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The signaling value of legal form in entrepreneurial debt financing

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ABSTRACT

This study examines the impact of mandatory legal form choices on startups' debt financing opportunities. We posit that an entrepreneur's initial legal form decision serves as a reliable signal to outside lenders, reducing adverse selection concerns. Using data from German startups, we find that limited liability companies with low capital requirements disproportionately secure less debt than their high-capital counterparts. This financing disparity is particularly pronounced for younger firms in areas dominated by small relationship banks, but it diminishes with firm age. Our findings highlight the unintended consequences of recent global deregulation efforts.

Executive summary: Formal debt financing is arguably the most important source of external financing for startups. Despite its importance, many startups find it challenging to secure such financing due to informational opacity: they lack the track record or publicly available evidence needed to prove that they are a sound investment. This raises a pressing question: How can startups credibly convey their creditworthiness to potential lenders?

We posit that a startup entrepreneur's choice of legal form acts as a pivotal signal to potential lenders, allowing them to differentiate between high-risk and low-risk ventures. Every startup must decide what legal form it will adopt at incorporation. Unlike most other, industry-specific decisions, the choice of legal form acts as a consistent and universally applicable signal. Moreover, recent shifts in global regulations have seen the emergence of companies with low-capital legal forms, a development further underscoring the importance of studying these choices (World Bank, 2020).

We theorize that adopting a legal form with high minimum paid-in capital requirements signals that a venture will be less likely to default on a loan: entrepreneurs who anticipate a higher likelihood of default will be less inclined to pick a legal form with high minimum capital requirements since they would be liable for the amount of paid-in capital in the case of bankruptcy. The opportunity costs of such a choice would also be higher as founding a high-capital firm would entail foregoing alternative, safer investment opportunities. Furthermore, the reputational costs and potential stigma of failure associated with defaulting when choosing a high- versus low-capital legal form may induce high-risk types to choose the latter. Importantly, we posit that the legal form choice has signaling value beyond the amount of paid-in capital: among firms with the same amount of equity and similar firm and founder characteristics, those ventures with a low-capital legal form have more difficulty in attracting the necessary external funding.

We utilize comprehensive administrative and survey data from German firms to empirically test our hypotheses. In 2008, Germany introduced the “mini-LLC” or “low-capital LLC,” allowing founders to opt for a lower minimum capital requirement than the traditional 25,000 Euro. This

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shift presented a unique opportunity to study the implications of legal form choice on external financing. Our findings suggest that low-capital LLCs typically secure less debt and more frequently experience financial constraints, despite the lack of any significant difference between their financing needs and those of high-capital LLCs. We further demonstrate that the total effect consists of a mild positive intentional impact from choosing a high-capital legal form and a strong negative unintentional impact from opting for a low-capital form.

Notably, these signaling effects are more pronounced for smaller, "relationship banks," which tend to rely more on nonfinancial cues for risk assessment due to their limited access to sophisticated financial evaluation tools. As the firm-bank relationship matures, the weight of this signal diminishes, indicating that banks adjust their assessment based on acquired knowledge of the firm's quality. However, larger, "transactional banks," which focus more on hard data, tend to maintain their reliance on this signal for extended periods.

For entrepreneurs, the key takeaway is that a trade-off exists between capital requirements and debt accessibility. The stigma tied to low-capital legal forms disproportionately affects their ability to secure debt. Opting for a legal form with low capital requirements might be advantageous to those not heavily dependent on external financing in the early stages, and fostering long-standing relationships with banks is one way of mitigating the unintended consequences of choosing a low-capital legal structure. Entrepreneurs should consider the prevalent banking landscape in their regions; in areas dominated by smaller banks, the legal form choice is especially crucial.

For policymakers, the implications are clear. Regulations regarding firm incorporation can unintentionally impact startups' access to external funding, potentially stifling growth. Understanding these dynamics when formulating policies that shape the entrepreneurial landscape is essential.

1. Introduction

Formal debt financing is widely considered the most important source of external financing for startups (Cosh et al., 2009; Robb and Robinson, 2014). The ability to attract debt financing has been linked to firms' longevity and revenue and employment levels (Cole and Sokolyk, 2018; Robb and Robinson, 2014). Furthermore, unlike equity financing, debt financing does not require relinquishing ownership control (Ueda, 2004) and can be more tax-efficient (Graham, 2000). Despite these advantages, many startups encounter difficulties in securing external debt due to informational opacity (Amit et al., 1990; Cosh et al., 2009; Sanders and Boivie, 2004; Villanueva et al., 2012; Wiklund et al., 2010).

Without a proven track record, startups face the problem of how to credibly signal their company's creditworthiness to outside lenders (Cassar et al., 2015; Connelly et al., 2011). We argue that a startup entrepreneur's initial choice of legal form serves as a reliable signal that can mitigate concerns of adverse selection, in which enterprises posing a high credit risk purport to be of high quality. Low-risk startups face a higher marginal rate of substitution between a loan's interest rate and amount of collateral, but their opportunity costs and expected reputational costs associated with default are relatively lower.

Choosing a legal form is mandatory at a firm's inception and in this respect differs from other kinds of signals, such as decisions concerning intellectual property protection (e.g., Audretsch et al., 2012; Conti et al., 2013b), whose applicability to a given startup may depend on industry nuances or business models. Because of its mandatory nature, the choice of legal form sends a particularly reliable signal because firms cannot strategically avoid or delay it (Connelly et al., 2011). In the case of other potential signals, such as patenting, highly innovative firms may have options: for example, they can decide not to patent, to patent only incremental innovations, or to delay patenting for strategic reasons (Hall et al., 2014). This kind of strategic maneuvering can obscure the true innovative potential of a firm, making the signal a less reliable indicator of firm quality.

Moreover, over the last two decades, >100 countries have lowered the minimum capital requirements[1] for setting up a limited liability company (LLC), typically by allowing entrepreneurs to opt for a new type of legal form with the same perks and benefits as a regular LLC but without a statutory minimum capital (e.g., in Croatia, Denmark, Germany and Luxembourg) (World Bank, 2020).[2] Yet the consequences of this change are not well understood. On the one hand, high-quality enterprises might be able to secure more financing than before as they can better distinguish themselves from the rest. On the other hand, the negative signal sent by choosing this new legal form may be more salient in shaping investors' perceptions than the positive one of securing financing (Maxwell and Lévesque, 2014; Shafi et al., 2020). As a result, firms that choose a legal form with lower paid-in capital may face *disproportionately* more difficulties in attracting the necessary external funding (i.e., an effect above and beyond the fact that they experience higher financing constraints because they have less equity) (Leland and Pyle, 1977). In contrast, firms that opt for the status quo (i.e., LLCs

[1] The paid-in minimum capital requirement reflects the amount that the entrepreneur needs to deposit in a bank when, or shortly after, incorporating a business. Traditionally, its primary legislative purpose has been to protect creditors from new firms that are set up carelessly (World Bank, 2014).

[2] Other countries, such as Austria, the United Kingdom, and France, have completely abolished or reduced the minimum capital requirements for all LLCs. We discuss these differences in legislation and their impact on our results in more detail in Section 6.4.4.

with high capital requirements) might benefit because of the separating equilibrium the choice creates.

Moving beyond the main relation between legal form and outside debt, we further delve into the differential reception of the legal form signal based on the lender's size and nature. Specifically, we hypothesize that in a startup's nascent stages, small lenders, which traditionally rely on intimate knowledge and soft information, are more sensitive to the legal form signal since they lack a robust history of interactions with young firms. On the other hand, large banks, equipped with sophisticated data-driven methods, might not heavily weigh the choice of legal form in their decision-making since they mainly rely on quantifiable metrics.

However, as startups evolve and mature, the dynamics change. Small lenders, with their propensity for relationship-based lending, gather a wealth of soft information through continuous interactions with the startup. Over time, this rich, nuanced understanding of the firm diminishes the lenders' reliance on the initial legal form signal. In contrast, large banks, predominantly operating on hard, transactional data, may maintain a consistent emphasis on the initial legal form choice given the limited number of repeated interactions they have with startups. It therefore follows that not only the size and nature of the lender but also the firm's age may be a factor in how the legal form signal influences lending decisions.

We test our predictions using historical firm records from Orbis and detailed survey data from the IAB/ZEW Start-up Panel for a sample of German LLCs. Since 2008, entrepreneurs in Germany have had the option of establishing a new legal form of LLC, the Unternehmergesellschaft (haftungsbeschränkt), or UG, commonly referred to as a "mini-LLC" or "low-capital LLC." It is similar in almost all respects to the regular "high-capital" LLC, the Gesellschaft mit beschränkter Haftung (GmbH). However, this low-capital alternative does not require the regular minimum paid-in capital of 25,000 EUR at startup. An entrepreneur can choose any amount between 1 and 24,999 EUR to set up a UG. Importantly, firms are required to put the legal form suffix UG or GmbH at the end of the company name, enabling outside investors to infer their type in a straightforward manner. These institutional features are similar to those of many other countries that have recently introduced a new LLC type with lower capital requirements.[3]

Our results show that low-capital LLCs have approximately 21 % less debt than high-capital LLCs, adjusting both for differences in capital and growth opportunities and for various firm, industry, and founder characteristics. Furthermore, we find that low-capital LLCs are more likely to indicate that they experience financing constraints, in particular bank financing constraints. We do not find that low-capital LLCs have less need for external funding. These findings are in line with our signaling explanation but inconsistent with the idea that low-capital LLCs experience less demand for external funding.

Heterogeneity analyses further reveal that this signaling effect can be decomposed into two opposing effects. Our results suggest that the main difference between high- and low-capital LLCs' access to debt is driven by the stigma associated with the low-capital LLC legal form. However, we also find that entrepreneurs who have opted for a high-capital LLC (the sole option before deregulation) are in a slightly better position than before the introduction of the novel low-capital legal form: the introduction of varied capital requirements results in an increase of 2 % in debt for high-capital LLCs. This lends evidence to the idea that deregulation has enabled high-quality entrepreneurs to more effectively signal their quality at startup.

Delving deeper, we find that the debt financing disparity between low- and high-capital LLCs is most pronounced for younger firms in areas dominated by small relationship banks. As firms age, the impact of legal form on debt diminishes across both bank types, but this decline is notably steeper in relationship bank regions. In fact, we find that the negative effect of choosing a low-capital legal form is almost twice as big in relationship bank regions compared to transactional bank regions among firms whose age is two years or less. However, this scenario flips as firms mature: for older firms, the difference is significantly smaller (or even nonexistent) in regions dominated by relationship banks compared to areas dominated by transactional banks.

We provide an array of robustness tests to address concerns about unobserved variables influencing the relation between legal form and debt. First, we compare low-capital LLCs that have hit the 25,000 EUR capital benchmark and become high-capital LLCs with firms that started out as high-capital LLCs. This allows us to isolate the impact of changing legal form from changes in access to finance that would have occurred otherwise; it also sets aside any unobserved time-invariant firm characteristics. The results indicate that shifting to a high-capital legal form is associated with greater creditworthiness. Next, using a Regression Discontinuity Design (RDD), we assess the impact of legal form on the equity boundary separating low- and high-capital LLCs. Consistent with our earlier findings, the RDD reveals a significant financing difference around this threshold. Third, we correlate the legal form choice with the founder's nationality. The results of our IV analyses confirm our OLS estimates. Finally, referencing a 2014 Austrian reform reducing capital requirements for LLCs without the introduction of a novel legal form, we demonstrate that our results stem from legal form, not just capital changes; without the legal form as a default risk indicator, investors prioritize a company's current equity over its startup capital.

The extensive body of literature on signaling principles uses both theoretical and empirical analyses to decipher the entrepreneur-investor relationship (e.g., Arthurs et al., 2009; Audretsch et al., 2012; Bapna, 2019; Conti et al., 2013b; Conti et al., 2013a; Epure and Guasch, 2020; Hoenen et al., 2014; Hopp and Lukas, 2014; Islam et al., 2018; Janney and Folta, 2003). While prior work has considered the importance of incorporation (Cassar, 2004; Demirguc-Kunt et al., 2006; Freedman and Godwin, 1994; Storey, 1994), we document the key role of firms' choice of legal form in shaping financing opportunities. Second, previous studies have predominantly concentrated on signals intended to convey positive information (Colombo, 2021). This paper also emphasizes the importance of negative signals that inadvertently reduce information asymmetry. In particular, our findings underscore the notion that investors are more responsive to negative signals than to positive ones (Maxwell and Lévesque, 2014; Shafi et al., 2020). To the best of our

[3] In Denmark, one can set up a low-capital LLC (IVS) requiring paid-in capital of 1 to 49,999 Dkr. A regular high-capital LLC (ApS) in Denmark requires at least 50,000 Dkr in paid-in capital. In Croatia, a low-capital LLC (j.d.o.o.) requires paid-in capital of at least 10,00 HKR, while a high-capital LLC (d.o.o.) requires at least 20,000 HKR in paid-in capital. In Luxembourg, a low-capital LLC (SARL-S) requires paid-in capital of 1 to 12,000 EUR, while a high-capital LLC (SARL) requires at least 12,000 EUR in paid-in capital.

knowledge, we are among the first to empirically decompose the total signaling effect into its positive and negative components based on entrepreneurs' choice of legal form. Third, existing literature on signaling effectiveness as it relates to investor characteristics highlights factors such as attention (Gulati and Higgins, 2003), commitment (Bruton et al., 2009), prominence (Ko and McKelvie, 2018), and experience (Bernstein et al., 2017). We add a novel dimension by demonstrating that investors' information production policy modulates the weightage and reception of the signals they send through lending decisions.

The rest of the paper proceeds as follows. Section 2 outlines our theoretical argument. Sections 3 and 4 present our setting and data. Section 5 lays out how we estimate the relation between legal form and debt financing. Section 6 presents the results and robustness checks. Section 7 concludes.

2. Theory and hypotheses

2.1. Information asymmetry and financing new ventures

Although many entrepreneurial ventures are self-financed, a majority of them have only limited internal funds and seek external financing (Berger and Udell, 2003; Fairlie and Krashinsky, 2012; Gartner et al., 2012). The ability to acquire external financing is therefore critical to startup performance. Prior studies have found that startups rely more heavily on formal debt financing than on equity financing and inside debt financing from friends and family (Cosh et al., 2009; Robb and Robinson, 2014). Furthermore, the use of external business debt during a firm's initial year of operations has been linked to superior outcomes years later (Cole and Sokolyk, 2018).

Still, despite this need for outside investments, many startups fail to borrow sufficient capital at reasonable rates (Cosh et al., 2009; Schmalz et al., 2017). Unlike established firms, startups lack formal or public records and a proven track record (Santos and Eisenhardt, 2009; Villanueva et al., 2012). Without established customer and supplier relationships (Aldrich and Auster, 1986), they lack the ability to prove the viability of their value propositions and the capabilities of their management teams. Startup entrepreneurs may therefore have better information than potential lenders on their firms' expected future performance and ability to repay loans (Sengupta, 1998). Lenders may find the cost of collecting this kind of information burdensome given the amounts being borrowed (Ang, 1991). The resulting information asymmetry between entrepreneurs and prospective investors may lead to *adverse selection*, in which entrepreneurs posing a high credit risk claim to be of high quality. This problem may also be aggravated under conditions of perfect competition among lenders, when the outcomes of costly screening activities are publicly available. A free-riding problem results, lowering external investors' incentives to engage in their own screening efforts to discover entrepreneurs' true quality (Parker, 2018). Consequently, potential investors are less inclined to provide startups with the necessary resources, and the cost of exchange increases (Sanders and Boivie, 2004; Wiklund et al., 2010; Williamson, 1985). This in turn may amplify financing risk, causing healthy firms to experience difficulty in finding investors (Nanda and Rhodes-Kropf, 2017).

Signaling theory (Spence, 1973) has been widely used to understand how entrepreneurs credibly convey information about the underlying unobservable quality of their firms through observable actions and attributes that help overcome asymmetric information problems (Connelly et al., 2011). Since a seminal study by Leland and Pyle (1977), scholars have investigated various signals that startups can use to attract external financing, such as patenting (Conti et al., 2013b; Conti et al., 2013a), third-party affiliations (Bapna, 2019; M.G. Colombo et al., 2019; Ko and McKelvie, 2018; Plummer et al., 2016; Pollock et al., 2010), choice of accounting methods (Cassar et al., 2015), eponymy (Belenzon et al., 2017), and founders' human capital (Ko and McKelvie, 2018). While the bulk of the literature focuses on positive, usually intentional signals, a few recent contributions have emphasized the importance of negative and unintentional signals, such as venture capitalist withdrawal (Shafi et al., 2020) or a seed investor's decision not to reinvest (Kim and Wagman, 2016).

2.2. Legal form as a signal of default risk

We contend that the choice of a firm's legal form can serve as a credible signal of a venture's unobservable default risk.[4] In particular, we consider how startups with different types of legal forms require different amounts of paid-in capital. Founders are liable for the amount of paid-in capital in case of bankruptcy. We argue that choosing a high-capital legal form is a credible signaling strategy for low-risk firms because 1) the legal form is observable to lenders and 2) high-risk firms have no incentive to "pretend" to be low risk by choosing the high-capital form, and vice versa (i.e., incentive compatibility constraints) (Connelly et al., 2011; Kirmani and Rao, 2000; Spence, 1973).

First, the legal form can easily be inferred from the company's legal documents (see Section 3). Second, models of the use of collateral as a signaling mechanism in credit markets with imperfect information (Besanko and Thakor, 1987a, 1987b; Bester, 1987, 1985; Boot et al., 1991; Chan and Thakor, 1987) argue that in comparison to high-risk firms, low-risk firms select credit contracts with lower interest rates but higher collateral requirements. This is because low-risk firm types have a higher marginal rate of substitution between a loan's interest rate and the size of the collateral: low-risk types are more inclined to accept a higher increase in collateral for a given reduction in interest payments than high-risk types. Analogously, high- and low-risk firms prefer different legal forms, which necessitate either substantial or minimal capital. High-risk types know they are more likely to default and therefore avoid high capital

[4] The notion of risk can be interpreted in many different ways. For the purposes of this paper, *risk* refers to the likelihood that a firm will fail to pay back its loans.

requirements. They are more likely to pick low-capital legal forms even though this implies they will receive smaller loans than low-risk entrepreneurs.

Relatedly, because entrepreneurs forego alternative investment opportunities when they invest paid-in capital in their firms, low- and high-risk legal forms entail differing opportunity costs. Since the expected returns for low-risk projects are greater due to the lower likelihood of default, ceteris paribus, it is less costly in relative terms for low-risk types to invest the required paid-in capital in the firm. In this sense, the legal form choice signals founders' commitment. Opting for a high-capital legal form demonstrates a founder's willingness to tie up substantial personal resources in the venture, thus conveying confidence in its success and resilience (Ross, 1977). This is consistent with the theory of signaling through personal investment, which suggests that entrepreneurs can signal their private information about the firm's quality by investing their own wealth (Leland and Pyle, 1977). Moreover, by choosing a high-capital legal form, founders also expose themselves to a higher risk of personal financial loss in the event of failure, further strengthening the signal of commitment (Bhide, 1992).

While these arguments revolve around individual preferences and opportunity costs, there may also be a collective component involved. In particular, when individual default risk is imperfectly observed, entrepreneurs choosing a high-capital legal form may benefit from the positive collective reputation of high-capital firms (Levin, 2009; Negro et al., 2014; Tirole, 1996). In turn, this induces them to be more committed to a successful outcome because the reputational cost of defaulting for this group is high (Landier, 2005). On the contrary, entrepreneurs choosing a low-capital form may inherit a bad reputation and therefore lose their incentive to avoid default: investors may expect failure within this group and not consider a default very informative. In this sense, entrepreneurs in the low-capital group are stuck in a "bad reputation trap" due to the self-fulfilling nature of expectations (Coate and Loury, 1993). From this perspective, choosing a high-capital legal form is more costly for high-risk entrepreneurs for another reason: when lenders respond negatively to a default by a high-capital firm (e.g., by not offering future loans to those entrepreneurs for new ventures), high-risk types have a higher likelihood of incurring this reputational cost.

Beyond entrepreneurs' strategic selection of legal forms and consideration of the costs and benefits of their choices, an additional dimension requires consideration: the unintended consequences of these choices. Investors, as suggested by Maxwell and Lévesque (2014) and Shafi et al. (2020), may exhibit heightened sensitivity to negative signals compared to positive ones because of negativity bias (Baumeister et al., 2001) or the tendency to rely on shortcut decision-making heuristics (Maxwell et al., 2011). In practice, this means that even a seemingly minor decision such as opting for a legal form with less paid-in capital could disproportionately amplify the perceived risks in the eyes of potential investors. Consequently, entrepreneurs who opt for a low-capital legal form might encounter more challenges when attempting to secure external funding. In contrast, entrepreneurs who opt for a high-capital legal form might be able to secure more financing than before as a result of distinguishing themselves from the rest. While we do not formally hypothesize about the relative strength of negative and positive signaling effects, we make an attempt to empirically disentangle them in Section 6.3.

Combined, these characteristics suggest the existence of a separating equilibrium, in which default risk is negatively related to the likelihood of choosing a high-capital legal form, instead of a pooling equilibrium, in which outside investors cannot distinguish between entrepreneurial firm types. This leads to our first hypothesis:

Hypothesis 1.. *Startups that choose a low-capital legal form receive less debt financing than startups that choose a high-capital legal form.*

2.3. Lender size, investment policy, and variability in signal interpretation

So far, we have argued that we expect high-capital (low-capital) startups to be more (less) likely to obtain outside debt financing because the choice of a legal form signals lower (higher) default risk. The effectiveness of a signal, however, depends on the ability and willingness of the receiver to notice and interpret it (Bafera and Kleinert, 2022). While it is well known that different types of investors have different investment policies, few studies have examined whether this affects their susceptibility and attention to signals from new ventures (Svetek, 2022).

It is well established that organizational structure, and in particular size, influences how investors approach the lending process. Specifically, large hierarchical organizations often grapple with complex agency and information problems (Berger and Udell, 2002; Rajan et al., 2000; Stein, 2002). Because the cost of communicating and transmitting information increases with hierarchization (Aghion and Tirole, 1997; Garicano, 2000), this impedes credible communication of information across hierarchical levels unless it is "hardened" through quantified information that is easily and independently verifiable (Liberti and Petersen, 2019; Stein, 2002). In contrast, smaller investors are better positioned to leverage "soft" information, which is often private, unverifiable, and difficult to transmit across layers in an organization. Such information often stems from intimate relationships and nuanced understandings of businesses, their owners, and local markets (Liberti and Petersen, 2019). As a result, large organizations typically lean toward transactional lending based on quantifiable metrics, while smaller investors or lenders prioritize relationship lending, which is rooted in soft information (Berger et al., 2014, 2005; Cole et al., 2004; Elyasiani and Goldberg, 2004; Scott, 2004).

We posit that these lending technology differences between small and large investors influence how they will act upon the legal form signal. In the early stages of a startup, large banks possess a distinct advantage in evaluating default risk due to their ability to benefit from scale economies. The efficacy of credit scoring models, which utilize statistical properties to assess risk, increases with the volume of clients and loans (Bofondi and Lotti, 2006). Modern advancements in computational capabilities and data analytics have equipped large transactional banks with the tools to employ credit scoring techniques effectively. By analyzing extensive datasets of similar companies within the same sectors and regions, these banks can accurately determine default probabilities (Berger et al., 2005). In contrast, small banks, because they predominantly rely on relationship lending and soft information, face challenges in assessing

default probability for nascent startups. The intimate, long-term recurrent interactions that characterize relationship banking (Boot, 2000) are not yet established with young startups, making the soft information, which is often unverifiable and based on nuanced understandings, sparse and less reliable. Consequently, in the absence of soft information from a robust history of interactions, small investors face heightened challenges in accurately assessing the default risk of fledgling startups. The limited availability and reliability of soft information for nascent startups amplifies the importance of observable signals, such as the choice of legal form, for small investors. In contrast, large transactional banks, with their reliance on hard, quantifiable data, may not weigh the legal form signal as heavily in their decision-making. We thus develop the second hypothesis:

Hypothesis 2.. *For young firms, the relation between the choice of a low-capital legal form and the amount of available debt financing is moderated by the size of the lender such that the relation is stronger for small lenders than for large lenders.*

2.4. Evolution of signal importance over time

While small investors are at a disadvantage during the initial stages of a startup's life cycle, this effect may diminish or even disappear over time. We argue this is the case because the dynamics of information collection and processing differ significantly between large and small investors, leading to varying reliance on the legal form signal as the startup matures.

Prior studies have shown that the signaling value of different attributes is greatest when firms are young and information asymmetries between startups and investors are most pronounced. When startups mature, these signals become less informative and relevant as investors can access more private information through due diligence or direct involvement (Hoenen et al., 2014; Hsu and Ziedonis, 2013; Ko and McKelvie, 2018).

An important implicit assumption shared by these studies, however, is that investors' rate of information collection is equal, regardless of their type. Yet our prior discussion has highlighted important differences in the nature and the extent of information collection between large and small investors. Large investors, with their predilection for hard, quantifiable data, often remain distant from the startups they finance, relying on transactional data and standardized metrics. Fasano and La Rocca (2023) find that bank digitalization has given further momentum to this approach, which despite its efficiency discourages large investors from engaging in recurrent interactions with startups, limiting their ability to collect new or evolving information about the firm as it matures (Bolton et al., 2016). Hence, although the value of early signals like the legal form choice might erode over time (Hopp and Lukas, 2014; Janney and Folta, 2006, 2003), in the absence of substitute information sources, large investors might still place significant weight on these initial signals when making financing decisions. As a result, their reliance on initial signals, such as the legal form, remains relatively constant over time.

In contrast, small investors, which prioritize relationship lending, engage in continuous and intimate interactions with startups. They have an incentive to do so as the person who produces the information and the one making the lending decision are typically one and the same (Stein, 2002). These interactions, characterized by the collection of soft information, allow small investors to develop a deeper understanding of the startup, its management, and its evolving business environment. As the startup matures and the bank accumulates more soft information through these interactions, the importance of initial signals like the legal form diminishes (Higgins et al., 2011; Podolny and Morton, 1999; Stuart et al., 1999). The soft information, being more nuanced and tailored to the specific startup, effectively replaces the generic information emitted by the legal form signal. Over time, as this repository of soft information grows, small investors can make lending decisions based on this rich, context-specific information, reducing their reliance on the initial legal form signal.

In summary, while the legal form signal plays a pivotal role in the early stages of a startup, especially for small lenders, its importance wanes for these banks as they gather more soft information through ongoing interactions. For large banks, however, the signal's importance remains relatively stable over time due to their consistent reliance on hard information and limited engagement in recurrent interactions with startups.

Hypothesis 3.. *The difference in the amount of debt financing between low- and high-capital startups decreases over time for small investors but not for large investors.*

3. Legal background

To test whether the legal form choice can serve as a screening device for credit providers, we make use of a law change that occurred in Germany. The German MoMiG[5] reform in 2008 introduced the UG as a second LLC option besides the already existing GmbH. In Germany the new legal form, UG, is often referred to as “the low-capital LLC” or “the mini-LLC.” Throughout the paper, we will label firms that operate under the legal form GmbH as “high-capital LLCs” and firms that operate under the new legal form UG as “low-capital LLCs.”

The main reason for the reform was increasing pressure to liberalize regulations within the EU. Several landmark rulings by the European Court of Justice between 1999 and 2003 justified the incorporation principle, by which firms incorporated in one EU

[5] Gesetz zur Modernisierung des GmbH-Rechts und zur Bekämpfung von Missbräuchen (MoMiG), October 23, 2008, BGBl I.

Member State were free to do business in any other Member State.[6] Historically, most EU Member States, such as Germany, Austria, and France, followed the real-seat principle, by which firms had to incorporate where they operated (Mucciarelli et al., 2017). Following the European liberalization, firms took advantage of legal arbitrage opportunities by increasingly incorporating in the UK due to lower minimum capital requirements and setup costs for limited liability firms (Becht et al., 2008). However, since countries aim to control the corporate law regulating the operation of firms in their jurisdictions, this liberalization caused European corporate law to respond defensively to the regulatory competition (Gelter, 2019).

In response to this policy of European liberalization, Germany implemented the MoMiG reform in 2008. The reform aims to mitigate the flow of incorporations to other Member States by offering a new limited liability firm with lower incorporation costs. The MoMiG reform has been perceived as a great success in that it is believed to have largely stopped the exodus of German entrepreneurs seeking to establish their businesses under UK law (Mock, 2016). As the popular press has documented, the MoMiG reform has even led to a sharp increase in entrepreneurial activity within Germany (Anger, 2018; Mathez, 2013). Roughly five years after the reform, 10 % of all LLCs were operating under the low-capital legal form (Mock, 2016). Research from Braun et al. (2013) also suggests that the reform has led to a net increase in entrepreneurship; however, they also find a decrease of 3 % in regular (high-capital) LLC firms shortly after the reform.

We use historical records of the Orbis database to confirm this finding. Fig. 1 and the corresponding statistics in Table 1 show that after the MoMiG reform, over 15 % more LLCs started up in Germany. However, among high-capital LLCs, we find a decrease of 7.54 %. Comparing this to data from Austria, a neighboring country that did not implement a change in paid-in capital during this period, we can approximate how many high-capital LLCs in Germany might have been established if the reform had not taken place. Our results show a very similar trend in the number of established firms between Germany and Austria before 2008. However, we do not observe the same decrease in high-capital LLCs in Austria after the MoMiG reform. A back-of-the-envelope estimation suggests a substitution effect of 33.69 %.[7] In other words, roughly one out of three low-capital LLCs would have been established anyway, but under a high-capital LLC legal form. Overall, these findings confirm prior observations that the reform seems to have led to an overall increase in entrepreneurship, but with evidence of a substantial substitution effect between high-capital and low-capital LLCs.

Several differences between high-capital LLCs (i.e., GmbHs) and the newly introduced low-capital LLCs (i.e., UGs) make them a suitable empirical setting for testing our theoretical predictions. First, setting up a low-capital LLC only requires 1 EUR of paid-in capital instead of the regular 25,000 EUR. Hence, the introduction of the low-capital legal form lowered potential financial barriers to setting up a company with limited liability. In addition, low-capital LLCs are required to transfer one quarter of the annual surplus to the retained earnings. Those accumulated reserves can only be used to increase paid-in capital or balance net losses of the current year and the previous years. To avoid the mandatory accumulation of retained earnings, low-capital LLCs must increase paid-in capital to 25,000 EUR, an amount that allows them to then automatically change their legal form to a high-capital LLC.[8] Although low-capital LLCs are not legally required to change their legal form, the limited allowable use of their profits is a strong incentive to change the legal form to GmbH once retained earnings exceed the capital requirements for GmbHs. Moreover, both legal forms have the same legal foundation, simplifying the switch from UG to GmbH status and obviating the need for the costly administrative work required for other legal form conversions. Our dataset confirms this assumption: we find that approximately 99 % of low-capital LLCs switched legal forms once they were allowed to do so.

Importantly, German LLCs are required to include the suffix “UG” or “GmbH” at the end of the company's name. This requirement makes it relatively easy for outsiders to differentiate between the two types of legal forms because companies are required to mention their full names on their corporate websites and on all contracts they sign. This also implies that outside credit providers can infer a firm's level of paid-in capital by simply looking at its name. This is a necessary condition for legal form to serve an effective signal (see Section 2). Other regulations, such as taxation and disclosure requirements, are the same for both legal forms.

4. Data and descriptive statistics

4.1. Sample construction

We use two distinct samples, the first of which is based on historical records of the Orbis database provided by Bureau van Dijk

[6] Centros Ltd. v. Erhvervs-og Selskabsstyrelsen, Case C-212/97 [1999] ECR I-1459; Überseering BV v. Nordic Construction Company Baumanagement GmbH, Case C-208/00 [2002] ECR I-9919; Kamer van Koophandel en Fabrieken voor Amsterdam v. Inspire Art Ltd., Case C-167/01 [2003] ECR I-10155.

[7] The substitution effect is calculated as follows: 33.69 % = (−7.54 % + 1.84 %) / (15.08 % + 1.84 %). Note that this percentage only reflects the substitution that would occur between high- and low-capital LLCs. The increase in newly established LLCs of 15.08 % in Germany might also be driven by a substitution effect due to a lower likelihood of choosing other legal forms such as an unlimited liability company (ULC). The Orbis database, however, only includes data for firms that are required to make their financial statements publicly available and therefore contains no data about ULCs.

[8] High-capital LLCs are allowed a minimum of 12,500 EUR in paid-in capital. For the remaining 12,500 EUR, however, the owners are personally liable, and only a small fraction of entrepreneurs choose this option. In a similar vein, low-capital LLCs can in principle change to a high-capital LLC once they reach 12,500 EUR in equity. However, in this case, the owners then also become personally liable for the remaining 12,500 EUR. In our database, we only find a handful of such instances. The vast majority of low-capital LLCs only switch to a high-capital LLC once they reach 25,000 EUR in equity.

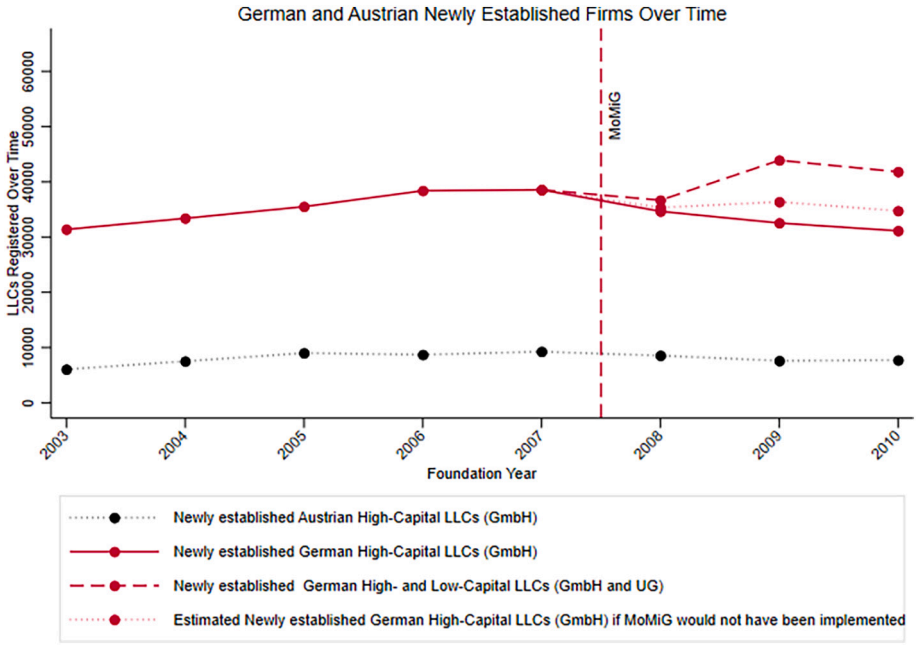

Fig. 1. Notes: This graph shows the number of newly established LLCs for Germany and Austria. The dotted black line shows the annual number of Austrian LLCs. The solid red line shows the annual number of German high-capital LLCs. The dashed red line shows the annual number of German high- and low-capital LLCs. The dotted red line shows the estimated annual number of German LLCs if MoMiG (introduction of low-capital LLCs) had not been implemented. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 1
Newly established firms in Germany and Austria over time.

	Germany		Austria
Foundation year	# Newly registered High-capital LLCs (GmbH)	# Newly registered High- and low-capital LLCs (GmbH and UG)	# High-capital LLCs (GmbH)
2003	31,394	31,394	6047
2004	33,400	33,400	7504
2005	35,509	35,509	8994
2006	38,398	38,398	8699
2007	38,563	38,563	9249
2008	34,653	36,672	8542
2009	32,547	43,901	7598
2010	31,139	41,820	7710
Yearly average # Newly Registered Firms during Pre-MoMiG period (03–07):	35,453	35,453	8099
Yearly average # Newly Registered Firms during Post-MoMiG year (08–10):	32,780	40,798	7950
Average % change Pre vs. Post:	−7.54 %	15.08 %	−1.84 %

Notes: This table presents the number of newly established LLCs within Germany and Austria over time. Data comes from historical records of the Orbis Database. High-capital LLCs are companies with the legal form GmbH. Low-capital LLCs are companies with the legal form UG.

(BvD).[9] The database contains financial statement information for the full population of German limited liability companies. We use this database to identify low- and high-capital LLCs and to construct a range of external financing measures and firm-level control variables. Our second sample is extracted from the IAB/ZEW Startup Panel, a firm-level database accessible at the ZEW (Leibniz Centre for European Economic Research). The Startup Panel contains detailed survey data about a representative set of startups operating in Germany. The survey data provides us with more detailed information about firms' financing frictions as well as a wide variety of data about founders and their firms.

We gathered historical names and financial information for German limited liability firms that were founded after 2008 (i.e., the

[9] Orbis historical database version February 2019.

first year in which low-capital LLCs could be established). We could identify firms' legal forms over time through their historical names, which contain the required legal form suffixes[10]; we cleaned the firms' names and historical legal forms manually.[11]

Prior literature shows that smaller firms are more financially constrained (Hadlock and Pierce, 2010) and that firm size affects growth (Czarnitzki and Delanote, 2013). Therefore, we restrict the sample to small startup firms.[12] Furthermore, we trim all continuous financial variables at the 1 % level on each side of the distribution to eliminate possible outliers. Last, we retrieve data from Orbis-IP, which provides information on patent applications of firms in the Orbis database, and use the information on filed patents to calculate firms' annual patent stock.[13] Table 2 displays the changes in sample size when applying the above restrictions.

Table 3 Panel A shows the summary statistics for low- and high-capital LLCs. In our main sample, we observe 138,495 high-capital LLCs and 33,840 low-capital LLCs that were incorporated between 2008 and 2017. Data from the Orbis database already reveals a couple of notable differences between low- and high-capital LLCs. First, we note substantial differences in the level of debt that they receive. On average, high-capital LLCs report long-term debt levels of 244,444 EUR compared to only 43,296 EUR for low-capital LLCs. Access to debt differs only slightly: 63 % of high-capital LLC firm-year observations have long-term debt compared to 58 % of low-capital LLCs (untabulated). Thus, most of the differences in debt between the two groups occur on the intensive rather than the extensive margin. The descriptive statistics also reveal that the observed differences in debt levels are correlated with differences in terms of capital, accumulated profit, size, age, and patents; the observed differences indicate the need to control for these characteristics in the regressions.

Panel B of Table 3 shows the summary statistics for the subsample of firms from the IAB/ZEW Startup Panel. The subsample includes firms that answered the survey and could be matched to the Orbis database. In total, the subsample consists of 2272 high-capital LLCs and 355 low-capital LLCs. The composition of firms is highly comparable to our Orbis sample. If anything, firms seem to be, on average, slightly larger in our subsample compared to the Orbis sample. Interestingly, the survey data shows that 23 % of low-capital LLCs state that they are financially constrained compared to only 18 % of high-capital LLCs. In addition, high-capital LLCs are 12 % more likely to indicate that they are *not* in need of external financing. This may suggest that banks are less willing to provide high levels of debt to low-capital LLCs even though low-capital LLCs have a higher demand for external funding. Furthermore, we observe that high-capital LLCs have on average more investments and R&D expenses and are also more likely to export. In addition, low-capital LLC entrepreneurs are less likely to have established prior businesses; they also tend to have less education and are more likely to have been unemployed before creating their startups. Hence, a firm's legal form choice seems to be correlated with several founder and firm characteristics. We control for these potentially confounding factors in the subsequent analyses.

5. Relationship between legal form and debt financing

In Section 2, we argue that firms with a low-capital legal form are generally perceived by credit providers as having a lower quality than high-capital LLCs. In turn, low-capital LLCs are less likely to obtain the needed external investments compared to high-capital LLCs, conditional on their level of creditworthiness. In other words, if paid-in capital and other characteristics are held constant, low-capital LLCs are perceived as constituting a higher credit risk. To empirically examine this, we estimate the following model using OLS:

$$y_{it} = \beta_1 Low - Capital\ LLC_i + \beta_2 X_{it} + \partial_t + \eta_i + \delta_i + \varepsilon_{it} \quad (1)$$

where y_{it} is one of the following variables that measure firms' financing frictions. Our first measure is the log of a firm's total amount of outstanding debt. As an alternative proxy, we use the log of a firm's long-term debt. The latter variable more closely reflects the amount of debt received from banks.

Next, we make use of the IAB/ZEW Startup Panel, which provides information about firms' access to bank financing for investments and the percentage of investments financed by external funding ("% Investments Financed by External Funds"). Additionally, the IAB/ZEW Startup Panel covers a set of financing constraint variables that allow us to examine whether differences in debt between low- and high-capital LLCs are driven by differences in the supply of debt (e.g., firms are unable to obtain the necessary external debt to finance

[10] Specifically, we parse all firm names for common variations and abbreviations of legal form suffixes. Additionally, we validate the obtained legal forms with balance sheet information listing firms' paid-in capital. As mentioned in Section 3, low- and high-capital LLCs (i.e., firms with the legal form UG and GmbH, respectively) have different capital requirements. Low-capital LLCs have <25,000 EUR capital, whereas high-capital LLCs must have 25,000 EUR or more in capital. For cases in which paid-in capital does not correspond with the legal form that we observe in the historical firm names, we manually look up their legal form using publicly available financial statements on the official section of the German Federal Gazette (see https://www.bundesanzeiger.de/) and adjust the name and legal form in the database accordingly. The procedure implies that we also exclude firms with missing, zero, or negative capital.

[11] We also identify the year when a firm switches from a low-capital LLC to a high-capital LLC and surpasses the 25,000 EUR capital requirement threshold. We can thereby identify three different groups: (1) firms that have switched from a low-capital to a high-capital LLC, (2) firms that have always operated under the low-capital LLC legal form, (3) and firms that have always been incorporated as high-capital LLCs. Data about firms that switch legal forms will be used in a difference-in-differences specification in Section 6.4.1.

[12] We use the German Accounting Directive Implementation Act (BilRUG) definition of small firms and only include firms with 50 employees or fewer and/or 4,840,000 EUR total assets and/or 9,680,000 EUR in sales in our sample. <1 % of low-capital LLCs are dropped when imposing these restrictions.

[13] We account for an annual depreciation rate of 15 %, following common practices in the literature. See, for example, Cuneo and Mairesse (1984).

Table 2
Cleaning data - German sample.

Cleaning steps	Number of unique firms:	Number of observations
Raw data	204,312	702,246
Remove financial companies		−52,500
Clean capital variable		−15,253
Drop if large		−34,833
Drop missing and implausible observations		−40,071
Final sample	172,335	559,588

Notes: This table describes the cleaning procedure. The raw data includes all unconsolidated balance sheet data for all German low- and high-capital LLCs (i.e., UGs and GmbHs) that were incorporated between 2008 and 2017 according to the Historical Orbis Database (Database version February 2019). We cleaned the data by removing financial firms. We also cleaned the capital data by removing high-capital LLCs that had values below the minimum that should be available. We only included small companies in the data as defined by the German Accounting Implication Act (BilRUG). As a final cleaning step, we removed firms with missing data on capital, a small number of doubles in the data, and firms that reported a zero or negative number for total assets.

their investment opportunities) or, alternatively, by differences in the demand for external debt (e.g., firms do not need debt because of lower growth opportunities). Our first financing constraint measure is a dummy variable equal to one if the firm states that it experiences external financing constraints ("*Financing Constraints*"). Our second measure is a dummy variable equal to one if the firm is not able to acquire the necessary external funds from banks to finance its investment opportunities ("*Bank Financing Constraints*"). A third measure is a dummy variable equal to one if a firm does *not* face external financial constraints because it needs no external financing ("*No Funds Needed*").

Our main variable of interest is *Low-Capital LLCi*, a dummy variable equal to one if a firm is operating under a legal form with low-capital requirements (i.e., it is a UG) and zero if it is operating under a legal form with high-capital requirements (i.e., it is a GmbH). Hence, the parameter of interest β_1 measures the difference in debt and financing constraints between low-capital and high-capital LLCs. Importantly, we also include X_{it}, which is a vector of time-varying firm-level characteristics that influence both a firm's legal form and its access to external funding. Specifically, we control for firms' total amount of capital and retained earnings (i.e., the difference in equity between firms). We also control for tangible assets over total assets as a proxy for collateral, which may influence firms' credit status (Almeida and Campello, 2007). Furthermore, we control for differences in firm size, measured as the log of tangible fixed assets plus one because smaller firms are more likely to be financially constrained and might have different growth opportunities (Hadlock and Pierce, 2010). We include firms' depreciated patent stocks to account for their inventive activity and demand for external funds (Hottenrott et al., 2016). We also control for differences in age between firms because of the dynamic changes in demand for financing over a firm's lifecycle. In addition, we include the lagged amount of debt to account for potential autocorrelation. Lastly, we include in all analyses ∂_t, which is a time fixed effect capturing macroeconomic changes. η_i and $\delta_i$are industry fixed effects and region fixed effects capturing time-invariant differences across industries and regions.

For the subsample of firms that are available in the IAB/ZEW startup dataset, we can control for a variety of additional firm-level and founder characteristics. Specifically, we control for (1) the log of total investments; (2) the log of R&D expenses; (3) the log of total earnings from export; (4) the number of employees at startup; (5) the number of founders; (6) the number of family members in the founding team; (7) an indicator variable if one of the founders is female; (8) an indicator variable if one of the founders has set up a company prior to this business; (9) the number of years that the founder has experience in the sector; (10) a set of dummy variables indicating the main reasons for establishing the new business (e.g., seeking better earnings opportunities, pursuing a new business idea, or being otherwise unemployed); (11) a set of indicator variables indicating the prior employment of the founders (self-employed, employed in the public or private sector, unemployed, inactive); (12) a set of indicator variables indicating the highest educational level attained by the founders (master's level and beyond, undergraduate education, high school degree or no degree); and lastly, (13) variables for firms' capital structure measured by shares of funds provided by banks, other credit providers, owners, family members, and venture capitalists. Hence, it allows us to better control for differences that might exist between firms that opted for either a low-capital or high-capital LLC. In the Variable Appendix, we present a detailed description of all variables included in our models.

6. Results

6.1. Pooled OLS

Table 4 Panel A shows the results for the OLS analyses of the relation between legal form and debt using the full Orbis sample. Column 1 shows that low-capital LLCs have less total debt. Including financial control variables in the regression reduces the size of the coefficient (Column 2), but it remains statistically and economically significant, providing support for Hypothesis 1. In an alternative specification, we also account for firms' prior debt intake (Column 3). Our most conservative estimate suggests that low-capital LLCs have on average 21 %[14] less debt compared to high-capital LLCs. Looking at long-term debt (Columns 4–6), we observe a similar picture. Low-capital LLCs receive on average 17 % less long-term debt compared to high-capital LLCs.

[14] $100^{*}\left(e^{-0.237}-1\right)$.

Table 3
Descriptive statistics.

Panel A: Full sample

	High-capital LLC		Low-capital LLC	
	# Firms: 138,495		# Firms: 33,840	
	Mean	Std. Dev.	Mean	Std. Dev.
Treatment				
Low-capital LLC	0.000	0.000	1.000	0.000
Financial constraint variables				
Total Debt$_{(x\ 1000)}$	281.310	443.038	46.342	125.899
Log(Total Debt)	10.990	2.350	9.313	1.931
Access to Long-Term Debt	0.627	0.484	0.584	0.493
Long-Term Debt $_{(x\ 1000)}$	244.444	394.605	43.296	123.584
Log(Long-Term Debt)	10.872	2.358	9.027	2.124
Control variables				
Capital$_{(x\ 1000)}$	28.759	24.114	1.436	2.239
Accumulated Profit/Loss$_{(x\ 1000)}$	58.057	194.042	7.091	53.785
Total Assets$_{(x\ 1000)}$	395.406	486.754	61.070	170.564
Size	8.805	3.717	7.228	3.225
Age	2.449	1.842	1.796	1.404
Tangible Assets	0.176	0.219	0.210	0.236
Patent Stock	0.030	0.492	0.007	0.163
Log(Total Debt) $_{(t-1)}$	10.987	2.363	9.270	1.966

Descriptive statistics

Panel B: Survey sample

	High-capital LLC		Low-capital LLC	
	# Firms: 2272		# Firms: 355	
	Mean	Std. Dev.	Mean	Std. Dev.
Treatment				
Low-Capital LLC	0.000	0.000	1.000	0.000
Financial constraint variables				
Total Debt$_{(x\ 1000)}$	394.590	653.246	43.061	71.399
Log(Total Debt)	11.941	1.582	9.675	1.717
Access to Long-Term Debt	0.745	0.436	0.614	0.487
Long-Term Debt $_{(x\ 1000)}$	286.718	555.439	30.362	55.815
Log(Long-Term Debt)	11.429	1.778	9.021	2.096
% Inv. Financed by Ext. Funds	0.348	0.421	0.283	0.395
Financing Constraints	0.184	0.388	0.230	0.421
Bank Financing Constraints	0.151	0.358	0.181	0.386
No Funds Needed	0.488	0.500	0.428	0.495
Firm control variables				
Capital$_{(x\ 1000)}$	36.324	72.476	1.818	2.725
Accumulated Profit/Loss$_{(x\ 1000)}$	77.364	400.502	7.674	38.477
Total Assets$_{(x\ 1000)}$	508.206	688.939	52.485	87.324
Size	9.864	2.514	7.811	2.492
Age	2.613	1.937	1.767	1.375
Tangible Assets	0.195	0.211	0.197	0.222
Patent Stock	0.152	0.883	0.017	0.205
Log(Total Debt)$_{(t-1)}$	11.909	1.563	9.584	1.716
Financing Banks	15.725	30.258	7.021	23.681
Financing Credit	12.087	24.654	6.513	19.812
Financing Owner	51.188	41.399	70.920	40.027
Financing Family	2.553	11.789	4.815	17.635
Financing VC	4.998	18.609	2.857	14.778
Financing Mezzanine	1.192	8.532	1.005	9.314
Investments$_{(x\ 1000)}$	64.035	190.718	15.654	89.976
R&D Expenses$_{(x\ 1000)}$	46.634	153.452	9.513	51.429
Export$_{(x\ 1000)}$	140.011	459.603	6.253	35.982
Employees at Startup	0.502	0.500	0.338	0.474
Founders	1.816	0.966	1.423	0.728
Family Members	0.081	0.360	0.050	0.253
Gender	0.165	0.371	0.179	0.384
Previous Enterprise	0.516	0.500	0.546	0.498
Prior Experience	17.523	9.914	14.335	10.915

(*continued on next page*)

Table 3 (*continued*)

Descriptive statistics				
Panel B: Survey sample				
	High-capital LLC		Low-capital LLC	
	# Firms: 2272		# Firms: 355	
	Mean	Std. Dev.	Mean	Std. Dev.
Motive: Self-Employment	0.393	0.488	0.311	0.463
Motive: Business Idea	0.465	0.499	0.482	0.500
Motive: No Emp. Opp.	0.083	0.276	0.082	0.275
Motive: Unemployment	0.028	0.166	0.051	0.221
Motive: Better Earnings	0.031	0.172	0.074	0.261
Prior: Self-Employed	0.421	0.494	0.431	0.496
Prior: Employed (Private)	0.583	0.493	0.404	0.491
Prior: Employed (Public)	0.056	0.231	0.084	0.277
Prior: Unemployed	0.063	0.242	0.082	0.275
Prior: Inactive	0.052	0.221	0.124	0.330
Edu: No Degree / High School	0.453	0.498	0.473	0.500
Edu: Undergraduate	0.205	0.404	0.239	0.427
Edu: Graduate	0.342	0.475	0.287	0.453

Notes: This table presents descriptive statistics for low- or high-capital LLCs. Corresponding variable definitions can be found in Variable Appendix. All monetary values are in euros. Panel A provides the statistics for the full sample, which is retrieved from the Orbis Historical Database. Panel B provides the statistics for the survey sample, which is retrieved from the IAB/ZEW Startup Panel.

Table 4 Panel B presents results using the survey sample.[15] Like the results for the full sample, those in Columns 1 and 2 indicate that low-capital LLCs have less total and long-term debt, conditional on a range of additional firm and founder control variables (cf. the complete list in Section 5), further supporting our Hypothesis 1. The finding that our results are robust to the inclusion of a broad set of controls strengthens our belief that they are not driven by firm and founder differences between low- and high-capital LLCs that are unrelated to legal form differences.

In Columns 3 and 4, we make use of alternative proxies for debt intake – namely, access to bank loans and the percentage of investments financed by external funds. Our findings suggest that low-capital LLCs are 7 % less likely to have bank debt and have 5 % less external funding for their investments compared to high-capital LLCs.

It is important to note that these findings may reflect differences in debt demand rather than access. To examine the potential influence of differential demand for debt, we look at firms' reported financing constraints in the survey sample. Columns 5 and 6 of Table 4 Panel B reveal that low-capital LLCs are more likely to indicate that they are financially constrained, and in particular that they face difficulties obtaining bank financing. Moreover, the results in Column 7 show that low-capital LLCs are less likely to report that they have no need of external financing. Taken together, these findings do not indicate that the differences in debt are driven by lower demand for debt among low-capital LLCs. On the contrary, these firms are more likely than their high-capital counterparts to indicate that they are financially constrained.

6.2. *Heterogeneity analysis*

Having found that low-capital LLCs obtain less debt, we next investigate if and when certain types of credit providers are more likely to use a firm's legal form as a signal of its default risk.

Table 5 shows the results of split sample analyses based on a firm's location and age. In particular, we obtain information on all banks in Germany from Orbis and divide the sample into relationship and transactional bank regions.[16] We classify savings banks as relationship banks and calculate the weighted share of relationship banks for each NUTS-2 region, weighting the share by the average amount of total assets. We compare firms in Q1 ("transactional bank" regions) with those in Q4 ("relationship bank" regions) in terms of the distribution of the weighted share of relationship banks. Furthermore, we split the sample into a group of young ($\leq$ 2 years) and old (>2 years) firms.

The results for firms in their nascent stages in Columns 1 and 3 of Table 5 indicate that new low-capital startups obtain less debt in relationship bank regions than in transactional bank regions, consistent with the predictions of Hypothesis 2. This difference becomes even more apparent when we take only long-term debt into account (Columns 5 and 7): low-capital startups secure, on average, 18 % less debt in transactional bank regions, a disparity that escalates to 30 % in regions dominated by relationship banks.

Turning to Hypothesis 3, the results indicate a diminishing difference in debt financing between low- and high-capital startups over time for small relationship investors, while the difference remains relatively constant for large transactional investors. Looking at total debt for relationship banks, Columns 1 and 2 exhibit a notable reduction in the coefficient, from −0.325 for young firms to −0.118 for

[15] In Online Appendix Table A1, we present a full table that includes the coefficients and standard errors for the additional control variables.

[16] Since most firms' main bank is located close to their headquarters, our measure should be highly correlated with the likelihood that firms are contracting with small relationship lenders.

Table 4
Legal form choice and external debt financing.

Panel A: Full sample

Outcome	Log(total debt)			Log(long-term debt)		
Column	(1)	(2)	(3)	(4)	(5)	(6)
Low-capital LLC	−1.627***	−0.742***	−0.237***	−1.677***	−0.798***	−0.190***
	(0.013)	(0.012)	(0.007)	(0.017)	(0.018)	(0.015)
Capital		0.006***	0.002***		0.006***	0.002***
		(0.000)	(0.000)		(0.000)	(0.000)
Accumulated profit		0.000***	−0.000***		−0.000	−0.000***
		(0.000)	(0.000)		(0.000)	(0.000)
Size		0.335***	0.115***		0.274***	0.065***
		(0.002)	(0.002)		(0.003)	(0.003)
Age		0.121***	−0.244***		0.042***	−0.232***
		(0.008)	(0.006)		(0.012)	(0.013)
Tangible assets		−1.843***	−0.667***		−0.749***	0.357***
		(0.020)	(0.013)		(0.028)	(0.024)
Patent stock		0.029	0.020		0.038	0.025
		(0.022)	(0.013)		(0.030)	(0.017)
$\text{Log(Total debt)}_{(t-1)}$			0.691***			0.699***
			(0.003)			(0.004)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	507,230	364,960	251,262	312,147	244,682	173,060
R-squared	0.326	0.490	0.779	0.230	0.298	0.520

Panel B: Survey sample

Outcome:	Log(total debt)	Log(long-term debt)	Access to bank loans	% Investments fin. by ext. funds	Financing constraints	Bank financing constraints	No funds needed
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Low-capital LLC	−0.448***	−0.690***	−0.073*	−0.051**	0.059*	0.064**	−0.056**
	(0.076)	(0.162)	(0.041)	(0.021)	(0.032)	(0.030)	(0.028)
Capital	0.001***	0.001	−0.000	0.000	−0.000	0.000	−0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Accumulated profit	−0.000***	−0.000***	0.000**	−0.000***	−0.000***	−0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.259***	0.236***	0.026***	−0.011***	0.003	0.006	−0.003
	(0.021)	(0.032)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
Age	−0.080	−0.015	0.133***	−0.060***	−0.040*	−0.041**	0.044*
	(0.060)	(0.100)	(0.039)	(0.015)	(0.022)	(0.021)	(0.023)
Tangible assets	−1.469***	−0.422**	−0.028	0.158***	0.039	0.003	−0.045
	(0.133)	(0.209)	(0.064)	(0.034)	(0.048)	(0.045)	(0.045)
Patent stock	0.055	0.110	−0.017	0.018**	−0.002	−0.016*	−0.014
	(0.041)	(0.069)	(0.013)	(0.008)	(0.011)	(0.008)	(0.012)
$\text{Log(total debt)}_{(t-1)}$	0.482***	0.485***	0.021*	0.006	−0.005	−0.001	0.003
	(0.023)	(0.036)	(0.011)	(0.005)	(0.007)	(0.006)	(0.006)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Founder controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Financing controls	Yes	Yes	No	Yes	Yes	Yes	Yes
Observations	3584	2672	1499	2543	3575	3575	3575
R-squared	0.662	0.442	0.232	0.711	0.124	0.113	0.494

Notes: This table displays estimations from regression analyses examining the relationship between legal form choice and measures of debt and financing constraints. Variable definitions can be found in the Variable Appendix. Panel A reports data from the full sample obtained from the Orbis Historical Database, while Panel B reports data from the survey sample retrieved from the IAB/ZEW Startup Panel. The complete table, including coefficients and standard errors for additional control variables, is presented in Online Appendix Table A1. Standard errors are displayed in parentheses and clustered at the firm level. Statistical significance is denoted by *, **, and ***, representing the 10 %, 5 %, and 1 % significance levels, respectively.

older firms. This contraction is even more pronounced for long-term debt, with the coefficient dropping from −0.359 for young firms to a practically negligible −0.022 for older firms as per Columns 5 and 6. In contrast, the coefficients for transactional banks show smaller reductions with age, maintaining more consistent levels of differentiation based on legal form across young and old firms.

Table 5
Legal form choice and external debt financing: heterogeneity across lender type and time.

Outcome:	Log(total debt)				Log(long-term debt)			
Split by region:	Relationship banks		Transactional banks		Relationship banks		Transactional banks	
Split by age:	Young	Old	Young	Old	Young	Old	Young	Old
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low-Capital LLC	−0.325***	−0.118***	−0.276***	−0.156***	−0.359***	−0.022	−0.201***	−0.121***
	(0.019)	(0.015)	(0.020)	(0.017)	(0.037)	(0.036)	(0.039)	(0.039)
Capital	0.003***	0.001***	0.002***	0.001***	0.004***	0.001***	0.003***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Accumulated Profit	−0.000	−0.000***	−0.000***	−0.000***	−0.000***	−0.000**	−0.001***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.164***	0.069***	0.137***	0.064***	0.114***	0.021***	0.080***	0.011**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.007)	(0.005)	(0.006)	(0.005)
Age	−0.515***	−0.077***	−0.459***	−0.099***	−0.552***	−0.052	−0.671***	−0.092*
	(0.032)	(0.016)	(0.037)	(0.019)	(0.058)	(0.043)	(0.066)	(0.048)
Tangible Assets	−0.920***	−0.353***	−1.017***	−0.451***	0.098	0.635***	−0.048	0.484***
	(0.038)	(0.023)	(0.041)	(0.028)	(0.063)	(0.050)	(0.069)	(0.059)
Patent Stock	0.074***	0.036***	0.004	0.000	0.093***	0.038*	0.002	0.013
	(0.025)	(0.009)	(0.016)	(0.005)	(0.035)	(0.022)	(0.023)	(0.009)
Log(Total Debt)$_{(t-1)}$	0.558***	0.834***	0.613***	0.824***	0.543***	0.862***	0.622***	0.832***
	(0.007)	(0.006)	(0.007)	(0.005)	(0.011)	(0.010)	(0.010)	(0.010)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,687	37,129	29,766	37,097	19,423	28,215	17,740	25,508
R-squared	0.742	0.862	0.692	0.819	0.498	0.575	0.468	0.520

Notes: This table displays estimations from regression analyses examining the relationship between legal form choice and measures of debt and financing constraints split by region and firm age. Variable definitions can be found in the Variable Appendix. Panel A NUTS-2 region is labelled a "Relationship Banks" region if it is in the fourth quartile of distribution of the weighted share of relationship banks per region; it is labelled a "Transactional Banks" region if it is in the first quartile. Firms are designated as young if they are aged two years or less and old otherwise. Standard errors are displayed in parentheses and clustered at the firm level. Statistical significance is denoted by *, **, and ***, representing the 10 %, 5 %, and 1 % significance levels, respectively.

6.3. Negative versus positive signaling effects

The disparity in access to financing between low- and high-capital legal form LLCs likely stems from a combination of positive (intentional) and negative (unintentional) signaling effects. Here, we aim to disentangle which one prevails. To do so, we compare LLCs from Germany with LLCs from the neighboring country of Austria, where access to credit is highly similar (Vanhaverbeke et al., 2022) but no low-capital legal form for LLCs exists in our time frame. We use this group of Austrian LLCs as the counterfactual situation by which we assess how much debt German (regular) high-capital LLCs would have been able to secure without the policy change. In particular, applying the same sampling protocol (cf. Section 4.1.), we complement our existing sample of German LLCs with German and Austrian LLCs founded between 2003 and 2007 and Austrian LLCs founded between 2008 and 2012. This sample allows us to assess how startups' access to debt differs between German and Austrian LLC firms and between the pre and post periods (i.e., before and after the deregulation of capital requirements in Germany). To do so, we estimate the following equation:

$$Log(Total\ Debt)_{it} = \beta_1 Germany_i\ x\ Post_t + \beta_2 Low - Capital\ LLC_i x Germany_i x Post_t + \beta_3 X_{it} + \partial_t + \eta_i + \delta_i + \varepsilon_{it} \quad (2)$$

$Germany_i$ is a dummy equal to one if a firm was founded in Germany and zero if it is an Austrian startup. $Post_t$ is a dummy that equals one from 2008 onward, when entrepreneurs in Germany could choose either a high-capital or low-capital legal form. Remaining variables are defined as before. β_1 measures the impact of being able to choose a particular legal form. It captures the average difference in debt financing between high-capital German startups after the introduction of the novel legal form compared to their Austrian counterparts (who have no legal form choice). Hence, β_1 should capture the positive signaling effect of a firm voluntarily opting for a high-capital LLC. β_2 measures the difference in debt between German low-capital and Austrian high-capital LLCs, net of the positive signaling effect. This represents the negative signaling effect that might arise from choosing a low-capital legal form.

The results are displayed in Table 6. Column 1 does not include the triple interaction term and consequently focuses solely on the average change in debt financing of *all* German startups post-2008 relative to their Austrian counterparts. In this column, the coefficient of *Germany x Post* is insignificant, suggesting the average German startup did not fare better than its Austrian equivalent after the law change. In Column 2 we differentiate between low- and high-capital firms to gain a more nuanced understanding of the contrast between the two national contexts. The positive and significant coefficient for *Germany x Post* suggests that high-capital German startups experienced, on average, a positive effect on debt financing post-2008 compared to Austrian firms. As expected, we find a negative coefficient on the triple interaction term *Low − Capital LLC x Germany x Post*. The effect size is much more pronounced, indicating a strong negative signaling effect associated with the choice of a low-capital legal form in Germany post-2008.

Table 6
Legal form choice and external debt financing: Germany vs. Austria.

Outcome	Log(total debt)	
Column	(1)	(2)
Germany × Post	−0.010	0.020**
	(0.010)	(0.010)
Low-capital LLC × Germany × Post		−0.264***
		(0.009)
Capital	0.003***	0.003***
	(0.000)	(0.000)
Accumulated profit	−0.000***	−0.000***
	(0.000)	(0.000)
Size	0.128***	0.128***
	(0.001)	(0.001)
Age	−0.483***	−0.492***
	(0.006)	(0.006)
Tangible assets	−0.687***	−0.676***
	(0.011)	(0.011)
$\text{Log(total debt)}_{(t-1)}$	0.647***	0.645***
	(0.002)	(0.002)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes
Observations	317,706	317,706
R-squared	0.744	0.745

Notes: This table displays estimations from regression analyses that investigate the relation between legal form choice and access to external debt financing, comparing Germany and Austria. Variable definitions can be found in the Variable Appendix. Standard errors are displayed in parentheses and clustered at the firm level. Significance levels are denoted by *, **, and ***, corresponding to the 10 %, 5 %, and 1 % thresholds, respectively.

Hence, the law change appears to initiate a separating equilibrium. Deliberately choosing the high-capital LLC option appears to slightly improve entrepreneurs' ability to secure debt compared to having no such choice. In contrast, firms opting for the new low-capital legal form (unintentionally) face substantial disadvantages in terms of accessing external debt.

6.4. Robustness tests

Our analyses control for a wide variety of observable covariates. However, as the legal form choice is not a random decision, it is possible that unobserved factors could be affecting both the choice of legal form and firms' level of debt. To minimize concerns of endogeneity, we provide a battery of robustness tests, including a difference-in-differences analysis, regression discontinuity design, and instrumental variable estimations.

6.4.1. Difference-in-differences

As a first method to mitigate concerns about unobservable factors being correlated with both the choice of legal form and firms' level of debt, we exploit changes in firms' legal form. The intuition behind this analysis is that if low-capital LLCs indeed face frictions in obtaining debt financing, changing to a high-capital LLC will relax these constraints by eliminating the negative signal attached to the low-capital legal form.

As explained in detail in Section 3, low-capital LLCs (almost automatically) change their legal form into a high-capital LLC once they reach the 25,000 EUR minimum capital requirement. In the full sample, we observe that 1890 low-capital LLCs become high-capital LLCs during the sample period. We label this group as *switching low-capital LLCs*. The remaining 31,954 low-capital LLCs do not change their legal form and are removed from the sample. We label these as *permanent high-capital LLCs*. Descriptive statistics for the different groups are presented in Online Appendix Table A2 Panel A. Table A2 Panel B already descriptively reveals that switching low-capital LLCs indeed increase both their likelihood of obtaining long-term debt and their total level of debt.

We estimate the impact of changing legal form on debt financing as follows:

$$y_{it} = \beta_1 Post\ Switch_t \times Low - Capital\ LLC_i + \beta_2 X_{it} + d_t + \alpha_i + \varepsilon_{it} \quad (3)$$

The indicator $Post\ Switch_t \times \text{Low} - \text{Capital LLC}_i$ is equal to one if a low-capital LLC has turned into a high-capital LLC in year t or any year following the change. Dt is a time fixed effect capturing macroeconomic changes, and αi denotes firm fixed effects capturing time-invariant differences across firms. This setup allows us to isolate the impact of changing legal form net of changes in access to finance that would have occurred otherwise and (unobserved) time-invariant firm characteristics, such as the founding team and management quality or ownership structure, which might also play a role.

The results are shown in Table 7 Panel A. We find that, on average, the total debt of switching low-capital LLCs goes up by 13 % after the transition to high-capital LLC, and their long-term debt increases by 20 %. Hence, it appears that the differences in debt are

Table 7
Legal form choice and external financing: difference-in-differences design.

Panel A: Main effects

Outcome:	Log(total debt)		Log(long-term debt)	
Column:	(1)	(2)	(3)	(4)
Post switch × Low-capital LLC	0.652***	0.141***	0.607***	0.228***
	(0.038)	(0.030)	(0.057)	(0.053)
Capital		0.003***		0.003***
		(0.000)		(0.001)
Accumulated profit/loss		−0.001***		−0.001***
		(0.000)		(0.000)
Size		0.233***		0.189***
		(0.003)		(0.004)
Age		0.449***		0.146***
		(0.014)		(0.023)
Tangible assets		−0.895***		0.206***
		(0.028)		(0.041)
Patent stock		0.055***		0.053***
		(0.013)		(0.019)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	434,741	256,277	256,277	206,097
R-squared	0.881	0.816	0.816	0.794

Panel B: Heterogeneity over time and lender type

Outcome:	Log(total debt)				Log(long-term debt)			
Split by region:	Relationship banks		Transactional banks		Relationship banks		Transactional banks	
Split by age:	Young	Old	Young	Old	Young	Old	Young	Old
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post switch × Low-capital LLC	0.218***	−0.095	0.021	−0.011	0.228**	−0.048	0.113	0.046
	(0.050)	(0.111)	(0.050)	(0.116)	(0.096)	(0.178)	(0.097)	(0.137)
Capital	0.001*	0.001	0.003***	0.002***	0.002*	0.001	0.003**	0.002
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Accumulated profit	−0.001***	−0.000***	−0.001***	−0.000***	−0.001***	−0.000***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.253***	0.144***	0.238***	0.131***	0.205***	0.138***	0.193***	0.125***
	(0.005)	(0.009)	(0.005)	(0.008)	(0.008)	(0.014)	(0.007)	(0.014)
Age	0.636***	0.144	0.636***	0.225	0.086*	0.767*	0.182***	0.486
	(0.030)	(0.188)	(0.031)	(0.216)	(0.048)	(0.423)	(0.054)	(0.498)
Tangible assets	−0.970***	−0.527***	−1.100***	−0.747***	0.037	0.562***	−0.062	0.209
	(0.050)	(0.085)	(0.048)	(0.077)	(0.076)	(0.128)	(0.073)	(0.132)
Patent stock	0.072***	0.098***	0.011	0.018	0.065**	0.006	0.016	0.134***
	(0.019)	(0.037)	(0.024)	(0.015)	(0.032)	(0.065)	(0.054)	(0.047)
$\text{Log(total debt)}_{(t-1)}$	0.218***	−0.095	0.021	−0.011	0.228**	−0.048	0.113	0.046
	(0.050)	(0.111)	(0.050)	(0.116)	(0.096)	(0.178)	(0.097)	(0.137)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	102,121	37,314	108,192	37,525	63,659	27,750	62,160	25,816
R-squared	0.920	0.945	0.906	0.935	0.848	0.834	0.845	0.816

Notes: This table presents the results for difference-in-differences regressions of debt on a switch in legal form. Post Switch is a dummy variable equal to one if a firm has changed its legal form from low-capital LLC to high-capital LLC. The control group are permanent high-capital LLCs (i.e., firms that opted for the legal form High-Capital LLC (GmbH) at startup). Variable definitions are presented in Variable Appendix. We use data from the Orbis sample. In the survey sample, we do not observe a sufficient number of firms that switch legal form. Panel A reports results for the full sample. Panel B shows the results of split sample analyses by region and time. Standard errors are reported in parentheses and clustered at the firm level. *, **, and *** represent significance at the 10 %, 5 %, and 1 % level, respectively.

not merely an outcome of stable differences aside from legal form between low- and high-capital LLCs.

The difference-in-differences estimator hinges on the assumption that in the absence of a change of legal form, the trends in debt financing between switching LLCs and their non-switching counterparts would have evolved in parallel over time. To provide some support for this assumption, we also estimate a dynamic version of Eq. 3 where we include indicators for the years before and after the change to a high-capital LLC.[17] The results are shown in Fig. 2. We find that long-term debt starts increasing significantly one year after low-capital LLCs have turned into high-capital LLCs. Importantly, we do not observe any significantly diverging pre-trends between the two groups. This bolsters our belief that permanent high-capital LLCs serve as a valid counterfactual.

Next, we run the same analysis but now split our sample based on lender type and firm age. The results are reported in Table 7 Panel B. As before, we find that the positive effects of switching legal form are most pronounced for young firms in relationship bank regions. We do not find a significant impact of changing legal form for older firms in relationship banks regions. For firms that are likely contracting with transactional banks, we do not find significant effects for either young or older firms.

6.4.2. Regression discontinuity

In addition to the difference-in-differences analysis, we make use of a Regression Discontinuity Design. In this setting, we estimate a local average treatment effect around the equity threshold of 25,000 EUR that defines low-capital LLCs and high-capital LLCs. Specifically, we compare a subgroup of low-capital LLCs that have accumulated equity close to the 25,000 EUR threshold with high-capital LLCs that have equity just above this threshold. The idea is that firms around this threshold are very similar in observed and unobserved characteristics. Because of this, any remaining difference in debt between firms on different sides of the cutoff value can be attributed to their legal form.

Importantly, we can plot the relationship between debt and equity to visually examine if a discontinuity is observable around the capital threshold that defines low- and high-capital LLCs.[18] Indeed, Fig. 3 displays a clear discontinuity in the relation between capital and total debt once firms have accumulated >25,000 EUR in paid-in capital, something we would not expect to observe absent the influence of firms' legal forms. For other values of capital, we see a clear positive relationship between capital and debt. The "jump" in debt is difficult to align with the interpretation that continuous growth of firms is associated with a continuous increase in the need for/use of debt. If this were the case, we would expect to see a linear relationship across the whole distribution.

We also estimate the following model:

$$y_{it} = \beta_0 + \beta_1 I[capital > 25,000] + \beta_2 X_{it} + \varepsilon_{it} \tag{4}$$

Here y_{it} is similar to what we saw in Eq. 3. $I[capital > 25,000]$ is an identity function that takes the value one if a firm has more capital than the corresponding threshold in a given year. To increase accuracy, we also control for the vector X_{it}, as in Eq. 1. Importantly, we estimate Eq. 4 using a local linear estimation within various bandwidths to assess its robustness.

The results of the RDD analysis shown in Online Appendix Table A3 confirm our results: we consistently find that high-capital LLCs have more debt than similar low-capital LLCs. A similar picture emerges when we replace total debt with our measures of demand for financing: high-capital LLCs report that they are less financially constrained.

6.4.3. Instrumental variable regression

Third, we instrument firms' legal form choice by the nationality of the founder as indicated in the IAB/ZEW Startup Panel. The instrumental variable choice is based on Becht et al. (2008), who show that reducing minimum capital requirements to set up a business attracts foreign entrepreneurs from countries where minimum capital requirements are higher. During our sample time period, capital requirements for LLCs in many neighboring countries (e.g., the Netherlands, Switzerland, and Austria) are higher than the minimum capital requirements for German low-capital LLCs. This is in line with the observation that over 10 % of all low-capital LLCs in our sample are founded by foreigners, while foreigners represent only 4 % of the share of high-capital LLCs. Moreover, a large proportion of foreigners who started an LLC in Germany are from neighboring countries.[19] However, the exclusion restriction could potentially be violated in the sense that holding a foreign nationality could be perceived as a negative signal by lenders. We find that foreign LLCs attract a similar amount of total debt compared to non-foreign LLCs. This provides some evidence against the hypothesis (cf. Table A4 in the Online Appendix).

In our IV estimation, we first predict the choice of a low-capital LLC by a dummy equal to one if the founder has a foreign nationality:

$$Low - Capital\ LLC_i = \beta_1 foreign\ ownership_i + \beta_2 X_{it} + \partial_t + \eta_s + \varepsilon_{it} \tag{5}$$

[17] The estimating equation is: $y_{it} = \sum_{\tau=-4,\tau\neq-1}^{+3} \gamma_\tau D_{i\tau} + \beta_2 X_{it-1} + d_t + \alpha_i + \varepsilon_{it}$. $D_{i\tau}$ is an indicator equal to one if a low-capital LLC switches to a high-capital LLC form τ years earlier or -τ later if τ is negative, and zero otherwise. We include indicators for τ = "-4 or more years" before the change to a high-capital LLC to "3 or more years" after switching. In the regression analyses, we omit the indicator of the year before low-capital LLCs have been transformed into high-capital LLCs ($\tau = -1$), so the estimated coefficients should be interpreted as the change relative to the year before the change in legal form.

[18] Specifically, we create 40 equal bins in terms of equity. The first bin represents all firms with 1 to 1250 EUR in equity, the second bin represents firms with 1251 to 2500 EUR in equity, and so forth. For each group we then display the average amount of total debt that is present.

[19] We observe that the founders of foreign LLCs are mainly Austrian (8.38 %), British (4.67 %), Dutch (8.38 %), Italian (7.66 %), Polish (6.71 %), Swiss (4.91 %), and Turkish (12.34 %) citizens.

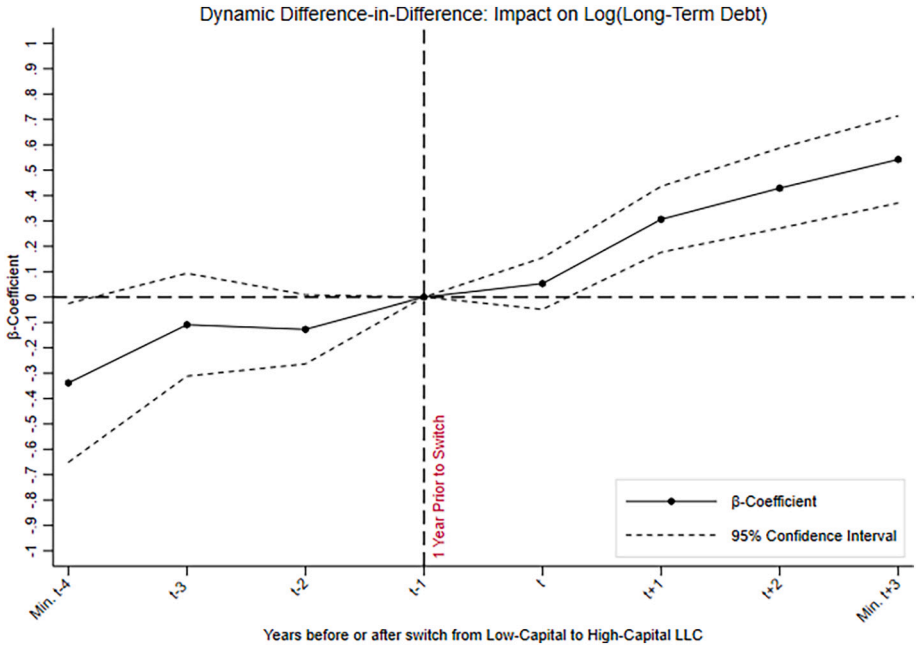

Fig. 2. Notes: This figure presents the results of the dynamic difference-in-differences regression of Log(Long-Term Debt) over time. The control group are high-capital LLCs. Dotted lines represent 95 % confidence intervals.

The second stage is identical to Eq. 1, but $Low - Capital\ LLC_i$ will be the predicted $Low - \widehat{Capital}\ LLC_i$ from the first-stage regression. Table 8 presents the results. Columns 1 and 3 show the first-stage results without and with controls. In line with our assumption, foreign ownership is highly significant and predicts the choice of low-capital LLC. Columns 2 and 4 show the second stage results for the impact of predicted low-capital LLCs on the amount of debt, again without and with additional controls. In both cases, we find a negative relation between being a low-capital LLC and the amount of debt received, even though the coefficient turns insignificant when we include the additional control variables. Columns 5 to 7 present second-stage results for our measures of financing constraints. Again, the findings show that low-capital LLCs are more financially constrained than their high-capital counterparts and less likely to say they need no external financing. Consequently, instrumenting the choice of legal form with foreign ownership leads to estimates similar to the ones we obtained from the OLS regressions.

6.4.4. Changes in paid-in capital vs. legal form

As a final robustness test, we verify that our findings are indeed driven by the change in legal form and not simply by (an increase in) the amount of paid-in capital. To do so, we exploit an alternative setting: the reduction of paid-in capital requirements in Austria in 2014. In contrast to Germany, Austria did not introduce a new legal form but instead lowered the paid-in capital requirements for newly created LLCs from 17,500 EUR in cash to 5000 EUR.[20] This means that Austrian LLCs have no suffixes in their names to give clear, observable signals about their paid-in capital. Hence, if the actual amount of paid-in capital rather than the signal related to a firm's legal form were driving our results, we would observe effects similar to those presented above.

As a first test, Fig. 4 displays a plot of total debt against paid-in capital. In contrast to the results shown in Fig. 2, we do not observe a discontinuity in total debt around the threshold level of 17,500 EUR. Total debt appears to linearly increase with paid-in capital. In line with this observation, the results from an RDD analysis shown in Table A5 in the Online Appendix indicate no significant difference between firms close to the threshold value. Similarly, results of a difference-in-differences analysis where we compare firms that at a certain point cross the capital threshold with firms that permanently have paid-in capital higher than 17,500 EUR show no significant changes in debt (Fig. 5 and Online Appendix Table A6).

7. Conclusions

In this paper, we examine how a firm's choice of legal form affects access to debt for a sample of German firms. We find that entrepreneurs choosing a legal form with low paid-in minimum capital requirements acquire substantially lower levels of debt compared to their high-capital counterparts. We provide indirect but compelling evidence that this is due to the default risk signal associated with a firm's legal form. This effect appears to be mainly driven by the negative signal sent by choosing a low-capital legal

[20] After 10 years, the former capital requirements of 17,500 EUR must be reached to prevent the dissolution of the firm.

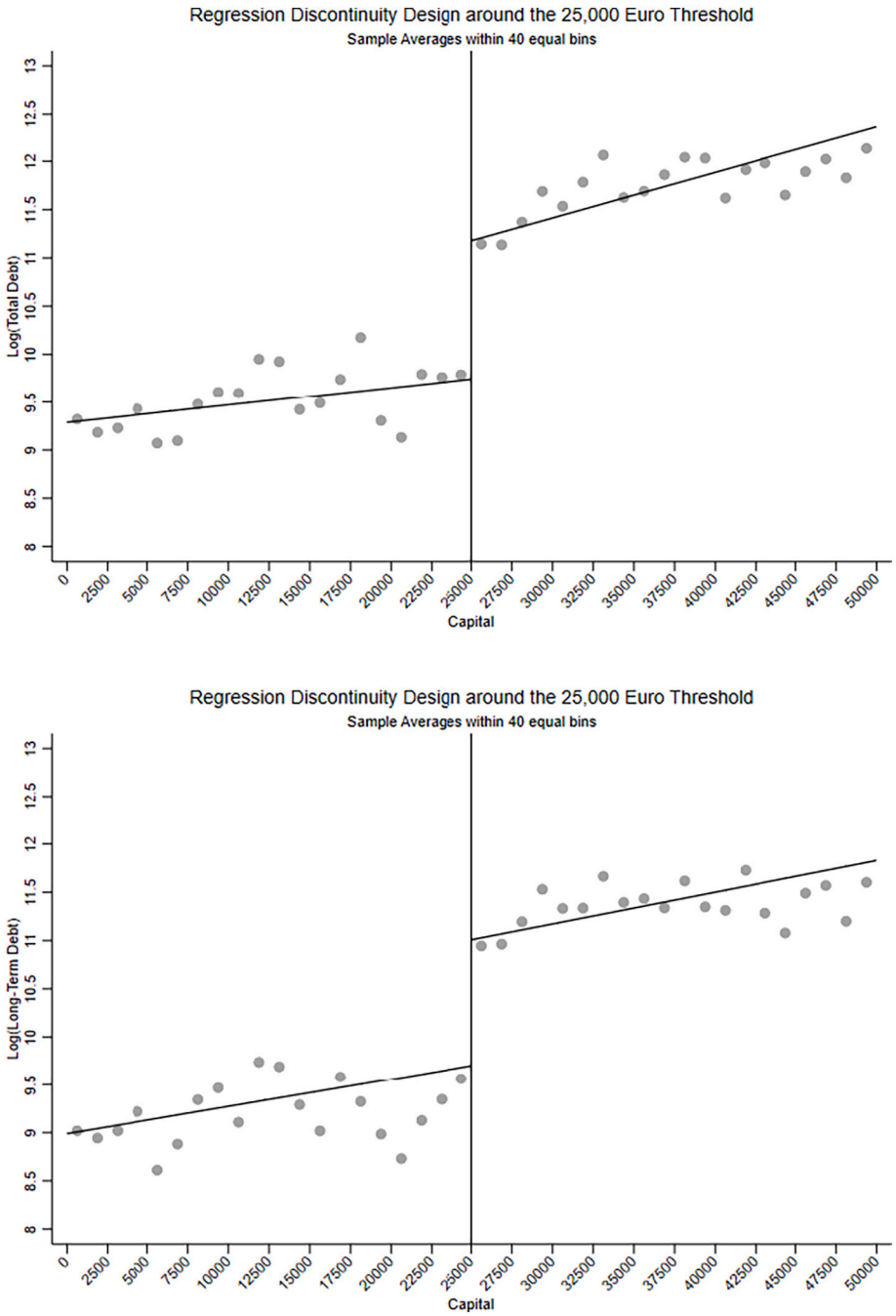

Fig. 3. Notes: These figures plot the relationship between log of total debt and capital (graph displayed at top) and log of long-term debt and capital (graph displayed at bottom). We used a bandwidth of 25,000 (i.e., capital between 0 and 50,000 EUR). The solid line represents the fitted values from the local linear regressions. The vertical line is the cut-off point (i.e., 25,000 EUR in paid-in capital) that defines the treatment (i.e., low- and high-capital LLCs). The dots represent the average log of total debt in 40 bins.

form rather than the positive signal of choosing a high-capital form. Several other plausible explanations for this difference are not supported by the evidence. First, we do not find that low-capital firms have lower demand for debt. Second, we find that investors do rely on firms' legal form and not purely on the underlying level of paid-in capital. Third, omitted variable bias – including the influence of potentially correlated signals – does not appear to undermine our main findings. Furthermore, our results underscore that smaller, relationship-based lenders place greater emphasis on the legal form signal, especially in the early stages of a startup. As startups mature, this emphasis diminishes among these lenders. In contrast, large banks, relying predominantly on hard data, consistently weigh the initial legal form choice irrespective of the firm's age. The findings emphasize the intricate interplay between a firm's age, its

Table 8
Legal form choice and external financing: instrumental variable estimation.

Sample:	Survey sample - no controls		Survey sample - all controls					
IV stage:	First	Second	First	Second	Second	Second	Second	Second
Outcome:	Low-capital LLC	Log(total debt)	Low-capital LLC	Log(total debt)	Log(long-term debt)	Financing constraints	Bank financing constraints	No funds needed
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low-capital LLC		−2.725**		−0.907	−0.092	1.110**	0.961*	−1.033*
		(1.358)		(1.540)	(1.674)	(0.558)	(0.545)	(0.547)
Foreign owner	0.103***		0.098**					
	(0.036)		(0.043)					
Capital	−0.001**	0.002*	−0.000***	0.001	0.001	0.000	0.000	−0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Accumulated profit/loss			0.000	−0.000***	−0.000***	−0.000***	−0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size			−0.023***	0.401***	0.395***	0.023*	0.024*	−0.026*
			(0.004)	(0.044)	(0.058)	(0.014)	(0.013)	(0.014)
Age			−0.035***	0.139	0.178*	−0.048*	−0.051*	0.046
			(0.012)	(0.099)	(0.106)	(0.029)	(0.027)	(0.029)
Tangible assets			0.167***	−2.191***	−1.217***	−0.094	−0.106	0.046
			(0.038)	(0.320)	(0.371)	(0.115)	(0.106)	(0.113)
Patent stock			−0.001	0.133***	0.179***	0.007	−0.012	−0.036**
			(0.005)	(0.024)	(0.038)	(0.011)	(0.009)	(0.015)
Additional Firm controls	No	No	Yes	No	No	Yes	Yes	Yes
Founder controls	No	No	Yes	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8569	8569	3584	8007	5942	3575	3575	3575
R-squared		0.125		0.420	0.240	−0.421	−0.349	−0.353

Notes: This table presents IV estimates from regressions of debt and financing constraint measures on legal form choice. Variable definitions are presented in the Variable Appendix. We use data from the survey sample retrieved from the IAB/ZEW Startup Panel. Standard errors are reported in parentheses and clustered at the firm level. *, **, and *** represent significance at the 10 %, 5 %, and 1 % level, respectively.

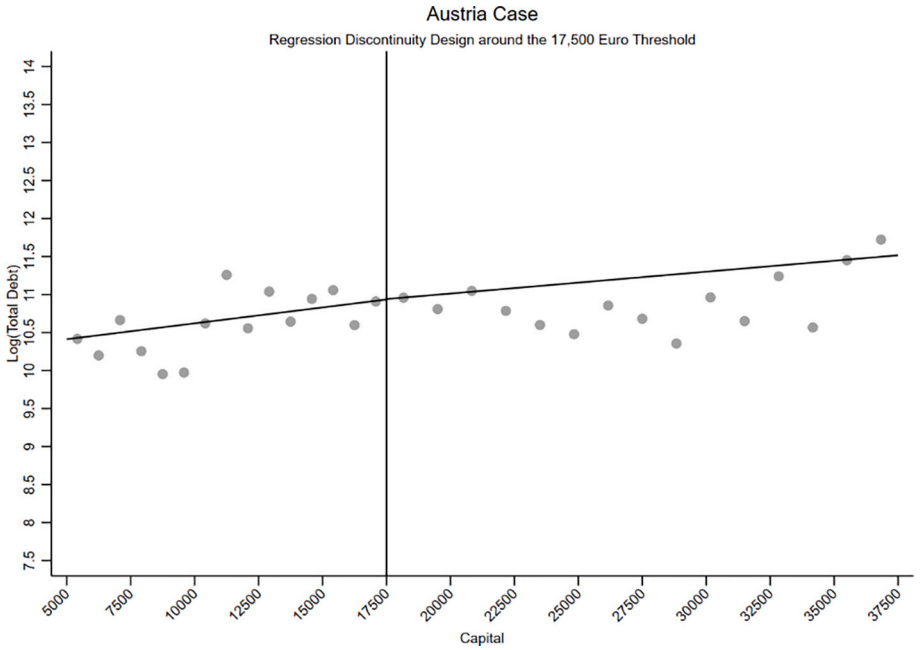

Fig. 4. Notes: This figure plots the relationship between log of total debt and capital for Austrian firms. We used data from firms with capital between 5000 and 37,500 EUR. The solid line represents the fitted values from the local linear regressions. The vertical line is the cut-off point (i.e., 17,500 EUR in paid-in capital) that defines the placebo (i.e., Austrian low- and high-capital LLCs). The dots represent the average log of total debt in 30 bins.

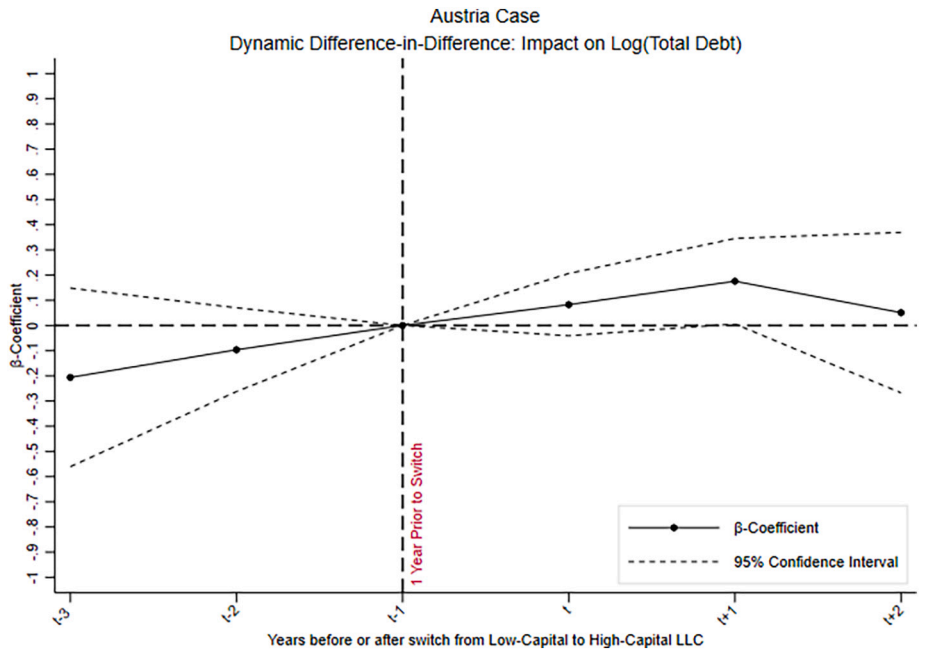

Fig. 5. Notes: This figure presents the results of the dynamic difference-in-differences regression of long-term- (graph on the top) and short-term-debt (graph on the bottom) on time since increase in minimum capital of Austrian low-capital LLCs. The control group are Austrian LLCs that have permanently higher capital. Dotted lines represent 95 % confidence intervals.

chosen legal structure, and the lending policies of different bank types. Theoretically, this interplay highlights the evolving nature of trust and risk perception in the lender-startup relationship, where signals, such as legal form, can have varying degrees of impact based on the firm's life cycle stage and the lender's informational approach.

For entrepreneurs, the results illuminate a pivotal strategic decision in the early stages of firm formation: the trade-off between initial capital requirements and future access to debt and other types of financing. Specifically, while lower capital requirements may offer immediate benefits, such as reduced financial barriers to business formation (Bellon et al., 2021; Robb and Robinson, 2014), our findings suggest they might inadvertently limit future access to external financing. Epure and Guasch (2020) find that debt, and in particular business debt, serves as a signal of governance to private equity investors. This finding emphasizes the possible cascading effects of the legal form choice not only on debt financing but also on a firm's overall reputation and attractiveness to diverse investors. However, our results indicate that the negative signaling consequences of opting for a low-capital legal form can be, to some extent, mitigated by nurturing deep-rooted relationships with financial institutions.

For policymakers, our results underscore a potential pitfall in the ongoing "deregulation race" among countries eager to attract new businesses through relaxed regulatory requirements (Becht et al., 2008; Braun et al., 2013). While such regulatory changes have indeed spurred firm entry (Becht et al., 2008; Branstetter et al., 2014; Klapper et al., 2006), a significant portion of these firms might have otherwise chosen a different legal setup. This shift, our data suggests, may inadvertently hinder these firms from accessing crucial debt financing, ultimately limiting their growth potential.

Our findings have implications beyond the context of the reduction in limited liability requirements. Next to differences in capital requirements among different types of LLCs, most countries also have different legal forms for private and public firms. One of the main differences between these is that public firms are required to have more paid-in capital at startup. As was true of the high-capital firms in our setting, these public companies may be perceived by lenders as being of higher quality. Further research could verify whether the findings in our setting can be extrapolated to this context. Additionally, our finding that the total signaling effect can be decomposed into a positive and negative effect suggests this may also be the case for other signals that come into existence due to regulatory change.

Finally, some limitations in our study point to avenues for future research. While we employ a variety of estimation techniques to isolate the effect of legal form, future work could look for quasi-natural variation to more narrowly identify the causal pathways between legal form and debt financing. Additionally, while our focus has been on how legal form influences the amount of financing, subsequent studies might investigate whether the choice of legal form also prompts loan providers to adjust the financing cost. Recent advances have shown that certain characteristics and actions can "unlock" the signaling value of other firm and market characteristics in the context of new venture financing (Bapna, 2019; Plummer et al., 2016). It would be interesting to examine whether legal form complements or acts as a substitute for other signals identified by prior work. Furthermore, future studies should investigate the signaling value of legal form in the context of equity financing. While debt providers tend to focus on a startup's stability and ability to repay a loan, equity investors concentrate on a venture's growth potential (Bruns et al., 2008). Therefore, different signals may be desired by debt versus equity providers. It is also important to note that our analysis for different lender types is based on a region's

concentration of relationship and transactional banks. Thus, we cannot exclude other factors correlated with regional bank concentration that might impact firms' access to debt, such as financial linkages through regional industry clusters. Future studies could use data on firm-bank relationships to examine whether such factors are indeed at play.

CRediT authorship contribution statement

Felix Bracht: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Jeroen Mahieu:** Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Steven Vanhaverbeke:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None.

Data availability

The authors do not have permission to share data.

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Appendix A

Variable appendix

Variable description

Variable	Description	Datasource
Low-Capital LLC	Dummy set to one if firm operates under the legal form with low capital requirements (i.e., UG in Germany or low-capital GmbH in Austria)	Orbis
Total Debt	Total debt in euros	Orbis
Log(Total Debt)	Log of total debt	Orbis
Long-Term Debt	Long-term debt in euros, conditional on having long-term debt	Orbis
Log(Long-Term Debt)	Log of long-term debt in euros, conditional on having long-term debt	Orbis
Access to Bank Loans	Dummy set to one if investments have been financed by bank loans	IAB/ZEW Startup Panel
% Inv. Financed by Ext. Funds	Percentage of investments that are financed by external funding	IAB/ZEW Startup Panel
Financing Constraints	Financing difficulties due to (any) external investors	IAB/ZEW Startup Panel
Bank Financing Constraints	Financing difficulties due to banks	IAB/ZEW Startup Panel
No Funds Needed	Dummy set to one if firm does not need external financing	IAB/ZEW Startup Panel
Share Relationship Banks	Dummy set to one if the weighted share of small relationship banks for a NUTS-2 region is higher than or equal to 75 %	Orbis
Trade Credit	Firm's value of inventory divided by total assets	Orbis
Foreign Owner (IV)	Dummy set to one if founder has foreign citizenship	IAB/ZEW Startup Panel
Post Switch	Dummy set to one if a low-capital LLC has turned into a high-capital LLC	Orbis
Capital	Issued share capital (authorized capital)	Orbis
Accumulated Profit/Loss	All shareholder funds not linked with the issued capital such as reserve capital, undistributed profit	Orbis
Size	Natural log of Tangible fixed assets +1	Orbis
Age	Years since founding date	Orbis
Tangible Assets	Tangible fixed assets / total assets	Orbis
Patent Stock	Depreciated (annual rate of 15 %) stock of patents	Orbis IP
Financing Banks	Type of financing to cover the demand of external financing: share of funding by banks	IAB/ZEW Startup Panel
Financing Credit	Type of financing to cover the demand of external financing: share of funding by short-term credit (credit from suppliers, overdraft, open credit, etc.)	IAB/ZEW Startup Panel

(*continued on next page*)

(*continued*)

Variable description		
Variable	Description	Datasource
Financing Owner	Type of financing to cover the demand of external financing: share of funding by owner	IAB/ZEW Startup Panel
Financing Family	Type of financing to cover the demand of external financing: share of funding by family and friends	IAB/ZEW Startup Panel
Financing VC	Type of financing to cover the demand of external financing: share of funding by venture capitalist	IAB/ZEW Startup Panel
Financing Mezzanine	Type of financing to cover the demand of external financing: share of funding by mezzanine capital	IAB/ZEW Startup Panel
Investments	investment volume in euros	IAB/ZEW Startup Panel
R&D Expenses	R&D expenditures in euros	IAB/ZEW Startup Panel
Export	Turnover due to export in euros	IAB/ZEW Startup Panel
Employees at Startup	Enterprise's employees at founding date	IAB/ZEW Startup Panel
Founders	Number of founders	IAB/ZEW Startup Panel
Family Members	Number of family members working in the enterprise at founding date	IAB/ZEW Startup Panel
Gender	Dummy set to one if female is part of the founding team	IAB/ZEW Startup Panel
Previous Enterprise	Dummy set to one if (one of the) founder(s) has founded an enterprise before	IAB/ZEW Startup Panel
Prior Experience	Industry experience in years (for teams: founder with the longest experience)	IAB/ZEW Startup Panel
Motive: Self-Employment	Dummy set to one if founding motive = self-determined working	IAB/ZEW Startup Panel
Motive: Business Idea	Dummy set to one if founding motive = realization of certain business idea	IAB/ZEW Startup Panel
Motive: No Emp. Opp.	Dummy set to one if founding motive = inadequate employment opportunities	IAB/ZEW Startup Panel
Motive: Unemployment	Dummy set to one if founding motive = escape from unemployment	IAB/ZEW Startup Panel
Motive: Better Earnings	Dummy set to one if founding motive = Encouragement by former employer	IAB/ZEW Startup Panel
Prior: Self-Employed	Dummy set to one if employment situation immediately before founding = self-employed	IAB/ZEW Startup Panel
Prior: Employed (Private)	Dummy set to one if employment situation immediately before founding = privately employed	IAB/ZEW Startup Panel
Prior: Employed (Public)	Dummy set to one if employment situation immediately before founding = publicly employed	IAB/ZEW Startup Panel
Prior: Unemployed	Dummy set to one if employment situation immediately before founding = unemployed	IAB/ZEW Startup Panel
Prior: Inactive	Dummy set to one if employment situation immediately before founding = inactive	IAB/ZEW Startup Panel
Edu: No Degree / High School	Dummy set to one if highest qualification of the founders = no degree / high school	IAB/ZEW Startup Panel
Edu: Undergraduate	Dummy set to one if highest qualification of the founders = undergraduate education	IAB/ZEW Startup Panel
Edu: Graduate	Dummy set to one if highest qualification of the founders = master's level and beyond	IAB/ZEW Startup Panel

Notes: This table shows all variables and respective data sources used for the empirical analysis.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbusvent.2024.106380.

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