(2002) 263 final) aiming to stimulate the development of services, applications, and content related to information and communication technologies. In line with these initiatives, internet-based services were introduced during the first half of the 2000s in France (Malgouyres *et al.*, 2021). The online publications of IP-related information via the INPI homepage can thus be viewed as one part of the general internet roll-out in France. Hence, the change in IP-related information disclosure was plausibly exogenous to the actual use of IP rights as loan collateral.

The adoption of web-based online services significantly facilitated the access to IP-related information. As a response to the pursuit of modernizing administrative services throughout European, INPI launched its web-based services for trademarks on January 1, 2006.[19] This administrative change made it easier for market participants to access information regarding the application of trademarks before the mark is registered and thus becomes legally enforceable.

The online disclosure of information is particularly decisive in the context of trademarks. As shown in Section 4.2, trademarks are subject to a public opposition period. After the publication of the application, different market participants are asked to for-

[19]Note that patent-related information were already published online as of January 1, 2005. Patent applications are subject to secrecy until the grant of provisional protection 18 months after the filing date. Plausibly, the 2005 launch of patent-related online services thus did not resemble a reduction in incomplete information. We confirm this presumption in a series of analyses in Section 6.4.

mulate oppositions to the trademark applications in case of infringements of prior rights. Making information accessible via the internet, thus enhanced the opposition process in terms of are subject to because it implies a more thorough examination of the validity and scope of claims during the opposition period. Hence, we expect a differential response in the pledge rates shortly after publication, comparing trademarks and patents, both before and after the online publication of the BOPIs.

5.2 The effects of online disclosure for trademark owners

The online publication of trademark applications is important for several reasons. First, it increased the importance of the trademark registration in terms of certainty about the validity of claims. As such, trademark examination occurs indirectly by other market participants and public institutions that are asked to oppose the trademark application during the opposition phase, i.e., after the publication of the application. Internet access increased the visibility of applications and thus increased the ex ante chances of opposition while keeping the ex post information value constant. Second, the online publication should increase the signaling value of trademarks. More salient trademark applications will lead to more strict assessments by other market participants, i.e., 'the wisdom of the crowd' increases, since the size of the crowd is larger. Third, trademark applicants may anticipate the stricter opposition period. This is important because the quality of trademark applications should increase in anticipation of a more thorough opposition period. Once applicants are aware that unlawful claims can be detected more easily with a much broader public attention, applicants may adopt their due diligence.

In all three cases, obtaining a trademark should be a more credible value signal comparing pre- and post online disclosure of applications. For instance, this potentially has strong implications from the perspective of loan providers regarding the credibility of the publication as a signal for the validity of trademarks. Everything else equal, we thus hypothesize that the publication of trademarks becomes more important for determining the pledgeability of trademarks in all three scenarios. For simplicity, we will refer to this effect as 'verification effect'.

5.3 Cross-sectional variation: different degrees of competition

To identify the causal effect online disclosure of publications on the relevance of publications for IP collateralization, we exploit additional cross-sectional heterogeneity. More specifically, our identifying assumption is that we expect heterogeneity in the response to the online publication of trademark-related information regarding the ex ante competition of trademark owners. As such, the reduction in incomplete information should be particularly high in competitive industries. We thus expect disproportionally strong

responses to the web-based disclosure of information for trademarks that are held by firms in relatively competitive environments.

The rationale behind this is that a higher threat (actual or perceived) of opposition should reduce the ex ante certainty about the legal boundaries of trademarks. Pre-publication opposition does not affect the ex post uncertainty. Hence, the difference in pre- and post 2006 certainty about trademark rights should be larger with more fierce competition as compared to situations with lower competition. Moreover, if assessment is stricter or applicants increase their due diligence, the ex post uncertainty about trademark claims from the perspective of potential loan providers should be lower. Yet, stricter assessment does not directly affect the ex ante uncertainty. Again, the wedge between pre- and post 2006 certainty about trademark rights should therefore be larger in environments with fiercer competition.

To operationalize firms' degree of ex ante competition, we follow previous literature that estimates industry-level differences in competition using firm-level data (e.g. Aghion *et al.*, 2005; Bajgar *et al.*, 2019). We use the full population of firms headquartered in France that are contained in the ORBIS database for the year preceding the implementation of online services at INPI in 2006. For each firm in the ORBIS database, we calculate individual mark-ups by dividing total sales over the total of operating expenses. Equipped with these information, we then compute concentration indices on an industry level (NACE 4-digit level). We classify industries with a below median concentration as 'competitive'.

The classification on has three additional advantages to the mere categorization on more or less affected trademarks. First, using industry-level information prior to the change in the disclosure policy is unlikely to be affected by individual, ex post firm level activities. Second, we can define industries on a highly granular level, since we observe individual mark-ups for several thousand firms. Third, using out-of-sample, industry-level data is advantageous, because the competition measures are unlikely to be affected by individual sampled firms.

Given our research design, it is important that trademarks held by firms in high and low competitive environments are similar along both trademark and owner characteristics. We present descriptive statistics for these two subgroups in Table 6. As can be observed, the differences are generally small in magnitude and statistically insignificant. Trademarks are similar with regard to different quality dimensions and the time lag between application and publication dates. On top of this, the trademark owners are comparable in observable characteristics that are both related to on and off-balance sheet items, including firm age, size, geographical location, legal type, use of debt, profitability, and financing needs approximated by the current- and cash flow-ratios.

- Insert Table 6 here -

5.4 Research design: identification strategy

We identify the effect of the launch of online publications for the timing of trademark pledges using a difference-in-difference design. More specifically, we estimate whether the share of pledges that occur soon after the IP publication increases after the introduction of online publications at INPI in 2006. In the presence of a verification effect, the probability of IP pledges right after the publication should increase. This is means: Conditional on an IP pledge, pledges should occur closer to the publication date. The verification effect is identified by the differential response in the pledge rates with respect to variation across time (pre vs. post 2006) and across trademarks (high vs. low competitive environments). To estimate this, we use our IP-level dataset that contains pledge information on a daily frequency. We focus on IP that is filed in a five year symmetric time window around 2006. By construction, IP that is filed in earlier years is more likely to be pledged at a relatively later stage. In line with previous literature (Hegde and Luo, 2018), we consider all IP pledges within 8 years after application to avoid these truncation issues. We estimate our baseline regression:

$$I(\text{Pledge}_{ij}^{\tau}) = \beta_n + \beta_1(\text{CE}_i^{high} \times \text{Post}_j) + \beta_2 \text{CE}_i^{high} + \beta_3 \text{Post}_j + X'_{ij} + u_{it} \qquad (4)$$

where the dependent variable $\text{Pledge}_{ij}^{\tau}$ is a dummy variable equal to one if the pledge of trademark j owned by firm i takes place within τ months after the publication of registration and zero otherwise. As a baseline, we use τ=12 months but also test other thresholds. CE_i^{high} is a dummy variable that indicates whether the trademark owner i is operating in a competitive environment, as defined in Section 5.3. Post_j is an indicator variable that captures if the trademark is initially filed after the launch of online publications at INPI in 2006. The coefficient of interest is β_1, which captures the differential effect of the 2006 online publication disclosure on the timing of pledges of trademarks owned by firms in high versus low competitive environments. If the 2006 web-based launch effectively induced more complete information on IP rights and increased the share of trademarks pledged shortly after the publication, we expect β_1 to be positive.

In our data, we observe IP pledges over a fairly long time span. To control for differences in pledging patterns across time, we thus including IP application-year fixed effects (β_n). Because trademark publications typically occur with a similar time gap relative to the application, these fixed effects also control for general time-related trends that specific to all trademarks. Our model includes a vector of control variables (X'_{ij}). We thereby control for other time-variant observable factors that might affect the timing of the pledge. These variables are defined in Table IA4 in Appendix A and relate to both the trademarks themselves and the firms that own them.

We investigate further heterogeneity across trademarks and trademark owners to carve out the mechanisms behind our results. In a first step, we exploit detailed information on

the locations of trademark owners' competitors to analyze differences in internet access. We hypothesize that the verification effect should be particularly strong, if competitors had better access to the internet. Moreover, we study differences in the informational opacity of the trademark owners prior to 2006. We hypothesize that owners which are less transparent, such as private and/or small firms, should be disproportionally affected by the information provided in the course of online publications. As a third step, we study differences in the intermediaries that accompany the IP pledge deals. We hypothesize that our baseline effects are mitigated once trademark pledges are supervised by more informed intermediaries, such as relationship banks or large, top-tier law firms. As a final step, we reintroduce data on patent pledges. Arguably, the timing of patent pledges should not have been affected by the launch of online repositories at INPI, because patents are kept secret until publications. We thus consider patents as an alternative comparison group for trademarks in a final set of tests. Here we hypothesize that the effects of online disclosures should be small or insignificant for the timing of patent collateral events.

6 Empirical analysis

6.1 Descriptive evidence

Descriptive statistics for the underlying identifying assumptions are presented in Panel A and B of Figure 7. Panel A displays the density functions of pledge rates in a broad, 10-year time window around the trademark publication date (i.e., two years prior to the publication and eight years afterwards). In the presence of a verification effect, the density of trademark pledges should generally increase, comparing pre- and post 2006 pledge rates. Differentiating among pre- and post 2006 densities shows that the timing of trademark pledges is indeed shifted closer to the publication dates.[20]

- Insert Figure 7 here -

Panel B of Figure 7 displays Kaplan-Meier failure rates, estimating the probability of trademark pledges within the 1.5 years after the publication of registration - conditional on a trademark being pledged at some point in time. The graphs display the failure estimates for trademark owners in high and low competition environments, separately for the years 2001-2005 and 2006-2010. For the earlier time window, the probability of a trademark pledge to occur within the first 1.5 years after publication is very similar between high and low competition environments. For the time window 2006-2010, the probability of a trademark being pledged early after publication is significantly higher

[20]Panels A and B of Figure IA8 in Appendix B display hazard rates that estimate the probability of trademark pledges around the time of trademark publications and the end of the opposition period, both of which confirm this observation.

for trademarks owned by firms in competitive environments compared to trademarks owned by firms in relatively less competitive environments. This difference is not only statistically significant but also economically meaningful. For example, the probability of high competition trademarks to be pledged within the first year after the publication of registration is about 80% larger compared to low competition trademarks, with Kaplan-Meier failure estimates of 0.18 and 0.10, respectively.

Taken together, the descriptive evidence supports our identifying assumptions along several dimensions. There is a general increase in the probability of trademarks to be pledged sooner after the publication of registration comparing pre- and post 2006 levels. Importantly, the timing of trademark collateral events that include trademarks held by firms in high and low competitive environments was similar prior to 2006. After the launch of online publications at INPI in 2006, the timing of trademarks pledges from competitive environments shifted closer to the publication date. Table IA5 (Appendix A) contains further statistics on the timing of trademark pledges before and after 2006.

6.2 Quasi-experimental setting: Baseline results

The results of our baseline difference-in-difference analysis are presented in Table 7. In Column I, we present the simple association of the launch of the online publication at INPI, measured by *Post*, and the probability of a trademark pledge within the first 12 months after publication. The estimated coefficient is positive and significant at the 5% level. This is consistent with the descriptive findings suggesting that the timing of IP pledges shifted closer to the publication of the trademark registration comparing pre- and post 2006 levels. Column II adds the indicator specifying trademarks owned by firms in competitive environments and its interaction with the *Post*-dummy. The estimate on the interaction term is positive and significant, whereas the coefficients of the level variables are both insignificant. This suggests that effect of the online launch in 2006 can be associated predominantly with firms that face relatively high competition. Column III repeats this specification but additionally controls for other confounding factors, i.e., it estimates our main specification as defined in Equation (4). The coefficient of the interaction term is positive and statistically significant at the 1% level. The size of the coefficient suggests an 43% differential change in the probability of a trademark pledge within the first 12 months after publication comparing trademarks held by firms in high versus low competitive environments, before and after 2006. This evidence is consistent with our proposition that the online disclosure of trademark applications increased the relevance of trademark publications for their use as loan collateral. There appears to be no general change in the timing of the pledges as the lack of significance of the coefficient for the post-2006 indicator suggests.

- Insert Table 7 here -

Columns IV and V repeat the baseline specifications but consider changes in trademark pledges within the first 6 and 24 months after publication, respectively. Estimates suggest that the positive baseline effect also applies for pledges within 6 months but not for the longer time window of 24 months. This result is in line with the idea that there is a shift in the distribution of the timing towards earlier pledges. For robustness, we test a whole set of different time windows ranging from 4 to 96 months. Estimates displayed in Panel A of Table IA6 (Appendix A) underline the results from Columns IV and V. In Panel B of the same table, we show that the baseline results are robust to applying a different threshold to classify trademark owners environment as highly competitive.

As another robustness test, we follow Hegde and Luo (2018) and reshape our sample into a week-level panel data set starting in the week in which the trademark application was filed at the INPI and ending in the week in which the trademark was initially pledged. Panel C of Table IA6 (Appendix A) reports probit regression results using this panel-structured data in which the dependent variable equals one for the week in which a trademark was pledged and zero otherwise. The coefficient of interest is the interaction *Post* $\times$ *Publication within* τ, indicating the differential probability of trademarks pledges within 12, 6, and 24 (i.e., τ) months after publication comparing trademarks filed before or after the online publication launch in 2006. We include the number of weeks elapsed since application (in logarithm) to control for the time dependence of the licensing likelihood (log duration). Split sample regressions for trademark owners in high (Columns I-III) and low (Columns IV-VI) result in coefficients of the interaction terms are positive and significant at the 5 percent level for firms facing high competition and insignificant for those facing relatively low competition, confirming our main results.

6.3 Mechanisms and extensions

6.3.1 Differences in firm locations and internet access

To gain further insights regarding the trademark owners that disproportionally respond to the launch of online publications at INPI in 2006, we consider differences in internet access during the mid 2000s in France. Plausibly, the change in the timing of trademark pledges should be larger for trademarks owned by firms whose competitors actually are able to access the information displayed on the internet. In general, France introduced the infrastructure for using high speed internet in the early 2000s (Malgouyres *et al.*, 2021). However, the internet roll-out was orchestrated by local authorities, leaving some regions with higher internet penetration than others. Hence, the actual subscription rates at the time of the online launch at INPI in 2006 varied substantially across the country.[21] We

[21] Panel A of Figure IA9 (Appendix B) illustrates this dispersion by mapping both the available internet nodes and the de facto access to broadband internet the actual broadband internet penetration provided by France Télécom as of January 2006. The light blue dots refer to the subscriber connection nodes

exploit these differences in internet penetration, since the online publications should be most important for firms whose competitors are actually able to access online publications of BOPIs in 2006. Historical firm-level information on internet access is not available. We thus leverage the fact that internet penetration is clustered and gather information on the internet penetration on the department-level. Based on this, we calculate the share of each trademark owner's competitors that are headquartered in departments (INSEE regions) with high internet penetration in 2007. For this, we use the full ORBIS database and aggregate information on the 4-digit NACE industry-level.

Panels A and B of Figure 8 display the Kaplan-Meier failure estimates on the probability of a trademark pledge within the first 1.5 years after the publication of registration. The panels distinguish pre- and post 2006 probabilities for trademarks pledged by firms in competitive environments. Panel A displays the failure estimates for firms with an above median share of competitors located in French regions with a low internet penetration at the time of the launch of web-based services at INPI. The probabilities of before and after 2006 are very similar and statistically insignificant. As Panel B displays, this is different for firms in highly competitive environments and with competitors that are expected to live in areas with higher internet penetration. Here, the probability of trademark pledges within the first 1.5 years after publication is much larger post 2006 as compared to pre-2006 levels.

- Insert Figure 8 here -

We conduct several tests that demonstrate the robustness of these findings. To confirm the findings from Panel A and B of Figure 8 in a multivariate setting, we augment the probit estimation from Table 7 by including a triple interaction term that captures the differential response for firms with competitors located in regions with high internet penetration. Estimates in Columns I-III of Figure 8 (Panel C) are positive and statistically significant at the one percent level, confirming the Kaplan-Meier estimates. For robustness, we repeat these three specifications but use weighted averages of the share of competitors that have internet access in Columns IV-VI. Weighting the averages by the size of the competitor as measured by total sales, leads to very similar results. Panel A of Figure IA10 (Appendix B) confirms this finding graphically. Panel B of the same figure show that the findings are robust to using a higher level of aggregation on the industry-level (2-digit NACE code) to calculate internet penetration. Additionally, there is a similar effect when considering the internet penetration in the location of the trademark pledging firms (see Panel C), which is consistent with the idea that competition

installed by January 1, 2006. It appears that locations where unbundling operators were already installed are concentrated to specific regions and cities. According to official statistics, there were 9.5 million broadband subscribers in France on January 1, 2006 (ARCEP, 2006), compared to a total population of 63.6 million. Panel B of Figure IA9 (Appendix B) illustrates the actual internet subscriptions relative to the total population in France during the years prior to the launch of web-based services at INPI.

may be locally concentrated. Yet, the effect is smaller compared to the initial findings from Table 7, which confirms that the location of competitors is most decisive.

Taken together, we find robust evidence that our baseline results are stronger for firms whose competitors are located in regions with established internet access at the time of the launch of online services at INPI. This confirms our identifying assumption, which is that the online publications actually affect the level of information available for market participants regarding the publication processes of IP in France. Additionally, the findings suggest differential effects depending on the location of firms and their competitors.

6.3.2 Differences in ex ante opacity

Furthermore, we find that firms which are informationally opaque prior to the online publications are more strongly affected by the 2006 launch of web-based services as compared to more transparent firms. Specifically, we follow the idea that private and relatively small firms are found to be more informationally opaque (e.g. Berger and Udell, 2006). We hypothesize that these firms are more strongly affected by the disclosure of information via the internet. Larger public firms are legally obliged to provide information to the public. This suggests that the degree of additional information released through online publications should be limited as compared to relatively more salient firms.

To test this, Table 8 re-estimates the baseline Difference-in-Difference model using different subsamples of firms. We consider several different specifications of informational opaque firms: private versus public firms, firms with more versus less than 250 employees, SMEs versus large firms, and firms with above versus below median level of total assets. For classification, we consider the 2005 values of firm size and legal status. We separately estimate regression on split samples according to these categories.

- Insert Table 8 here -

Estimates are consistent across specifications and suggest strong positive effects for firms that are more informationally opaque prior to the launch of online publications in 2006. For private firms and relatively small firms using three different size categories the coefficient of interest from Equation (4) are positive and statistically significant. In contrast, the coefficients are much smaller for public limited firms and relatively large firms. All of these coefficients are statistically insignificant. Again, these results emphasize the validity of our empirical approach.

Additionally, the findings show that before the introduction of the online publications, trademark pledges were delayed particularly strong for small private firms. This is important, because these type of firms are typically considered to have a relatively strong reliance on debt financing. These above findings thus suggest that online publications may be particularly beneficial for small, private firms.

6.3.3 Intermediaries as mitigating factors of information asymmetries

Financial intermediaries are important factors in the context of IP-backed agreements. For example, the bank-firm relationship can mitigate the negative effects of incomplete information associated with IP. Closer ties between IP pledging borrowers and lenders are likely to moderate agency issues and informational asymmetries that are typically associated with young or intangible-intensive firms (e.g. Berger and Udell, 2006; Hall and Rosenberg, 2010).

To study this, we exploit information on firms main bank from the ORBIS database. We classify banks as relationship bank if they are in one of the following categories as defined by ORBIS: 'cooperative bank', 'savings bank', or 'private banking'. We operationalize using a dummy variable that is equal to one if the trademark pledging owner has a main bank with any of these three categories. The indicator is equal to zero once banks are classified as 'specialized governmental credit institution', 'commercial bank', or 'investment bank'. Using these information has notable drawbacks. The main bank is defined as of today and we do not have historical information for the year of 2006. Likewise, the information on the bank are not very complete. We therefore consider this analysis as suggestive evidence on the effect of firm-bank relationships for impact of the introduction of online publications in 2006 on the timing of IP pledges.

Panel A and B of Figure IA11 (Appendix B) display Kaplan-Meier failure estimates for firms with relationship lenders and firms without relationship lenders, respectively. The estimates suggest that relation there is no statistically significant difference in the timing of patent pledges comparing trademarks filed before and after 2006 that are owned by firms with a relationship bank. Different to this, for firms with no relationship lender as a main bank the probability of trademark pledges within the first 1.5 years after the publication of registration is significantly higher after 2006. We find a similar pattern when only considering firms in highly competitive environments. These estimates provide suggestive evidence that bank relationships mitigate information asymmetries and thus reduce the impact of online publications on the timing of IP collateralization.

As a related analysis, we consider the assisting law firms as an important moderator of information asymmetries. As such, firms with top tier law firms can be expected to be already better informed prior to the 2006 launch of online publications. In contrast, for firms without this assistance, the information provided via the web-based services should have disproportionally benefited. We thus web-scrape information on the main legal advisor ('mandataire') of the trademark owning firms from the INPI webpage. We classify law firms that are listed in the 'legal 500' ranking as top tier.[22] Panel C and D of Figure IA11 (Appendix B) display the Kaplan-Meier estimates for trademark owners

[22]See www.legal500.com; accessed: April 3, 2022. For a full list of law firms that we consider as top tier, see Table IA7 (Appendix A). Using this classification method flags 37% (34%) of sample firms (SMEs) to be advised by a top tier law firm.

with and without top tier law firms and for trademarks filed before and after 2006 on the subsample of firms in competitive environments. Estimates suggest that the effect of the 2006 launch is lower if the trademark is owned by firms with top tier lawyers.[23]

6.4 Robustness tests: Patent publications as placebo setting

Next, we turn to the response in the timing of patent pledges to the launch of online publications in France. The publication of application is an important date over the course of patents life cycles. It is the first time that the technological invention is displayed to the public. For the patent applicant, it is further important because if give a very probable outlook on the to-be-granted claims, i.e., the legal boundaries of a technological invention. This already reflects a crucial difference to the publication of the trademark registration. As such, patent applications are held secret until the publication of the application (see Section 4.3) and there is no public opposition prior to the publication of the application. It follows that the timing of patent pledges around the publication of the application should not be particularly affected by the start of the web-based services at INPI.

This institutional setting provides us with an alternative way to assess the impact of online disclosures in France.[24] For instance, observing a similar pattern in the change in the timing of patent pledges would question the mechanism behind our empirical strategy. In other words, if the underlying mechanism behind our main results truly emerged from the fact that trademark applications became more easily observable, then patent pledges should not occur closer to the publication date after the launch of web-based services. Patent-related publications were already launched online in January 2005. Hence, we analyze the response of the timing of patent pledges relative to patent publication and compare the pledge rates of patents filed before or after 2005.

Panel A of Figure 9 displays the density functions of pledge rates in a 10-year window around the patent publication date, analogue to Panel A of Figure 7. Unlike for trademarks, the density functions for both patents filed before and after 2005 are very similar. Panel B of Figure 9 measures the changes in timing right after publication in more detail. The graph plots the Kaplan-Meier estimates for the probability of patents to be pledged in a three-years time window around the patent publication. The graph shows that the two hazard rates for patents filed before and those filed after 2005 for a very similar path. The difference in the hazard rates is statistically insignificant for the entire time window. Taken together, this suggests that patent pledges do not occur closer to the publication

[23]The difference in pre- and post 2006 probabilities for firms without ties to top tier law firms is only weakly significant. Yet, we can confirm these results in (undisplayed) regressions.

[24]Trademarks and patents cover very different items and are two fairly different legal concepts, despite being generically referred to as IP rights, which impedes a one-to-one comparison. We thus consider the differential responses to the launch of trademark- and patent-related publication information as an additional proof of concept.

date after the launch of web-based services.

- Insert Figure 9 here -

7 Conclusion

In this study, we disclose new insights into the use of IP rights as collateral in loan contracts. We assess new data from official sources on trademark, patent, and design pledges in France between 1995 and 2018. This unique dataset allows us to first present a number of key facts on IP collateralization that were previously not known. We find 84% of IP-backed loans in France between 1995 and 2018 involve trademarks. Further, the majority of firms that use IP collateral are SMEs (77%). These facts are important, because previous literature on IP-backed loans has primarily investigated patent pledges by specialized borrowers, such as large public corporations or high-tech start-ups. Importantly, we also show that these IP pledges significantly increase firms' debt capacities. Relative to firms with comparable observable features, IP pledging firms increase their use of debt by on average 31%, in relative terms. Additionally, we provide evidence that these pledges can be associated with increased asset growth, investment, and employment.

As another major contribution, we use the data to study IP publications as one key determinant affecting the pledgeability of trademarks and patents. Publications present the first authorized specification of the conferred legal rights associated with IP. Hence, publications mitigate one central issue of IP collateralization, i.e., incomplete information on their legal boundaries. We use daily IP-level information on more than 20,000 first-time IP pledges to show that the publication date increases the hazard rate of trademark and patents to be used as loan collateral. In other words, the publication date enhances the probability of IP right collateralization comparing pre- and post publication rates.

To estimate the causal effect of publications on the timing of IP pledges, we study the introduction of online repositories at the French IP office in 2006 as an plausibly exogenous shock to the relevance of IP publications for trademarks. We use a difference-in-difference strategy that compares the differential effect for trademarks that were filed before or after 2006 and held by firms in more competitive environments compared to those in less competitive environments both before and after 2006. Estimates suggest a disproportional increase of pledges within the first year after publication for trademarks in competitive environments after the introduction of online publications. This confirms that online disclosure of trademark-related information increased the relevance of trademark publications for their use as loan collateral. Furthermore, these results are stronger for firms whose competitors are located in regions with ex ante higher penetration of broadband internet access. Again, we find that online publications are especially

important for small private firms. This is important, because these firms are typically considered to have a relatively strong reliance on debt financing.

Overall, we provide novel evidence on the ability of formal IP rights to enhance access to finance by mitigating information costs. As such, incomplete information are likely to be considered a major deterrent for utilizing IP for financial transactions. In this context, our findings suggest that strengthened IP rights, i.e., through more thorough examination, may mitigate problems related to incomplete information of IP and thus enhances the relevance of IP as loan collateral.

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Tables from the main part

Table 1: Descriptives on TM and patent characteritics

	Pledged IP			Non-Pledged IP			
	Obs.	Mean	Median	Obs.	Mean	Median	Differences in means
All TMs:							
NICE classes	13,848	2.954	2	2,304,894	2.837	3	0.117***
Transfers	13,848	1.011	1	2,304,894	0.194	0	0.818***
Licenses	13,848	0.178	0	2,304,894	0.028	0	0.150***
Renewals (pre 2010)	12,895	1.279	1	1,619,748	.426	0	0.853***
Renewed TMs (pre 2010):							
NICE classes	9,537	2.944	2	481,106	2.630	2	0.314***
Transfers	9,537	1.236	1	481,106	0.584	0	0.651***
Licenses	9,537	0.235	0	481,106	0.082	0	0.154***
Renewals	9,537	1.730	2	481,106	1.434	1	0.295***

Notes: The table compares characteristics of French trademarks distinguishing between pledged and non-pledged trademarks. The upper part of the table ('All TMs') covers the universe of registered trademarks active in France between 1995 and 2018. The lower parts contains trademarks that are renewed at least once. NICE classes refers to the total number of different NICE (technology) categories included in the registration. The variables transfers, licenses, and renewals are quality/value indicators of trademarks, resembling a count measure of the changes in ownership, licensing agreements, and renewals (pre 2010) of sample trademarks total life span. The last column contains the differences in mean values of pledged and non-pledged trademarks of the respective variables. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 2: Firm-level descriptive statistics: IP pledging firms in France

	IP pledging firms				
	All	TM	Patents	IP holding French firms	Differences in means
	(I)	(II)	(III)	(IV)	(II vs. III)
SME (% of total)	76.8	75.9	84.3	96.5	-8.5** (2.033)
Listed (% of total)	5.2	4.7	10.1	0.5	-5.4*** (2.504)
Age	22.1	22.6	16.0	15.5	6.6*** (4.729)
Employees (count)	280.8	282.6	257.5	54.1	25.2 (0.621)
Debt-ratio	0.373	0.373	0.382	0.325	0.009 (0.493)
Tangibility	0.121	0.120	0.136	0.114	-0.016 (1.248)
Current-ratio	1.500	1.496	1.549	1.785	-0.052 (0.526)
Profitability (RoA)	0.068	0.073	0.004	0.089	0.068*** (5.946)
Cash flow-ratio	0.051	0.055	0.018	0.081	0.036*** (3.350)

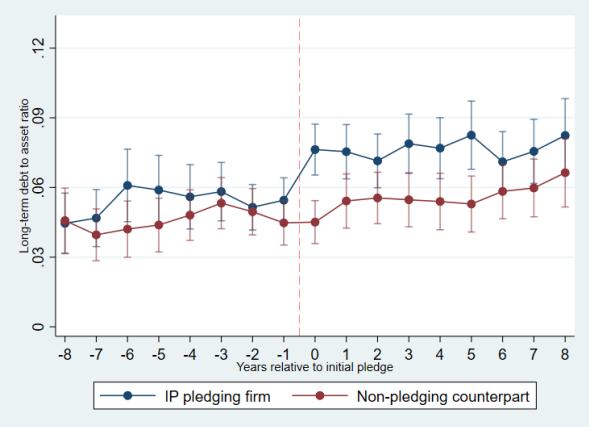
Notes: The table displays firm-level statistics of IP pledging French firms for the years 1995 until 2018, including general information on the firm (firm size, listed, age, employees) and financial variables (debt-ratio, tangibility, current-ratio, RoA, cash flow-ratio). The table differentiates between IP-pledging firms (Column I), firms pledging trademarks (Column II), firms pledging patents (Column III), and all IP holding firms headquartered in France (Column IV) that are contained in the ORBIS data base. The last column displays the differences in mean values between trademark- and patent-pledging firms (t-values are displayed in parentheses below the means). *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 3: Descriptive statistics on the matched sample

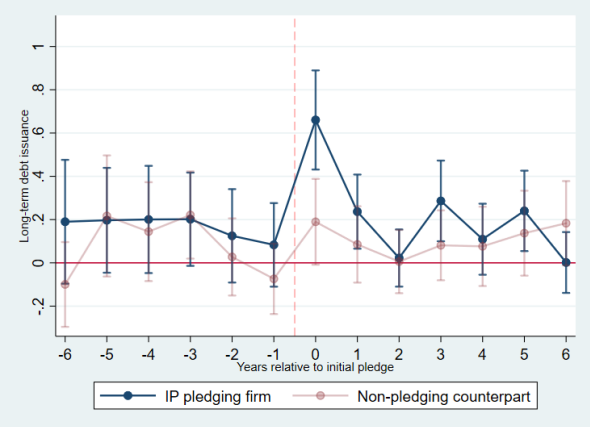
Panel A: Observable firm characteristics for the matched sample

	Mean			
	IP pledging firm	Matched counterparty	Differences in means	*t-values*
Firm size (log. assets)	16.476	16.359	0.118	(0.816)
Age	20.913	21.800	-0.887	(-0.784)
Debt-ratio	0.656	0.645	0.011	(0.449)
Tangibility	0.103	0.117	-0.014	(-1.386)
Profitability (RoA)	0.031	0.029	0.002	(0.151)
Current-ratio	1.938	2.061	-0.201	(-0.667)
Cash flow-ratio	0.050	0.057	-0.007	(-0.606)

Panel B: IP pledges and debt-ratios



Panel C: IP pledges and debt issuance



Notes: In Panel A, the table compares mean values of French firms distinguishing between IP pledging firms and their matched non-pledging counterparts as specified in Section 3.3. Firm-level variables include the firm-level information analogue to Table 2. Differences in mean values and the corresponding t-values are displayed in parentheses in the last two columns. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively. Panel B displays the average long-term debt to asset ratios of both firms with IP pledges and their matched counterparts. Panel C displays the rate of new long-term debt issuance. We calculate these annual growth rates in long-term debt as: $(ltdb_t - ltdb_{t\text{-}1})/ltdb_{t\text{-}1}$, with $ltdb_t$ defined as long-term debt outstanding at the end of year t. In both panels, year denotes the firm-pair specific year, relative to the first IP collateral event of the IP pledging firms. Whiskers span the 95 percent confidence intervals.

Table 4: Fixed effect-regressions explaining firms' use of debt

Dep. variable	Long-term debt-ratio			
	I	II	III	IV
IP × Post	0.018***	0.018***		
	(0.006)	(0.005)		
Post	-0.007			
	(0.004)			
IP	0.008			
	(0.005)			
IP × $Pre^{t<-1}$			-0.004	-0.002
			(0.005)	(0.006)
IP × $Post^{t[0,1]}$			0.015**	0.019**
			(0.007)	(0.007)
IP × $Post^{t>1}$			0.017**	0.018**
			(0.008)	(0.008)
Constant	-0.006	0.020	0.018	0.052
	(0.028)	(0.068)	(0.068)	(0.068)
Sample:	full	full	full	excluding crises
Additional controls:				
Firm-level	yes	yes	yes	yes
Industry FE	yes	no	no	no
Firm FE	no	yes	yes	yes
Year FE	no	yes	yes	yes
N	12,220	12,220	12,220	10,398

Notes: The table displays estimates from fixed effect-regressions explaining firms' use of debt. The dependent variable is firms' long-term debt to asset ratio. Post is a firm-pair-specific pledge indicator, which equals one for all years after the pledging firm within the matched couple pledges an IP right. IP is a dummy variable differentiating between IP pledging firms and their matched counterparts. The first three columns show regression estimates from Equation (1), (2), and (3), respectively. All specifications are defined in Section 3.3. Column IV repeats the specification from Equation (3) but excludes years in which the Global Financial Crisis hit France (2008 and 2009). Firm-level controls (omitted in the interest of space) are common capital structure determinants, i.e., total assets, the share of tangible assets among total assets, profitability (return on assets), the current-ratio, and cash-flow ratios. Additionally, we include different sets of fixed effects as indicated in the bottom of the table. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 5: Differential effects across firm-types of IP pledges on the use of debt

Dep. variable	Long-term debt-ratio					
Subsample:	High innovation intensity		Small and private firms		Limited access to finance	
Measure:	IP-ratio (>Q50)	Tech./scientific sectors	SME	Private firms	RZ-score (>Q50)	Log (tangibles) (<Q50)
	I	II	III	IV	V	VI
IP × Post	0.022***	0.020***	0.016**	0.018***	0.017**	0.022***
	(0.008)	(0.007)	(0.006)	(0.005)	(0.008)	(0.007)
Subsample:	Low innovation intensity		Large and public firms		Good access to finance	
Measure:	IP-ratio (<Q50)	Non-tech./ sci. sectors	Non-SMEs	Public firms	RZ-score (<Q50)	Log (tangibles) (>Q50)
	I	II	III	IV	V	VI
IP × Post	0.014*	0.017**	0.017	0.028	0.007	0.014*
	(0.007)	(0.007)	(0.011)	(0.008)	(0.009)	(0.008)
Additional controls (in both panels):						
Firm-level	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
N (top panel):	6,085	6,672	8,176	11,650	4,956	7,037
N (lower panel):	6,135	5,548	3,428	570	4,099	5,183

Notes: The table displays estimates from fixed effect-regressions explaining firms' use of debt. The specifications estimate Equation (2) but are run separately on split samples, distinguishing different types of firms. The table only displays coefficients for the interaction term, IP × Post, as defined in Equation (2). Columns I-II distinguish firms regarding their innovation intensity; IP-ratio is calculated by the share of IP over firms' total of intangible assets (Column I); technology and science sectors are firms from NACE classes C and M (Column II). Columns III and IV distinguish firms by size and legal status; we classify firms based on their status as SME (Column III) and whether they are publicly listed (Column IV). Columns V and VI distinguish among firms access to finance. We use two measures to approximate this: the RZ-score as proposed by Rajan and Zingales (1998) (Column V) and firms tangible asset holdings, measured by the logarithm of total tangible fixed assets (Column VI). All values are defined by the respective firm-specific values in the last year prior to the first IP collateral event. The top (bottom) panel displays results for firms with high (low) innovation intensity, small and private (large and public) firms, and firms with (without) limited access to finance. All regressions include controls equivalent to those used in Table 4 and specified in Equation (2). Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 6: Trademark and owner characteristics in high vs. low competition environments

	Ex ante competition		Differences	
	High	Low	in means	(t-values)
Trademark characteristics:				
Renewals	0.557	0.561	-0.004	(0.165)
Licensed (prev.)	0.018	0.032	-0.014	(1.387)
Transfer (prev.)	0.225	0.197	0.027	(1.283)
Time lag: appl.-publication (days)	38.948	37.714	1.234	(1.035)
Time lag: appl.-registration (days)	173.698	176.821	-3.123	(0.730)
Firm-level characteristics:				
Age	21.866	21.123	0.743	(0.422)
Firm size (log. assets)	16.678	17.086	-0.407*	(1.806)
Firm size (SME cat. 'small')	0.437	0.365	0.072	(1.446)
Firm type (private)	0.648	0.574	0.074	(1.534)
Relationship bank	0.496	0.427	0.069	(1.037)
Firm location (Eastern FR)	0.775	0.785	-0.010	(0.252)
Firm location (major cities)	0.482	0.522	-0.040	(0.829)
Debt-ratio	0.121	0.144	-0.024	(1.223)
Profitability (RoA)	0.045	0.027	0.018	(0.810)
Profitability (RoCE)	0.115	0.145	-0.030	(0.441)
Turnover-ratio	1.128	1.139	-0.011	(0.125)
Current-ratio	1.754	1.637	0.116	(0.494)
Cash flow-ratio	0.121	0.144	0.024	(1.223)

Notes: The table compares mean values of trademark and owners' firm-level characteristics in high and low competitive environments, respectively, as defined in Section 5.3. Trademark characteristics are the number of renewals, previous licenses, previous transfers, and the time lag between the application date and the dates of both the publication of application and the publication of registration. Firm-level characteristics include general information on the trademark owners (firm age, size, legal type, bank relationship, location) and financial variables (debt-ratio, RoA, RoCE, turnover-ratio, current-ratio, cash flow-ratio). Differences in mean values and the corresponding t-values are displayed in parentheses in the last two columns. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 7: Baseline estimates: DID estimation on the timing of trademark pledges

Dependent variables:	I(Pledge within τ)				
	(1)	(2)	(3)	(4)	(5)
Post × CE^{high}		0.344**	0.427***	0.390**	0.002
		(0.158)	(0.165)	(0.196)	(0.146)
CE^{high}		-0.146	-0.210*	-0.223	-0.011
		(0.108)	(0.114)	(0.136)	(0.099)
Post	0.145**	-0.111	0.234	0.280	0.135
	(0.062)	(0.112)	(0.194)	(0.239)	(0.165)
τ months:	12	12	12	6	24
Firm-specific controls	No	No	Yes	Yes	Yes
TM-specific controls	No	No	Yes	Yes	Yes
Application-year FE	No	No	Yes	Yes	Yes
N	2,635	1,640	1,640	1,640	1,640

Notes: The table reports probit estimates for trademark pledges after the publication of registration. The dependent variable is equal to one for if a trademark is pledges within τ months after publication, with τ specified in the bottom of the table. $Post_j$ is an indicator variable that captures if the trademark is initially filed after the launch of online publications in 2006. CE_i^{high} is a dummy variable that indicates whether the trademark owner operates in a competitive environment, as defined in Section 5.3. Column I shows the probability of a trademark pledge within the first 12 months after publication post 2006. Column II displays estimates on the simultaneous and interaction effects of the *Post*- and CE^{high}-indicators. Column III estimates the regression specification as defined in Equation (4). Columns IV and V display regressions estimating Equation (4) that define τ as 6 and 24 months, respectively. Control variables include trademark- and firm specific variables as defined in Table IA4 (Appendix A). Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table 8: Heterogeneous treatment effects: Ex ante opacity of the trademark owners

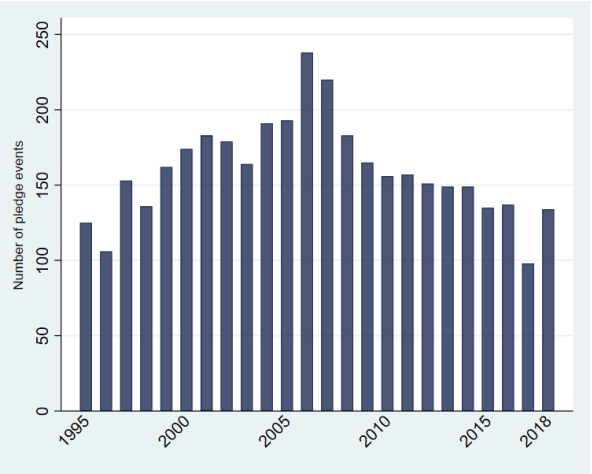
Dependent variables:	I(Pledge within τ)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post × CE^{high}	0.525**	0.452*	0.556*	1.448***	0.405	0.058	0.132	-0.112
	(0.231)	(0.273)	(0.312)	(0.487)	(0.265)	(0.342)	(0.371)	(0.540)
CE^{high}	-0.285	-0.193	-0.326	-0.103	-0.151	-0.332	-0.548**	0.025
	(0.174)	(0.206)	(0.206)	(0.264)	(0.175)	(0.208)	(0.254)	(0.308)
Post	0.599**	0.677*	-0.257	-0.740	-0.095	-0.354	0.327	0.494
	(0.285)	(0.352)	(0.374)	(0.574)	(0.296)	(0.388)	(0.414)	(0.551)
Subsample:	Private firms		< 250 employees		Public firms		> 250 employees	
τ months:	12	6	12	6	12	6	12	6
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TM-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Application-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	486	446	512	466	643	602	617	577

Notes: The table reports probit estimates for trademark pledges after the publication of registration. We reestimates specifications from Column III and IV of Table 7 for different subsamples of firms. All estimations are defined accordingly. Subsamples are private limited companies (Columns I and II), firms with less than 250 employees (Columns III and IV), public limited companies (Columns V and VI), and firms with at least 250 employees (Columns VII and VIII). These categories are determined for values measured in 2005, i.e., the final pre-treatment year. All regressions include firm-level controls as indicated in the bottom of the table and defined in Table IA4 (Appendix A). Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

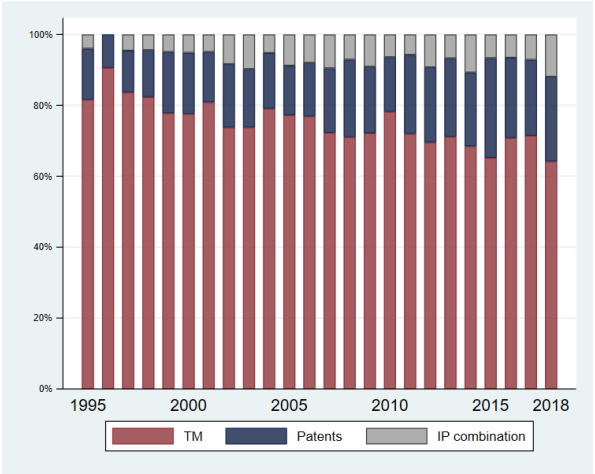
Figures from the main part

Figure 1: IP-level descriptives of French firms, 2005-2018

Panel A: IP-pledge events



Panel B: Composition of IP-pledges



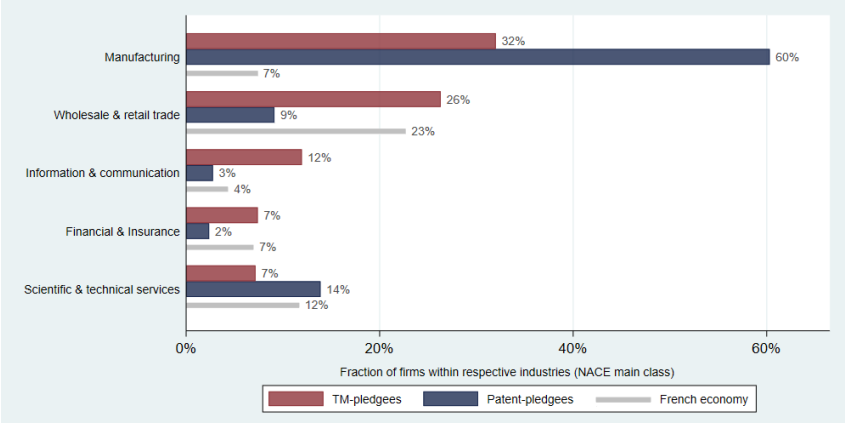
Panel C: IP pledging firms and collateralized IP rights by types

		Pledge-events by included IP rights			
	Number of entities	All events	Trademarks	Patents	Designs
All entities	2,451	3,838	3,132	955	53
Foreign firms	406	527	273	287	15
French individuals	168	110	77	110	0
Missing SIREN	60	67	43	24	0
French firms	1,817	2,876	2,558	534	38

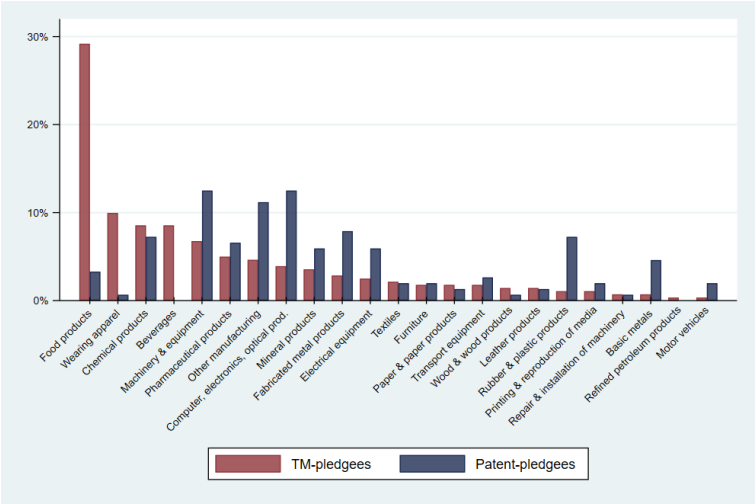
Notes: Panel A displays the absolute numbers of IP pledging events for the years 1995 until 2018 in France using our main sample. Panel B illustrates the composition of IP pledges by IP-types using the same sample. We observe three main IP types that are used as loan collateral: trademarks, patents, and designs. Since designs are only pledged in combination, the graph considers three categories: i) trademark only collateral, ii) patent only collateral, and iii) a combination of at least two of the three IP collateral types. Panel C provides an overview on the different entities that pledge IP rights in France between 1995 and 2018 and lists the corresponding numbers of IP pledge events, distinguishing among trademarks, patents, and designs. The full sample (denoted as 'All entities') covers foreign firms, French individuals, French firms without an unambiguous SIREN identifier and French firms with a unique SIREN identifier. 'French firms' refer to observations in our main sample.

Figure 2: Sectoral & geographic distribution of IP pledging firms in France (1995-2018)

Panel A: Trademark and patent pledging firms across main NACE classes

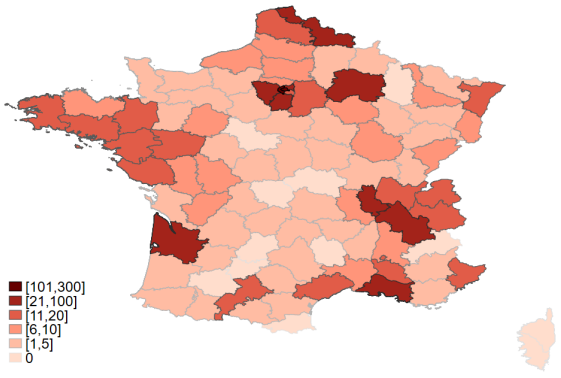


Panel B: Trademark and patent pledging firms in manufacturing (NACE class C)

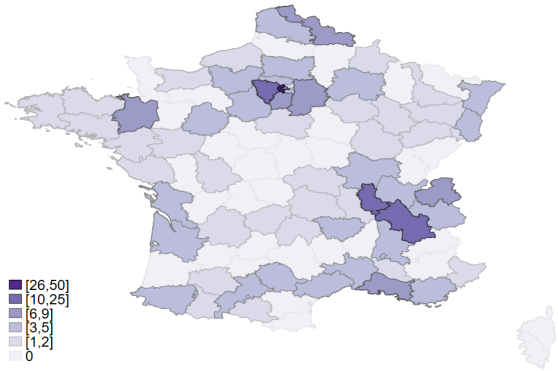


Panel C: Locations of IP owners that pledge IP rights

Trademarks:



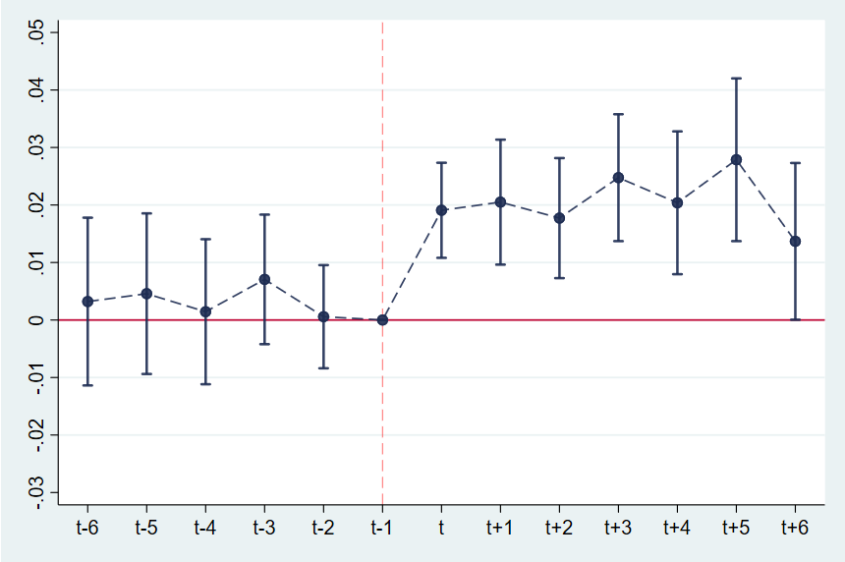
Patents:



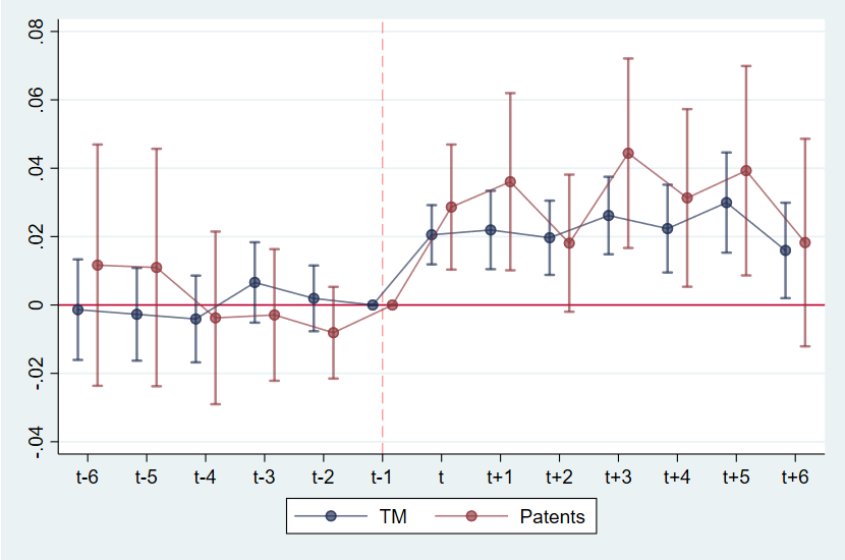
Notes: Panel A shows the fractions of trademark and patent pledging firms according to their industry affiliation (NACE main categories). French economy refers to the fraction of all French firms belonging to respective industry classes. Panel B breaks down the share of trademark and patent pledging firms within the manufacturing sector, i.e., NACE class C. Panel C illustrates the geographical distribution of IP pledging entities, distinguishing trademark and patent pledging firms headquartered in France.

Figure 3: Event-study type analysis on the use of debt

Panel A: Average effects using any kind of IP collateral



Panel B: Average effect using trademark or patent collateral



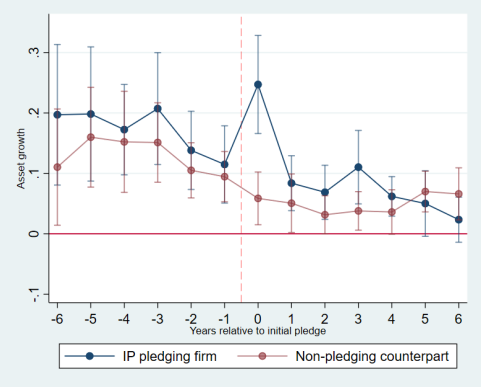
The regression specifications in both panels:

$$Y_{it} = \alpha_t + \gamma_i + \phi X_{it} + \sum_{S=-6}^{-2} \beta_1^S (IP_i \times Pre_{it}^S) + \sum_{S=0}^{6} \beta_2^S (IP_i \times Post_{it}^S) + u_{it}$$

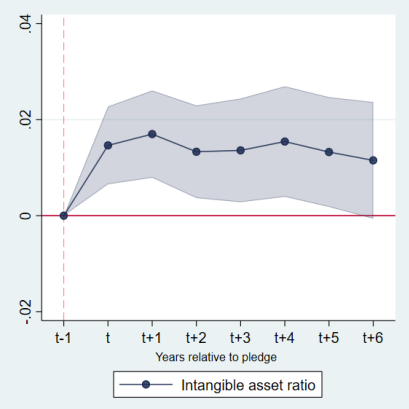
Notes: The figures plot the coefficients β_1^S and β_2^S from the above-displayed regression specification. The dependent variable is the long-term debt to asset ratio. Panel A reports estimates on the full firm-level sample. Panel B displays coefficients for trademark- and patent-pledging entities separately. In both panels, Pre_{it}^S and $Post_{it}^S$ are indicator variables equal to one for the firm-specific years 2-6 before (Pre) and 0-6 after (Post) the initial IP collateral event: t refers to the firm-pair-specific years, relative to the first pledge of the IP pledging firm. The year prior to the pledge is used as a reference year. All remaining variables are equivalent as those specified in Equation (3). Whiskers span the 95 percent confidence intervals.

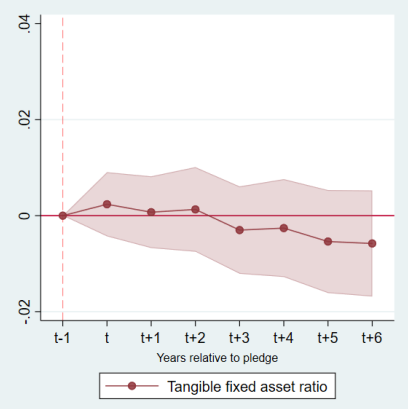
Figure 4: Estimations on real economic implications associated with IP pledges

Panel A: Asset growth rates relative to the pledge event



Panel B: Estimating the use of intangible and tangible assets after the IP pledge





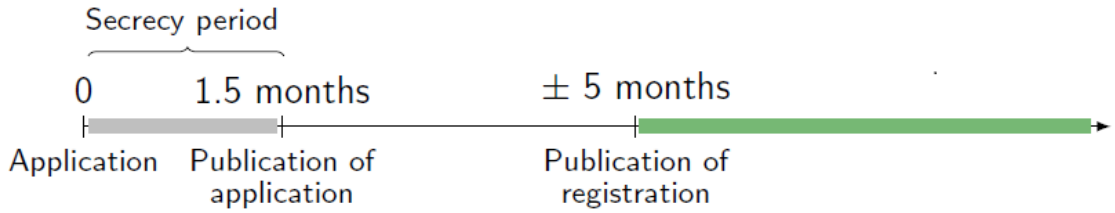
Panel C: Estimates relating IP pledge to firm growth, sales, and employment

Dep. variable	Log (assets)		Log (sales)		Log (employees)	
	I	II	III	IV	V	VI
IP × Post	0.221***	0.189***	0.325***	0.281***	0.104**	0.078*
	(0.042)	(0.034)	(0.005)	(0.005)	(0.049)	(0.041)
Post	0.279***		0.405***		0.056*	
	(0.027)		(0.077)		(0.031)	
IP	0.043		-0.198		0.060	
	(0.112)		(0.157)		(0.099)	
Additional controls:						
Firm-level	yes	yes	yes	yes	yes	yes
Industry FE	yes	no	yes	no	yes	no
Firm FE	no	yes	no	yes	no	yes
Year FE	no	yes	no	yes	no	yes
Obs.:	12,214	12,214	12,220	12,220	8,784	8,784

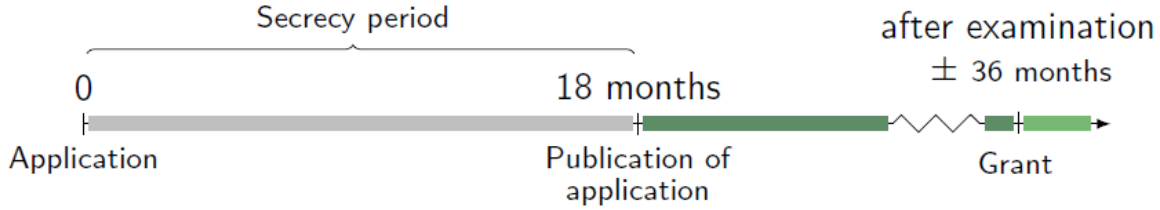
Notes: These figures illustrate potential real economic effects associated with IP pledges. Panel A plots average values of firm-level asset growth defined as: $(toas_{it} - toas_{it-1})/toas_{it-1}$, with $toas$ as the total assets held by firm i at time t. The graph is analogously defined as Panel C of Table 3. Panel B shows coefficients of estimation that explain the use of intangible and tangible assets ratios subsequent to the initial IP pledge of a firm and relative to a non-pledging counterpart. We estimate Equation (3) using firms ratio of tangible and intangible assets to total assets as dependent variables and a set of year-indicators as main regressors. Estimates use a window of the six years after the initial pledge (t), where $t-1$ is the reference year. The shaded areas reflect the 95 percent confidence intervals. Panel C displays estimates of Equations (1) and (2) using a set of different proxies for firm-level activities as depend variable. The dependent variables are total assets (Columns I and II), total sales (Columns III-IV), and the number of employees (Columns V-VI) measured using the natural logarithm. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Figure 5: Trademark and patent application processes in France

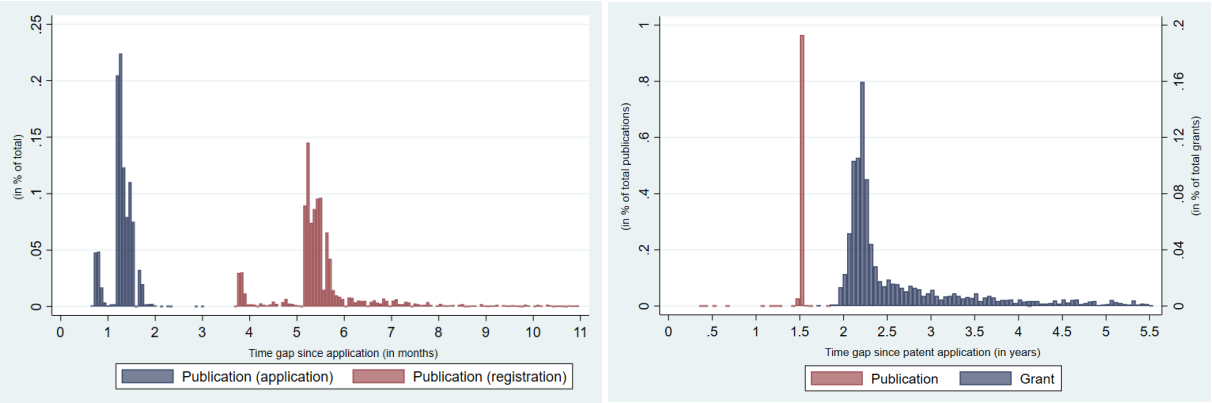
Panel A: Trademarks



Panel B: Patents



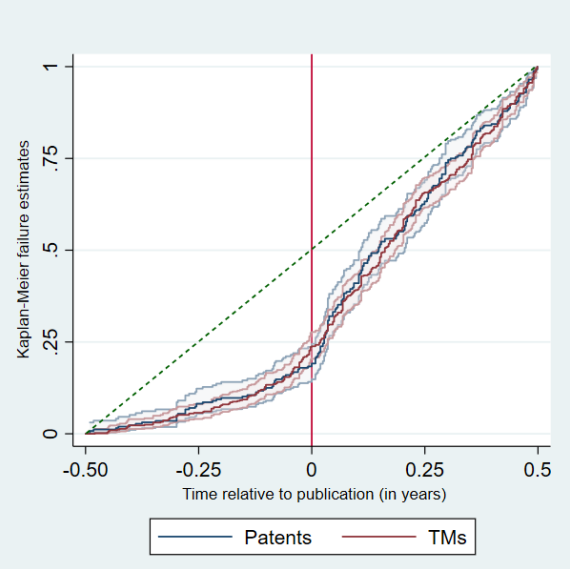
Panel C: The timing of IP applications and publications in France (1995-2018)



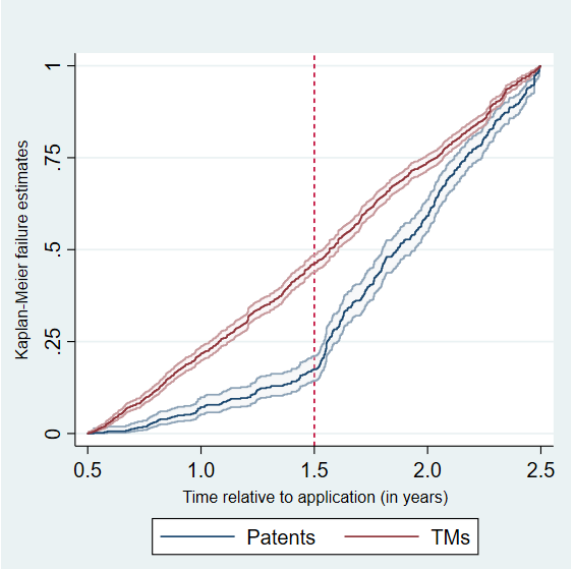
Notes: These figures present information on the trademark and patent application processes in France. Panels A and B display the procedural steps of the trademark and patent application proecess that are most central for our analysis on a time line. They include the number of months between the initial application and respective steps. For values that are not specifically determined by law, the values are denoted by +/-. Panel C presents the distributions of the time gaps between trademark applications (left graph) or patent applications (right graph) and specific publication dates in over the lifespan of IP rights. For trademarks, the time gap is measured in months. For patents the gap is measured in years. In red, we display the publications types that we consider for the estimations in our empirical analyses, i.e., the publication of trademark registration and the publication of patent application (indexed on the left y-axis). The blue bars mark the distribution of time gaps between the application and publication of trademark application (left graph) or the application and the patent grant (right graph and indexed on the right y-axis). All distributions are displayed as a fraction of the total number of IP rights in our IP-level sample.

Figure 6: Hazard rates on the probability of pledges relative to publication dates

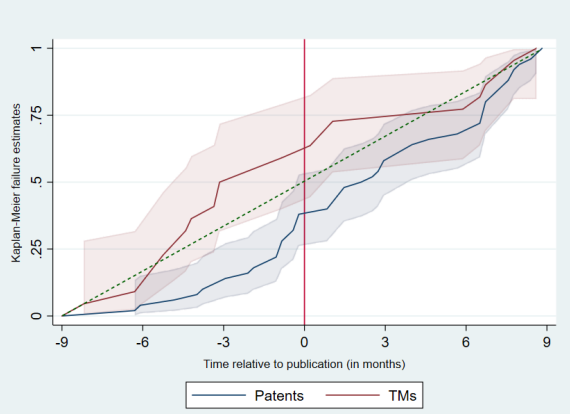
Panel A: (+/-) 0.5 years to publication



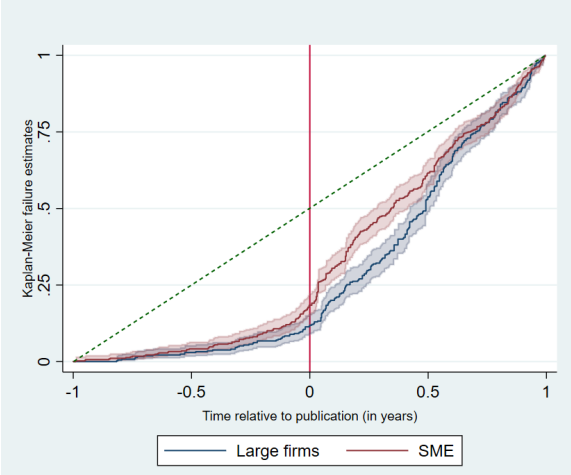
Panel B: 0.5-2.5 years to application



Panel C: Placebo analysis: Alcatel pledges



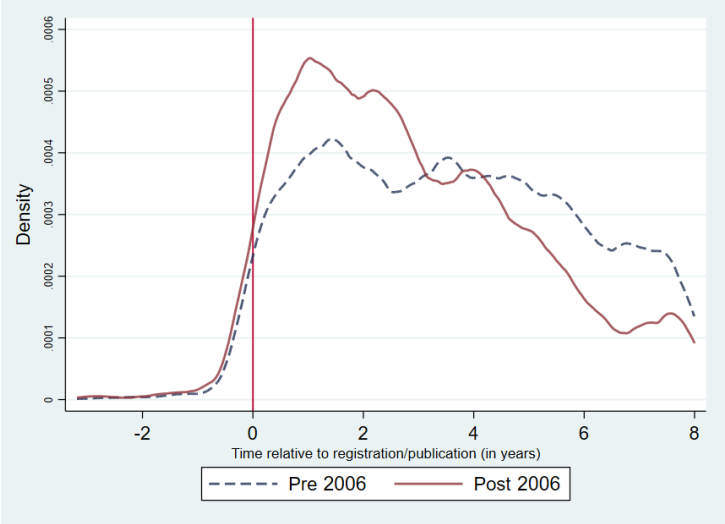
Panel D: SME versus large firms



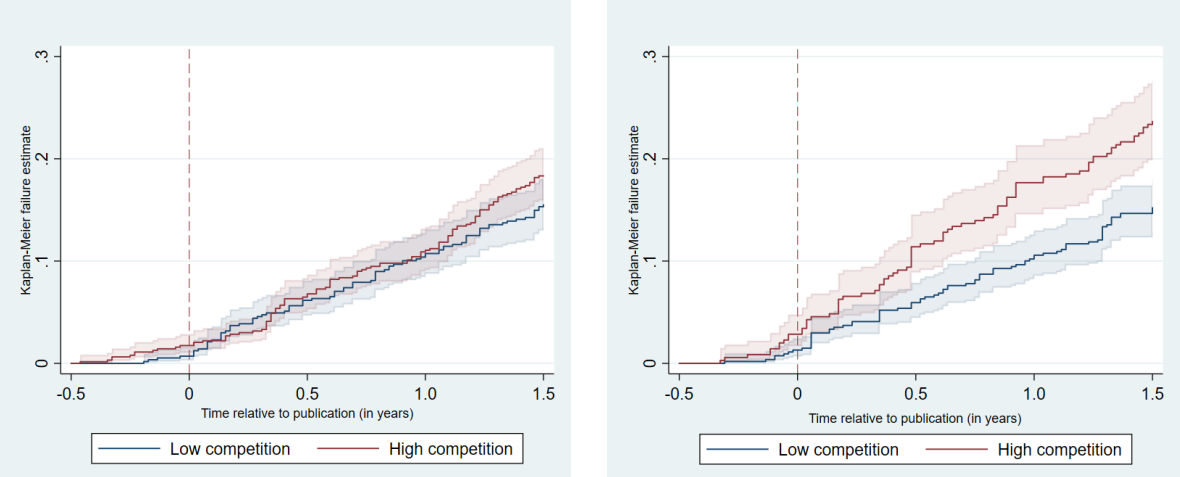
Notes: These figure show the Kaplan-Meier failure estimates (hazard rates) illustrating the probability of IP pledges over the life cycle of IP rights for different time windows, conditional on IP rights being pledged within these periods. Panel A displays the hazard rates for patents and trademarks over a symmetric one-year time window around the publication of application (patents) and the publication of registration (trademarks). Panel B displays hazard rates for patents and trademarks using the time window of 0.5-2.5 years after their initial application. Panel C repeats Panel A but uses out-of-sample data for patents and trademarks that were pledged by Alcatel Lucent during 2013 and 2014. Panel D displays hazard rates using a two year symmetric time window around the publication of patents and trademarks (combined) and differentiates among large firms and SMEs. SMEs are defined as firms with less than 250 employees and a maximum balance sheet total of 43 million Euros in year prior the respective pledges. Accordingly, large firms are all firms not classified as SME. In Panels A, C, and D, the green dashed lines illustrate the timing of IP pledges if they were evenly distributed across time. The shaded areas reflect the 95 percent confidence intervals.

Figure 7: Descriptives on cross-sectional and cross-time variation

Panel A: Distribution of pledges relative to the trademark publication date



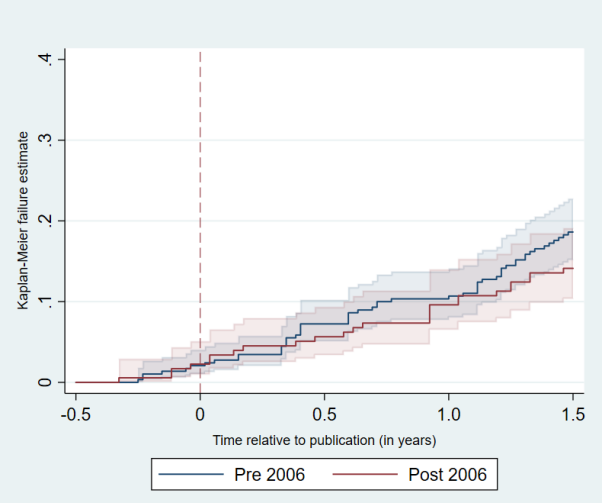
Panel B: The probability of trademark pledges: high vs. low competition environments.



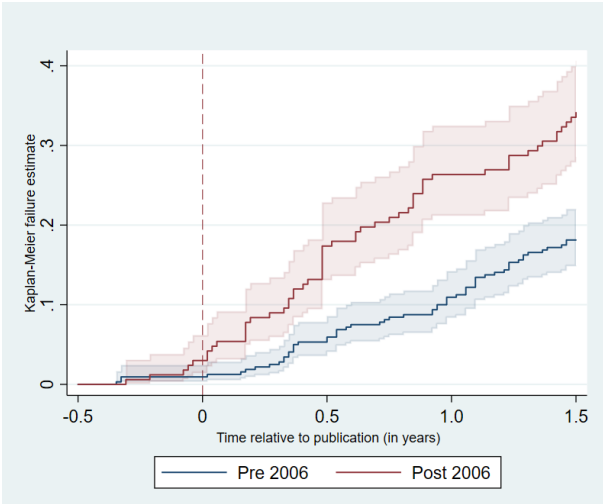
Notes: Panel A plots the kernel density estimates of IP pledge delays calculated as the difference between the date of trademark registration and the date of pledge (in full years). The graph differentiates between the years before and after 2006, i.e. the launch of web-based services at INPI. Panel B shows Kaplan-Meier failure estimates for low competition (blue) and high competiotn (red) firms relative to the moment of IP publication, separately for the years before and after 2006. The competitive environment is defined in Section 5.3. The shaded areas reflect the 95 percent confidence intervals.

Figure 8: Heterogeneous treatment effects: High versus low internet penetration

Panel A: Low internet penetration



Panel B: High internet penetration



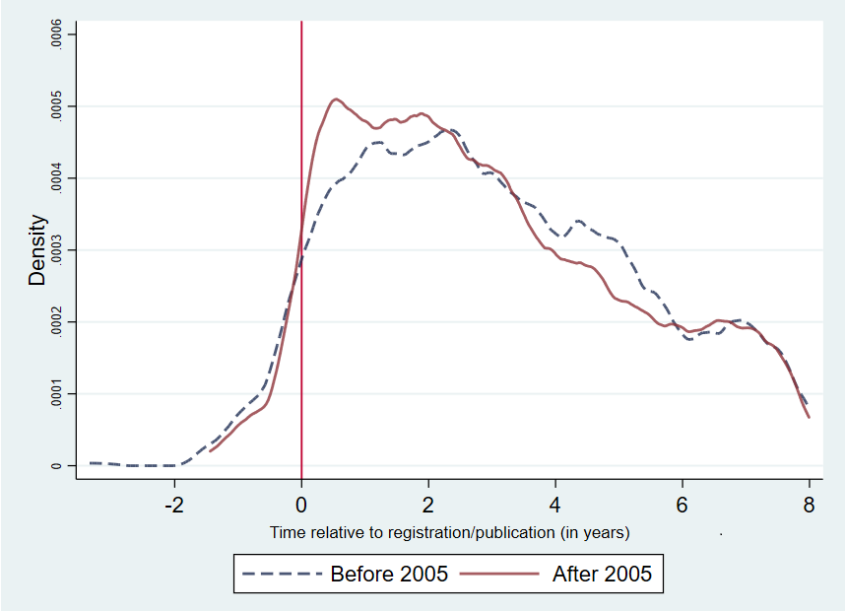
Panel C: Probit estimates: The timing of IP pledges and internet penetration

Dependent variables:	I(Pledge within12 months)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × CE^{high} × $Internet_{comp.}^{good}$	0.734***	0.676***	0.384*	0.713***	0.675***	0.482**
	(0.180)	(0.180)	(0.200)	(0.173)	(0.174)	(0.191)
Post × CE^{high}	-0.082	-0.111	-0.184	0.030	-0.028	0.189
	(0.196)	(0.193)	(0.210)	(0.180)	(0.177)	(0.192)
CE^{high}	-0.142	-0.095	-0.204*	-0.142	-0.096	-0.202*
	(0.263)	(0.114)	(0.135)	(0.107)	(0.109)	(0.112)
Post	-0.107	0.378*	0.248	-0.107	0.361*	0.225
	(0.112)	(0.197)	(0.196)	(0.112)	(0.198)	(0.197)
Weighted share	No	No	No	Yes	Yes	Yes
Additional controls:						
Application-year FE	No	Yes	Yes	No	Yes	Yes
TM-specific controls	No	Yes	Yes	No	Yes	Yes
Firm-specific controls	No	No	Yes	No	No	Yes
N	1,640	1,640	1,640	1,640	1,640	1,640

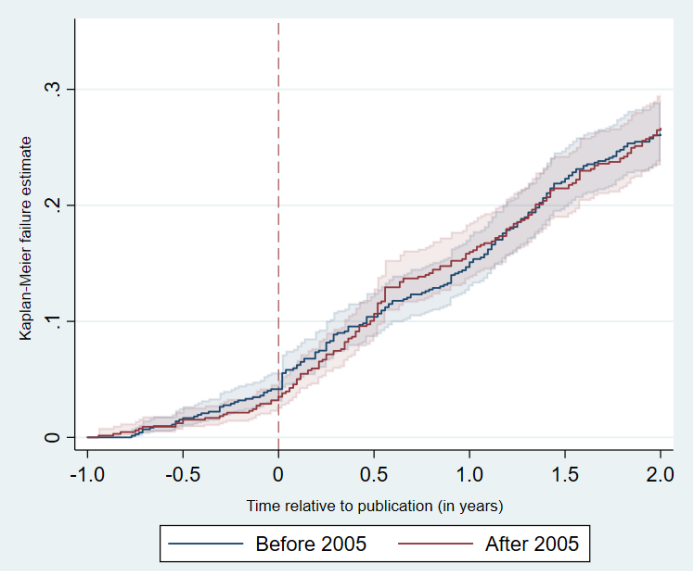
Notes: The graphs illustrate heterogeneous treatment effects for firms in high and low competitive environments with respect to their competitors' access to internet at the time of the launch of online services at INPI in 2006. Internet penetration is defined in Section 6.3.1. Panel A shows Kaplan-Meier failure estimates (hazard rates) of IP pledges for firms with competitors that are located in an area with low internet penetration comparing the timing before and after 2006. Analogously, Panel B the same statistics but for firms with competitors that are located in areas with high internet penetration. The shaded areas reflect the 95 percent confidence intervals. Panel C displays regression results estimating the probability of trademark pledges within the first year after the publication of registration. Estimations are augment the baseline difference-in-difference specification from Equation (4) by introducing a triple interaction term $Post \times CE^{high} \times Internet_{comp.}^{high}$. Here $Internet_{comp.}^{high}$ is equal to one if the share of trademark pledging firm i's competitors that are located in areas with available internet access in 2006 is above the sample median. In Columns I-III we use the unweighted share of firms competitors, whereas in Columns IV-VI, we weight the share of competitors by competitors size, using total sales as an approximation for firm size. The specifications differ with regard to the control variables included, as indicated at the bottom of the table. Controls are equivalent to those in Table 7. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Figure 9: The timing of patent pledges before and after online publication disclosures

Panel A: Kernel density functions of patent pledges



Panel B: The probability of patent pledges around patent publication



Notes: The figures display changes in the timing of patent pledges before and after the launch of patent-related online services at INPI in 2005. Analogue to Panel A of Figure 7, Panel A displays the kernel density estimates of patent pledge delays calculated as the differences between patent publication and the date of the first pledge.

FOR ONLINE PUBLICATION

Internet Appendix A : Tables

Table IA1 : Definition of IP rights: Trademarks, patents, and designs

IP right	Trademark	Patent	Design
Subject matter	Disinct signs that distinguish companies (i.e., brands, words, drawings, and/or symbols)	Technical invention	Aesthetic creative forms and non-functional product features
Conferred rights	Exclusive right to use the trademark and prevent use for similar goods/services	Exclusive right to make, use, and sell the patented invention	Exclusive right to use the design
Requirement	Distinctiveness, use in commerce	Novelty, material, non-obviousness, industrial application	Similar to patents (lower threshold)
Protection length	10 years	1 year	1 year
Max. protection	indefinite	20 years	25 years
Maintenance/ activation costs	low	high	high
Benefits	Promotes quality and competition; information provider	Incentive to innovate; Knowledge protection and diffusion	Provides means for product differentiation

Notes: The table defines the three most common IP right types, i.e., trademarks, patents, and designs. For comparison, uniformly applicable definition criteria are displayed, such as the object which is subject to protection, the basic requirements that need to be fulfilled to obtain the right, the actual procedural steps needed for activation, the protection length without renewals after grant, the maximum protection length, and a qualitative assessment of the average costs to activate and maintain the IP right. These definitions comprise IP rights filed and registered in Europe, i.e., at the EPO, EUIPO, or national IP offices. Most features also apply in other main IP jurisdictions, such as the US, Japan, or Korea.

Table IA2: Logistic regression explaining the use of IP collateral by IP owners

Dependent variable:	I(IP pledging firm)			
	(1)	(2)	(3)	(4)
Size (log. assets)	0.497***	0.521***	0.444***	0.297***
	(0.014)	(0.014)	(0.026)	(0.072)
Age	-0.008	-0.003	-0.019	-0.001
	(0.009)	(0.009)	(0.017)	(0.034)
Debt ratio	0.035	0.005	-0.075	-0.175
	(0.097)	(0.110)	(0.182)	(0.181)
Profitability	0.171	0.426	-0.483	0.630
	(0.274)	(0.309)	(0.485)	(0.708)
Tangibility	-0.592**	-0.696**	-0.139	-0.749
	(0.229)	(0.247)	(0.405)	(0.743)
Current-ratio	-0.013	-0.009	-0.018	-0.084
	(0.008)	(0.008)	(0.014)	(0.055)
Cash flow	-1.257***	-1.352***	-1.567***	-0.843
	(0.255)	(0.269)	(0.527)	(0.789)
Sample:	Full	Full	Full	Pledging firms
Dep variable (pledgee type):	All	TM only	patents only	TM only
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	1,592,169	1,592,169	1,512,481	2,694
χ^2	2,494	2,449	1,047	144

Notes: The table displays logistic regressions explaining the probability of a firm to pledge IP. The dependent variable is an indicator equal to one for any year in which a French firm engages in an IP collateral event and zero otherwise. We include a set of firm-specific, time-varying variables to measure their effect on the probability of IP pledges. Specifically, we deploy general firm characteristics (size, age) and financial information (debt ratio, profitability, tangibility, current-ratio, cash flow) as independent variables. On top of this, all specifications control for industry- and year-fixed effects. In Column I, we use all French firms contained in the ORBIS data base that filed at least one trademark or patent at any time in the years before 2005. The dependent variable is equal to one for any type of IP pledge (i.e., irrespective of the collateralized IP type). Columns III use the same sample but only considers IP collateral events that include trademarks (Column II) or patents (Column III) for the classification of the dependent variable. Column IV uses the sample of IP pledging firms and deploys collateral events that involve trademarks as dependent variable. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table IA3: Fixed-effect regression explaining debt-ratios: small vs. large pledges

Dep. variable	Long-term debt-ratio			
Subsample:	Small pledges (<Q50)		Large pledges (>Q50)	
	I	II	III	IV
IP × Post	0.019**	0.021***	0.017*	0.016**
	(0.009)	(0.007)	(0.009)	(0.008)
Post	-0.010		-0.002	
	(0.006)		(0.006)	
IP	0.002		0.014**	
	(0.008)		(0.006)	
Mean dep. var.:	0.059		0.041	
Additional controls:				
Firm-level	yes	yes	yes	yes
Industry FE	yes	no	yes	no
Firm FE	no	yes	no	yes
Year FE	no	yes	no	yes
N	6,451	6,451	5,769	5,769

Notes: The table displays fixed-effect regressions explaining the effect of IP pledges on firms' debt-ratios for split samples. The dependent variable are long-term debt ratios. We reestimate specifications from Table 4 (Column I-II) for two subsamples. Columns I and II consider only firms with small IP pledges, whereas Columns III and IV consider firms with large IP pledges. Pledge size refers to the number of individual IP rights included in a single pledge event. Below median pledge size is considered a small pledge and above median pledge size is considered a large pledge. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table IA4: List of control variables

Control variables:	
Trademark-specific	
`event_pl_patent`	Dummy = 1, if TM is pledged in combination with patent(s)
`event_pl_des`	Dummy = 1, if TM is pledged in combination with design(s)
`delta_appl_grant`	Time lag between TM application and grant (in days)
`appl_year`	Application year fixed effects
Firm-specific	
`sme`	Dummy = 1, for firms that qualifies as SME
`private`	Dummy = 1, for firms with legal status '*private limited companies*'
`manuf`	Dummy = 1, for firms active in manufacturing sectors
`loc_iledefr`	Dummy = 1, for firms headquartered in Île-de-France
`log_assets`	Firm size, logarithm of total assets
`age`	Firm age at time of pledge
`lt_debt_ratio`	Debt-to-asset ratio; total long-term debt over total assets
`turn_ratio`	Total turnover to asset ratio
`current_ratio`	Liquidity riks; total current assets over current liabilities

Table IA5: IP collateralization before and after 2006

	Full sample (%)	Before 2006 (%)	After 2006 (%)	Differences in shares (before vs. after)
All firms (N = 2,723)				
Pledged pre publication	2.6	2.5	2.8	0.3 (0.400)
Within 6 months post publication	6.5	5.9	7.4	1.5 (1.558)
Within 12 months post publication	13.4	12.5	14.8	2.3* (2.504)
12-24 months post publication	15.6	16.0	15.0	-1.0 (0.671)
24-36 months post publication	13.8	13.8	13.9	0.1 (0.036)
Later than 36 months post publication	55.1	55.7	54.1	-1.6 (0.819)
High comp. environment (N = 877)				
Pledged pre publication	2.4	2.0	3.0	1.0 (0.921)
Within 6 months post publication	7.2	5.9	9.3	3.4* (1.909)
Within 12 months post publication	12.8	11.0	15.6	4.6** (1.977)
12-24 months post publication	15.3	17.3	12.3	-5.0** (1.980)
Low comp. environment (N = 890)				
Pledged pre publication	1.6	1.4	1.7	0.3 (0.921)
Within 6 months post publication	6.6	7.7	5.9	-2.0 (1.212)
Within 12 months post publication	12.0	13.7	10.5	-3.2 (1.468)
12-24 months post publication	11.1	11.3	10.9	0.4 (0.178)

Notes: This Table illustrates the timing of trademark pledges before and after 2006 for the full sample, firms in relatively competitive environments, and firms in relatively less competitive environments. Values are percentage shares of all pledges. The sample is all trademark pledges between 2001 and 2010 in by French firms in our sample. The last column displays the differences in average shares comparing pledges before and after 2006. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table IA6: Robustness tests on the main DID estimations

Panel A: Alternative definition of the CE^{high} (top quartile)

Dependent variables:	I(Pledge within τ)				
	(1)	(2)	(3)	(4)	(5)
Post × CE^{high}		0.399**	0.447***	0.405**	0.040
		(0.160)	(0.163)	(0.194)	(0.145)
CE^{high}		-0.001	-0.049	-0.130	0.188*
		(0.108)	(0.117)	(0.141)	(0.102)
Post	0.145**	-0.098	0.317*	0.336	0.197
	(0.062)	(0.105)	(0.188)	(0.229)	(0.159)
τ months:	12	12	12	6	24
Additional controls:					
Firm-specific controls	No	No	Yes	Yes	Yes
TM-specific controls	No	No	Yes	Yes	Yes
Application-year FE	No	No	Yes	Yes	Yes
N	2,635	1,640	1,640	1,640	1,640

Panel B: Alternative definition of τ

Dependent variables:	I(IP pledge within τ months post publication)						
Time post publication:	4 month	6 months	8 months	12 months	24 months	48 months	96 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post × CE^{high}	0.498**	0.390**	0.339*	0.427***	0.002	0.056	-0.291
	(0.240)	(0.196)	(0.178)	(0.165)	(0.146)	(0.147)	(0.319)
CE^{high}	-0.356**	-0.223	-0.175	-0.210*	-0.011	0.236**	0.084
	(0.163)	(0.136)	(0.126)	(0.114)	(0.099)	(0.100)	(0.210)
Post	0.088	0.280	0.252	0.234	0.135	-0.581***	0.225
	(0.278)	(0.239)	(0.221)	(0.194)	(0.165)	(0.162)	(0.337)
Additional controls:							
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TM-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Application-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,544	1,640	1,640	1,640	1,640	1,640	1,640

Panel C: Panel-structured data

Dependent variable:	I(Pledge)					
Ex ante competition	High (CE^{high}=1)			Low (CE^{high}=0)		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Pledge within τ	0.137**	0.168**	0.011	-0.061	-0.070	0.021
	(0.065)	(0.085)	(0.030)	(0.065)	(0.085)	(0.067)
Pledge within τ	-0.052	-0.034	0.048	0.025	0.054	-0.038
	(0.043)	(0.057)	(0.050)	(0.044)	(0.057)	(0.048)
Post	0.030	0.036	0.045	0.056	0.054	0.046
	(0.055)	(0.055)	(0.056)	(0.050)	(0.049)	(0.050)
Log. (duration)	-0.067***	-0.067***	-0.066***	-0.100***	-0.100***	-0.100***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
τ months:	12	6	24	12	6	24
Additional controls:						
Application-year FE	Yes	Yes	Yes	Yes	Yes	Yes
TM-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
N	470,745	470,745	470,745	497,475	497,475	497,475
χ^2	444.73	346.96	464.21	591.47	451.52	369.60
Pseudo R^2	0.018	0.018	0.018	0.022	0.022	0.022

Notes: The table displays robustness tests on the main difference-in-difference estimations. Panel A restimates Table 7 with a different definition of CE^{high}. Here, we classify firms to operate in high competitive environments if they belong to an industry in the top quartile of the competition concentration. All other firms are considered to operate in relatively less competitive environments. Panel B reestimates the main specification as defined in Equation (4) for different values of τ. In Panel C, we estimate the differences in the timing of trademark pledges using a week-level panel data set as described in Section 6.2. *Publication within* τ is a dummy variable equal to one if a collateral event occurs within τ months after publication; *Log. (duration)* measures the number of weeks elapsed since application (in logarithm). The remaining variables are defined as in our baseline estimations in Table 7. The coefficient of interest is the beta of the interaction term *Post* × *Publication within* τ. Standard errors (in parentheses below coefficients) are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

Table IA7: List of top tier law firms in France

(1) Intellectual Property: Patent and trademark attorneys

Santarelli
Cabinet Beau de Loménie
Casalonga
Germain & Maureau
Plasseraud IP
Bringer IP
Lavoix

(2) Intellectual Property: Patents (not included in 1)

Allen & Overy LLP
August Debouzy
Bird & Bird
Gide Loyrette Nouel
Bardehle Pagenberg
Hogan Lovells LLP
DTMV & Associés
Simmons & Simmons
DLA Piper
Abello
Armengaud Guerlain
Bignon Lebray
De Gaulle Fleurance & Associés
Dentons
Herbert Smith Freehills LLP

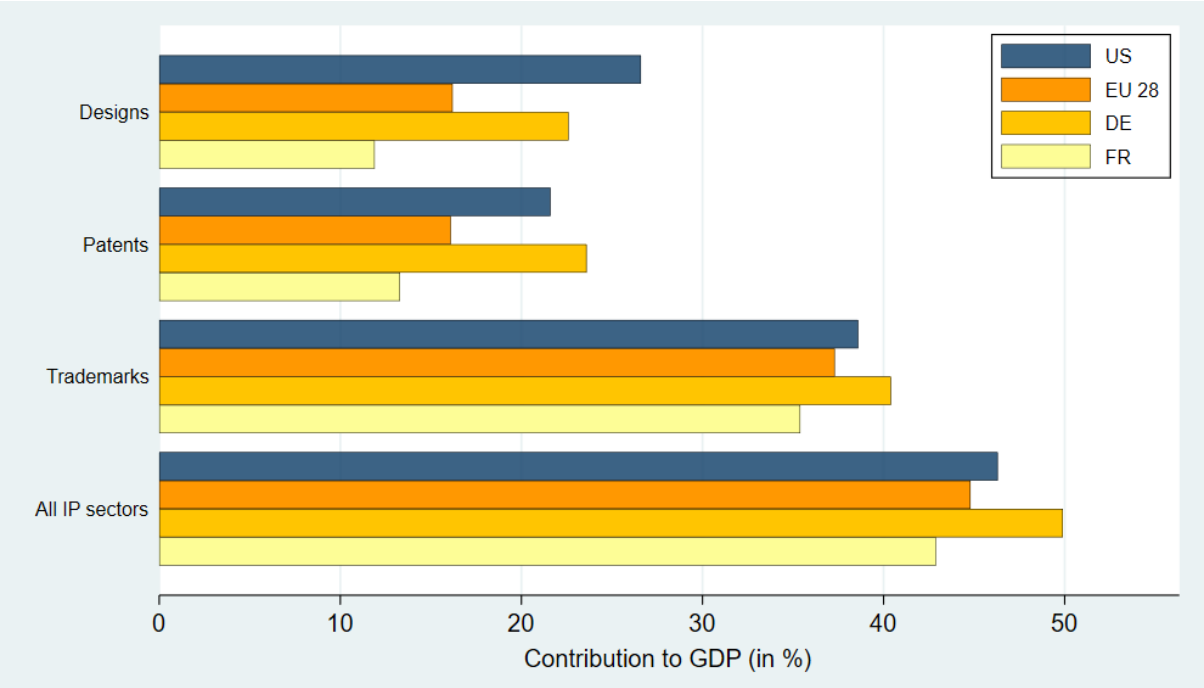
(3) Intellectual Property: Trademarks and designs (not included in 1 or 2)

Armengaud Guerlain
Baker McKenzie
Altana
Arenaire
Cabinet Bouchara Avocats
Fieldfisher
Lexington
Fidal

Notes: This Table displays a list of law firms that we consider as top tier, based on the assessment of www.legal500.com, using the three categories as named in the list. Firms that currently name any of these firms as 'mandataire' in the INPI data base are considered to benefit from assistance of these lawyers at the time of the IP pledge.

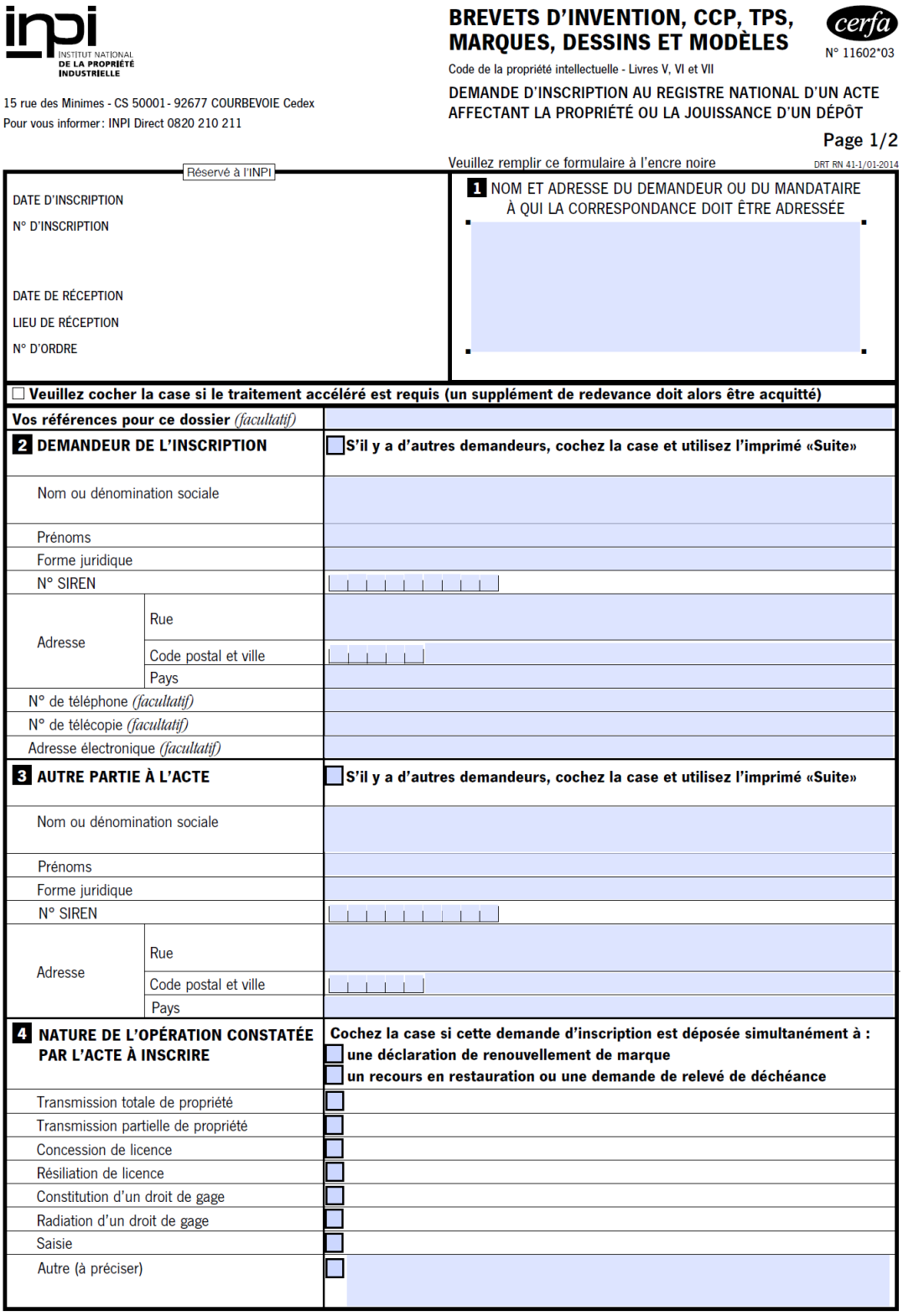
Internet Appendix B : Figures

Figure IA1 : IP-intensive sectors contribution to GDP in selected economies



Notes: The graph shows the contribution of IP-intensive sectors (designs, patents, trademarks and overall) to the overall GDP in the US, the EU, Germany, and France in 2016. Inustries are classified as IP-intensive, if the industry average of IP rights per employee exceeds the overall average. We obtain information on the industry-classifications from USPTO (2016) and EPO-EUIPO (2019) for the US and European countries, respectively.

Figure IA2: Form sheet of IP-related legal changes at INPI



INPI — INSTITUT NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE

15 rue des Minimes - CS 50001 - 92677 COURBEVOIE Cedex
Pour vous informer : INPI Direct 0820 210 211

BREVETS D'INVENTION, CCP, TPS, MARQUES, DESSINS ET MODÈLES

cerfa N° 11602*03

Code de la propriété intellectuelle - Livres V, VI et VII

DEMANDE D'INSCRIPTION AU REGISTRE NATIONAL D'UN ACTE AFFECTANT LA PROPRIÉTÉ OU LA JOUISSANCE D'UN DÉPÔT

Page 1/2

Veuillez remplir ce formulaire à l'encre noire

DRT RN 41-1/01-2014

Réservé à l'INPI

DATE D'INSCRIPTION
N° D'INSCRIPTION
DATE DE RÉCEPTION
LIEU DE RÉCEPTION
N° D'ORDRE

1 NOM ET ADRESSE DU DEMANDEUR OU DU MANDATAIRE À QUI LA CORRESPONDANCE DOIT ÊTRE ADRESSÉE

☐ **Veuillez cocher la case si le traitement accéléré est requis (un supplément de redevance doit alors être acquitté)**

Vos références pour ce dossier *(facultatif)*

2 DEMANDEUR DE L'INSCRIPTION — ☐ **S'il y a d'autres demandeurs, cochez la case et utilisez l'imprimé «Suite»**

Nom ou dénomination sociale
Prénoms
Forme juridique
N° SIREN
Adresse — Rue
Adresse — Code postal et ville
Adresse — Pays
N° de téléphone *(facultatif)*
N° de télécopie *(facultatif)*
Adresse électronique *(facultatif)*

3 AUTRE PARTIE À L'ACTE — ☐ **S'il y a d'autres demandeurs, cochez la case et utilisez l'imprimé «Suite»**

Nom ou dénomination sociale
Prénoms
Forme juridique
N° SIREN
Adresse — Rue
Adresse — Code postal et ville
Adresse — Pays

4 NATURE DE L'OPÉRATION CONSTATÉE PAR L'ACTE À INSCRIRE

Cochez la case si cette demande d'inscription est déposée simultanément à :
☐ **une déclaration de renouvellement de marque**
☐ **un recours en restauration ou une demande de relevé de déchéance**

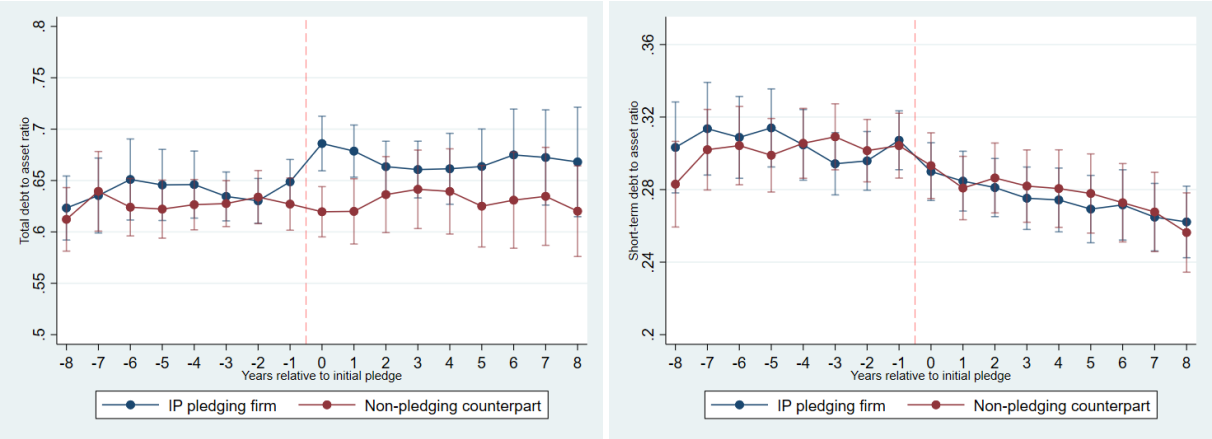
☐ Transmission totale de propriété
☐ Transmission partielle de propriété
☐ Concession de licence
☐ Résiliation de licence
☐ Constitution d'un droit de gage
☐ Radiation d'un droit de gage
☐ Saisie
☐ Autre (à préciser)

Notes: The figure displays the first page of the form sheet for IP-related legal changes at the French IP office (INPI). IP owners are asked to indicate any changes in ownership, which are specified under point 4. Specifically, pledges of trademarks, patents, and designs are indicated by '*Constitution d'un droit de gage*'.

Figure IA3: Mean plots on debt financing activities relative to pledge year

Panel A: Total debt ratios

Panel B: Short-term debt ratios

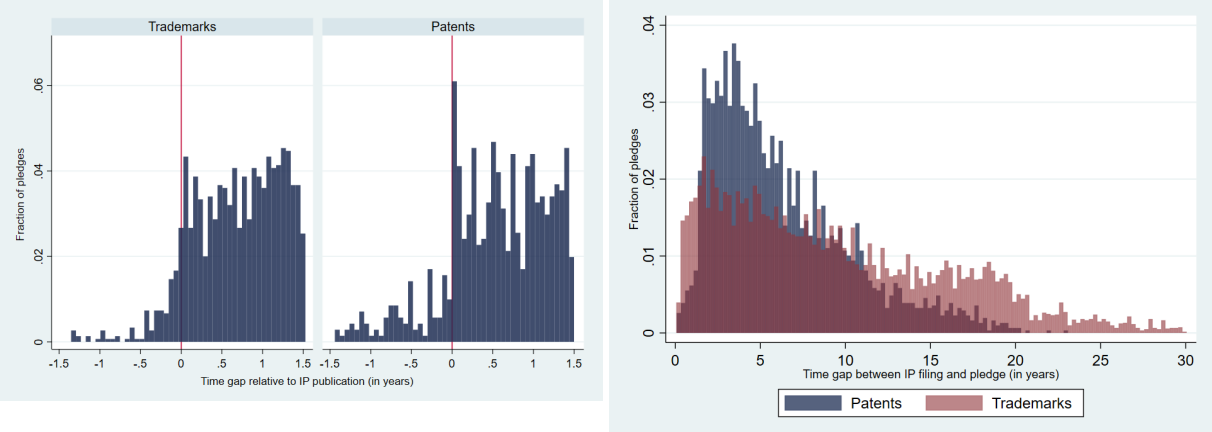


Notes: The graphs display mean plots of total debt to asset rations (Panel A) and short-term debt to asset ratios (Panel B) in a symmetric time window of 8 years around the initial pledge. The graphs differentiate between IP pledging firms and their non-pledging counterparts. Short term debt is defined as any debt with a maturity of less than one year. Whiskers span the 95 percent confidence intervals.

Figure IA4: Distribution of patent and trademark pledges across IP age

Panel A: Pledges rel. to publication

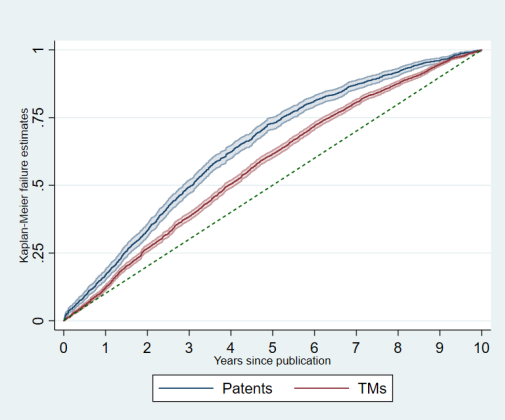
Panel B: Pledges relative to the first filing



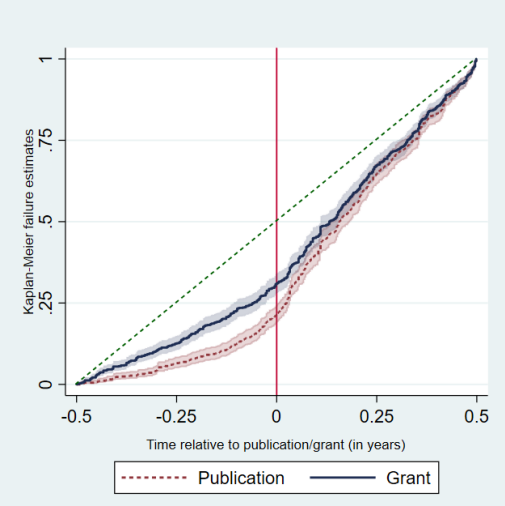
Notes: These figures display distributions of patent and trademark pledges across the IP life cycle. Panel A shows the fractions of trademark and patent pledges in 3 years symmetric time window relative to first publication (year=0), conditional on a pledge within this time frame. Panel B depicts the fractions of patent (blue) and trademark (red) pledges relative to the initial filing date (year=0) for our sample of pledged IP rights.

Figure IA5: The effect of IP age and patent grants on the timing of IP pledges

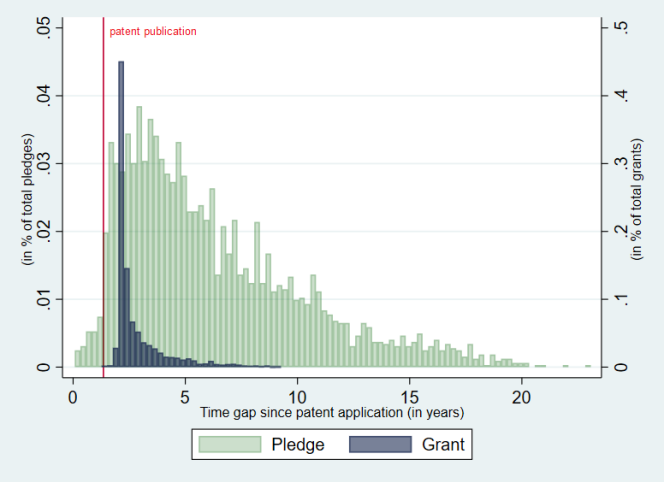
Panel A: Probability of IP pledges on the long-term - within 10 years after publication



Panel B: Comparison of the publication and grant effects of patents



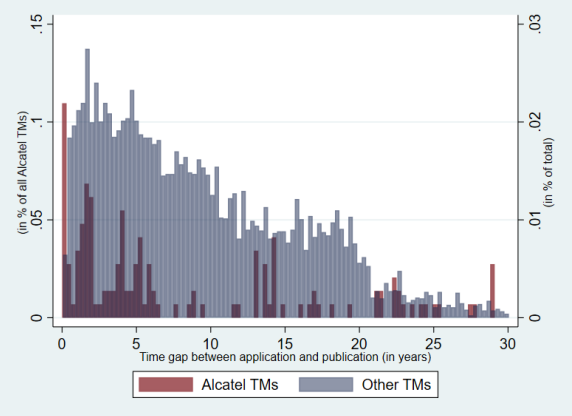
Panel C: The timing of pledges, grants, and publications for sample patents



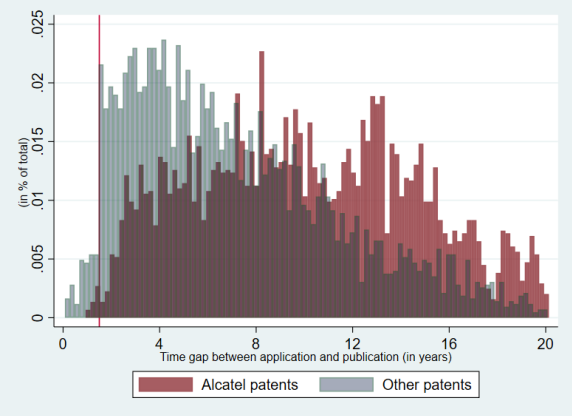
Notes: Panel A presents Kaplan-Meier failure estimates for the timing of trademark and patent pledges relative to their publication date. The plot is similar to Figure 6 but uses a time window of 10-years after IP publication. Panel B displays the timing of patent pledges in a one-year symmetrical time window around the publication of application and the patent grant. For comparison, we use the relative timing of pledges to these events such that they can be stacked on top of each other. In Panels A and B, the green dashed lines illustrate the timing of IP pledges if they were evenly distributed across time. In both panels, the shaded areas reflect the 95 percent confidence intervals. Panel C displays the distribution of the timing of patent collateral events relative to the patent application for the full sample of patents pledged in France between 1995 and 2018 by firms headquartered in France. The green bars mark the timing of patent pledges. The blue bars mark the distribution of the timing of patent grants relative to patent applications. The red line reflects the mandatory publication date of patent applications 18 months after initial filing.

Figure IA6: The timing of IP pledges by Alcatel Lucent relative to application

Panel A: Trademark pledges



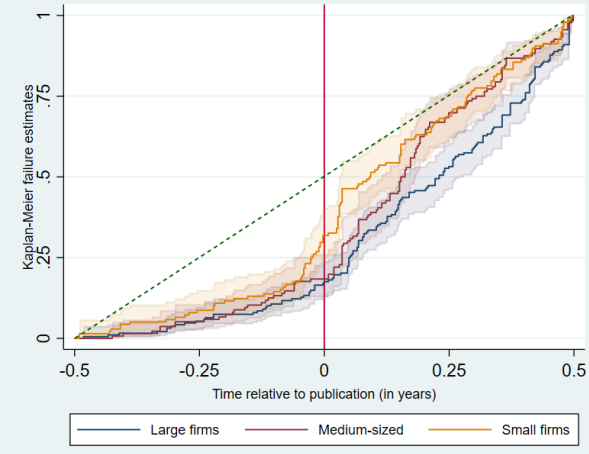
Panel B: Patent pledges



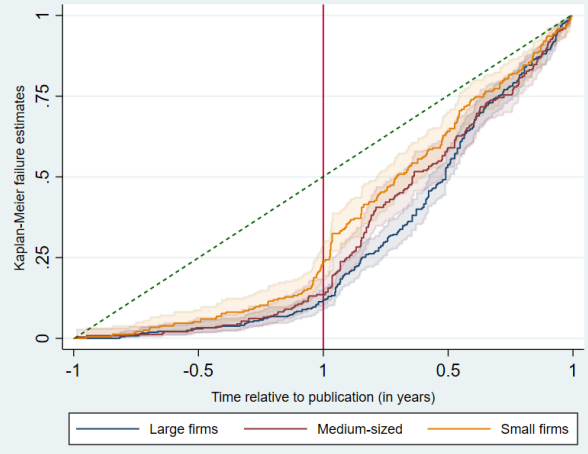
Notes: These figures show the timing of trademark (Panel A) and patent (Panel B) pledges by Alcatel Lucent relative to the respective IP application date (red bars). For comparison, the blue bars show the corresponding distributions for IP rights that are pledged by other firms headquartered in France. Due to the financial struggles faced by Alcatel Lucent, we consider their pledges as lump-sum pledges for which the timing of the pledge relative to the IP publication is not relevant.

Figure IA7: Heterogeneous responses to IP publications regarding IP owners' opacity

Panel A: One-year time window



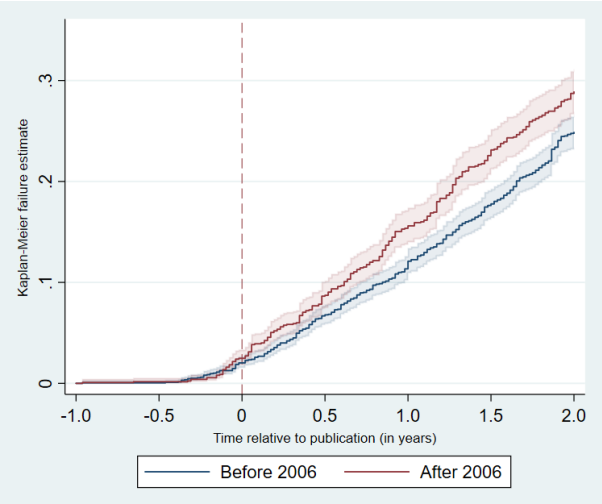
Panel B: Two-years time window



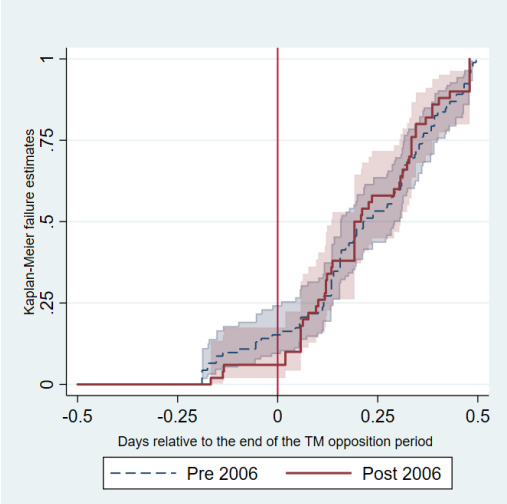
Notes: The figures display the hazard ratios for IP pledges relative to their publication dates. The figures are equivalent to those in Figure 6 but pool patent and trademark pledges and differentiate between different subsamples: large firms, medium-sized firms, and small firms. Small and medium-sized firms are defined as specified in Panel B of Figure 6. Small firms are firms with less than 50 employees and a maximum balance sheet total of 10 million Euros in the year prior to the IP pledge. The figures use a symmetric time window of one year (Panel A) and two years (Panel B), respectively. The green dashed lines illustrate the timing of IP pledges if they were evenly distributed across time. The shaded areas reflect the 95 percent confidence intervals.

Figure IA8: Comparing pre- and post 2006 probabilities of trademark pledges

Panel A: Relative to the publication



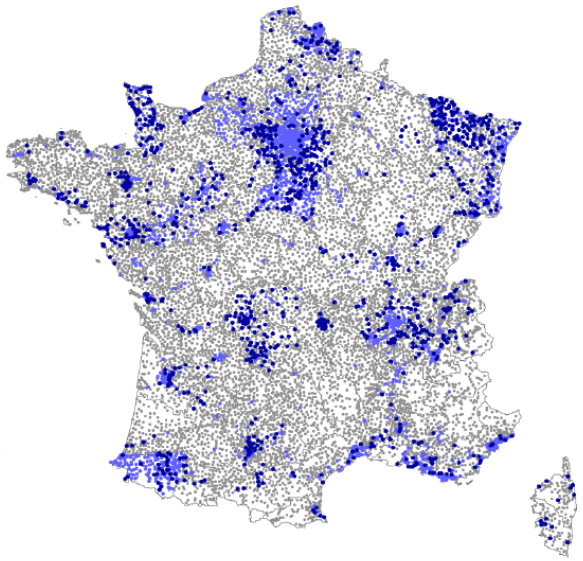
Panel B: Relative to the opposition period



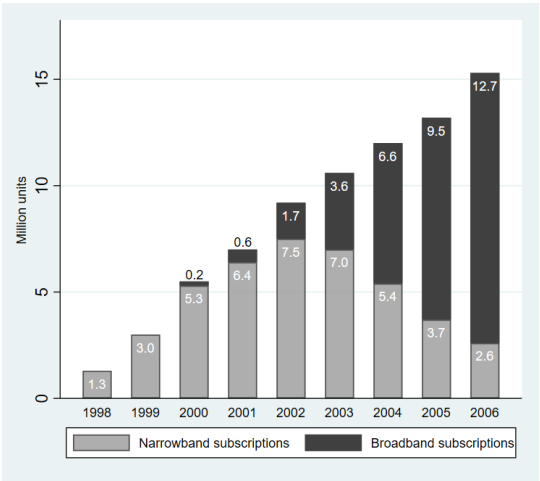
Notes: The figure displays hazard rates on trademark pledges comparing pre- and post 2006 probabilities in different time windows. Panel A depicts Kaplan-Meier failure estimates on the timing of trademark pledges in a three year time window (-1, 2) around the publication of trademark registration for the sample of pledged trademarks. The graph distinguishes pledges of trademarks that are filed before and after 2006. Panel B displays the timing of trademark pledges in a one-year symmetrical time window around the end of the opposition period (see Section 4.2). The shaded areas reflect the 95 percent confidence intervals.

Figure IA9: Variation in internet penetration across France in 2006/07

Panel A: Services of France Télécom in 01/2007



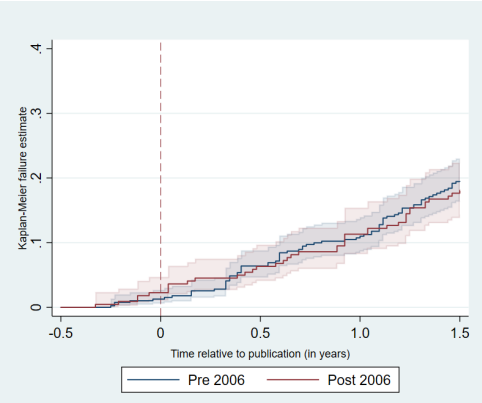
Panel B: Internet subscribers 1998-2006

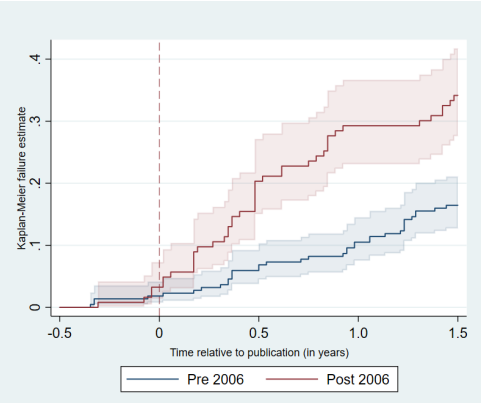


Notes: The figures illustrates variation in internet penetration across France around the time of the launch of online services at INPI in 2006. Specifically, Panel A maps ADSL broadband coverage in France as of January 1, 2007. The gray dots mark locations that are equipped with subscriber connection nodes (NRA) by 2007. The light blue dots mark locations where NRAs are accompanied with unbundling operators of France Télécom by 2007, which are able to access broadband internet. The dark blue dots marks planned installments of unbundling operators by France Télécom for the calendar year 2007. Panel B displays subscription rates for narrowband and broadband services in France for the years 1998-2006. Subscriptions refer to free accounts that have connected at least once in the final 40 days of a given year plus all accounts that pay a monthly flat rate (regardless of whether flat-rate telephony is included or whether the account is residential or business). Source: ARCEP (2006). For a comparison, the total population of France ranged between 60.2 (in 1998), 61.8 (2002), and 63.3 (2006) million inhabitants, corresponding to subscription rates of 2.2%, 14.9%, and 24.0%.

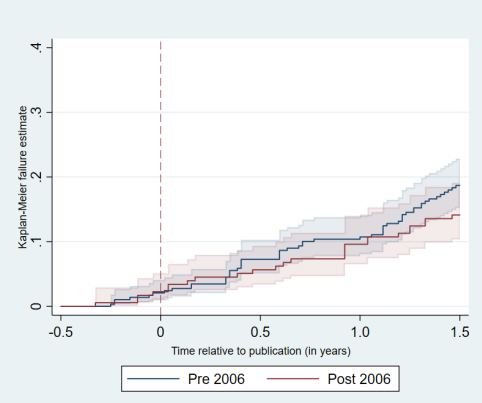
Figure IA10: Heterogeneous effects regarding the ex ante internet access

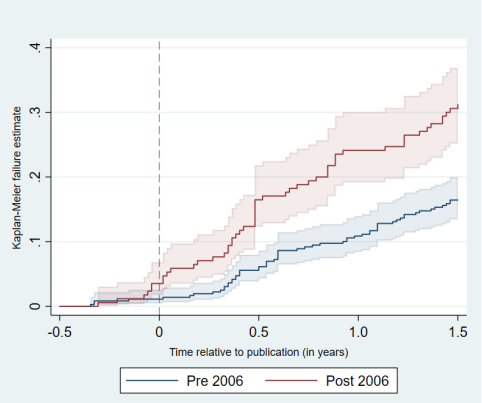
Panel A: Weighted averages by competitor size



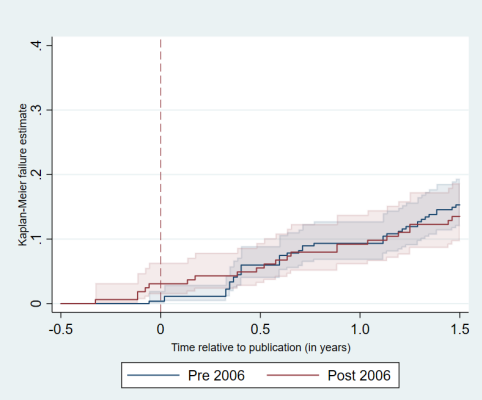


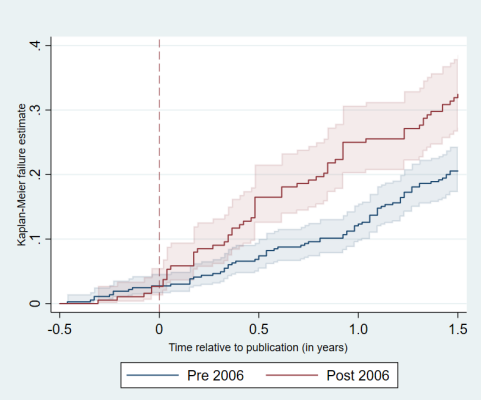
Panel B: Industry-level aggregation level at 2-digit NACE codes





Panel C: Trademark owners' internet access

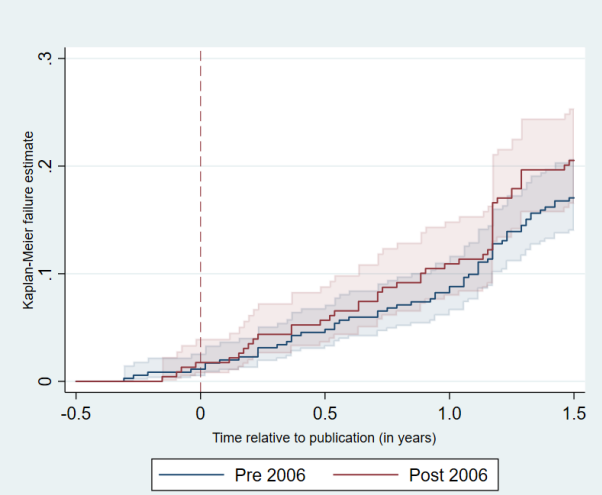




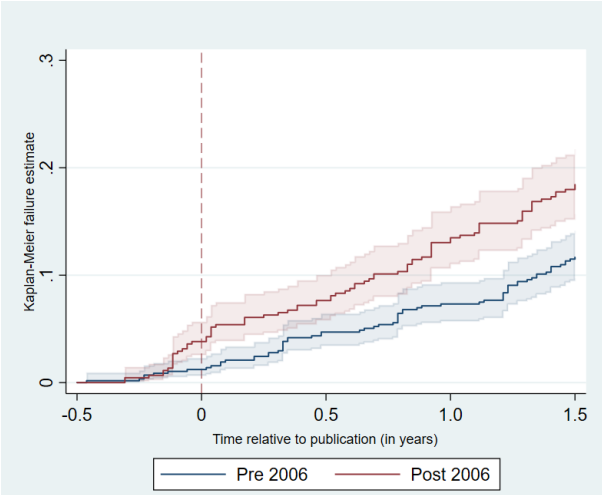
Notes: The figure displays the timing of trademark pledges analogue to Panels A and B of Figure 8, but introduces different definitions of high and low internet penetration. Panel A displays defines high internet penetration by calculating the weighted share (as opposed to the unweighted share in the original definition) of competitors with relatively high internet penetration. The weighting considers the firm size of competitors measured by total sales in the year prior to the launch of online services at INPI in 2006. Panel B defines the share of competitors with high internet penetration by using a higher level of aggregation on the industry-level (2-digit NACE code). Panel C differentiates among trademark owners with and without internet access and does not consider the internet access of competitors. The shaded areas reflect the 95 percent confidence intervals.

Figure IA11 : The role of relationship banks and legal experts as moderators of information costs

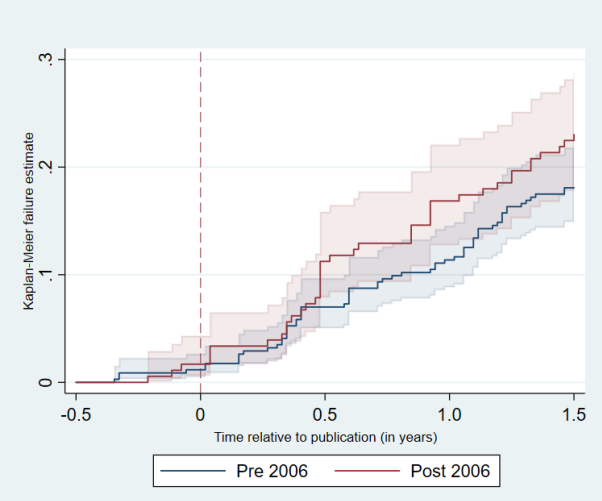
Panel A: Firms with relationship banks



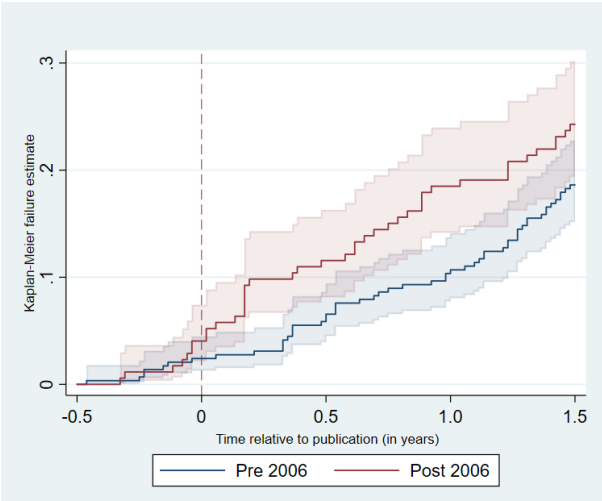
Panel B: Firms with no relationship lender



Panel C: Firms with top tier law firms



Panel D: Firms with no top tier law firm



Notes: The graphs illustrate the role of intermediaries, such as relationship banks and legal experts, as moderator for the information shock released by IP publications. The graphs display Kaplan-Meier failure estimates on the timing of trademark pledges just like in previous specifications (i.e., Panel B of Figure 7). In the panels, we separately estimate these hazard rates for firms with and without a bank that is considered as a relationship lender (Panels A and B) and firms with and without a legal advisor that is considered a top tier law firm in France (Panels C and D), respectively. s of IP pledges for firms with relationship banks pre (blue) and post (red) 2006 in relation to the moment of IP publication. Relationship banking is defined in Section 6.3.3. The list of top tier law firms is displayed in Table IA7 (Appendix A). The shaded areas reflect the 95 percent confidence intervals.

Internet Appendix C:

Collateralization of IP in France: legislative details

Our study focuses on France, whose institutional background provides an ideal set-up for studying IP collateralization. In France, IP pledges are governed by the combination of the general security law concerning incorporeal property in the Code Civil (CC) and the Intellectual Property Code (IPC). A pledge of incorporeal movables is defined by CC article 2355 as "the allocation of an incorporeal movable or of a set of incorporeal movables, present or future, as security for an obligation".[25] It gives the lender, who accepts the respective IPs as collateral, the right over other creditors to receive payment on the collateral in case of default (Séjean and Binctin, 2020). In France, it is possible to pledge multiple different types of IP as collateral, including patents, trademarks, designs, and copyrights.[26] Excluded from pledgable IP are collective trademarks.[27]

Establishing the contract: For the perfection of the loan agreement certain aspects regarding the collateral must be included in writing. Specifically, the contract must contain the designation of the secured debt as well as the the quantity, type, and nature of the collateral.[28] In the context of IP pledges, it is further necessary to include a detailed description of the pledged IP. During the time of the loan agreement the borrower has the obligation to preserve the IP. For example, this entails continuously paying the renewal fees during the loan agreement. Public disclosure via registration at INPI is needed to secure opposability of a security right against third parties . The person registered first takes precedence over later registrations.

Resolving the contract: Three possible scenarios can mark the end of the loan agreement. First, the loan is repaid in full resulting in a release of the secured IP. Second, default can occur not being caused by the insolvency of the borrower, and the third scenario is a default caused by insolvency of the borrower. While the process of the first case is evident, the latter two need some clarification. In case of default without insolvency, the lender can obtain a court order to either have the IP sold at auction[29] or to keep the respective IP as a form of payment. If the value of the IP exceeds the amount of outstanding debt, the difference will be paid back to the original owner).[30] In the case of an insolvency, a collective proceeding is opened aiming to satisfy the claims of the affected debtors. This process implies that the lender can no longer claim exclusive IP ownership.[31]

[25] Civil code, as of 1st july 2013, translated by David W. Gruning; accessed: Oct. 1, 2021.
[26] Patents: L. 613-8, CPI and L. 613-21, CPI; Trademarks: L. 714-1, CPI; Designs: L. 513-2, CPI and L. 513-3, CPI; Copyrights: L. 131-2, CPI; accessed: Nov. 18, 2021.
[27] L. 715-2, CPI; accessed: Nov. 18, 2021.
[28] Code Civil 2336; accessed: Nov. 18, 2021.
[29] Code Civil 2346; accessed: Nov. 18, 2021.
[30] Code Civil 2347; accessed: Nov. 18, 2021.
[31] Code de Commerce L.622-7, II and Code de Commerce L.641-3; accessed: Nov. 18, 2021.

Recording IP collateralization

In the majority of jurisdictions worldwide it is not mandatory to register the use of an IP asset as collateral. The decision to register an IP collateralization is therefore left to the involved parties and is, from a business perspective, a weighting of costs and benefits. Costs of registration first include the administrative fees imposed by the patent office for the registration of the transaction. They also encompass the potential legal fees charged by the patent representative for handling the registration. Finally, they can include the potential economic and reputational impacts of publicly disclosing collateralization, in case public disclosure is inherent to registration. In contrast, the benefits from documenting a pledge in official registries can be extensive but typically depend on the explicit legal framework. Hence, the incentives to register the collateralization of an IP asset depends on whether the legal framework is organized such that benefits outweigh costs.

In France, the collateralization of IP assets can be registered at the national patent and trademark office (INPI). The registration fee is small: it is of 27 euros for each collateralized asset – patent, trademark, or design. The total fee is moreover capped to 270 euros for transactions encompassing the collateralization of more than ten assets.[32]

Although the registration of IP collateralization is not mandatory in France, it provides the involved parties with large benefits. As stated by the French IP law, the publication of the transaction in the official INPI journal, which follows the registration, makes the collateralization opposable to third parties.[33] Hence, an unpublished collateralization cannot be enforced against a third party, as the third party could have acted in good faith and not have known about any previous transactions. This rule is particularly important, for instance, in the case of subsequent changes of ownership and of borrower liquidation. It implies that a lender has a strong incentive to register the pledge of an IP, because it displays that this particular IP right is already being used as security to any other party.

In addition to this, there are important incentives to register IP pledges in France close to the actual date of the contract. The effective date of enforceability against third parties is the publication date of the transaction by the INPI in its official journal and not the date of the transaction, i.e., the issuance of a loan. Enforceability is also not-retroactive[34]. Moreover, in the event of a conflict between successive securitization of the same IP right, seniority of the claims is determined by the order of the publication of the pledge.[35] As a result, the lending party has a strong incentive for a timely registration,

[32]In case parties request for a fast registration procedure, the registration fee amounts to 79 euros. According to INPI, a standard registration is processed "within a few weeks", while a fast registration is processed 'in a few days'.

[33] Designs: L.513-3; Patents: L.613-9; Trademarks: L.714-7; accessed: May 11, 2021.

[34]See for instance, CA Lyon, 11 février 1999: Ann.prop.ind. 1/2000, p.3

[35] Code Civil 2340, accessed: May 11, 2021.

because it assures a superior claim in case of default or non-payment of the debtor over any other parties that are eventually involved in legal transactions over that particular IP right with a later effective date.

These advantages are likely to dominate the negligible costs of registration. Consistent with the idea that the registration decision is a weighting of benefits and costs, the specific legal setting in France is likely to provide the involved parties with strong incentives to (timely) register IP collateral transactions.