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Financing intangibles: Is there a market failure?

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1. Introduction

It is well established that growth companies positively and disproportionately impact employment creation and economic growth (European Commission, 2016a; OECD, 2019a). At the same time, these companies are confronted with significant challenges, including access to finance (OECD, 2019b). Numerous initiatives have been taken by regional and national authorities and by the European Union to alleviate growth companies' expected funding gaps. Despite these efforts, 61% of EU27 high-growth companies highlight that access to finance is still a growth barrier (EIBIS, 2019) and 9% of European high-growth companies even consider access to finance as their *most pressing* problem (SAFE, 2019). To date, an area that has not received much attention from governments and academics is the funding of growth companies' intangible assets. While intangible assets are important for most growth companies (OECD, 2019b), it is argued that intangible asset-based funding is not readily available due to the low perceived market value and tradability of these assets (Döttling, Ladika, & Perotti, 2018). Hence, the financing of intangibles might pose significant difficulties for growth companies. **The goal of the present document is to present a method to assess whether European growth companies suffer from a debt financing gap for their investments in intangible assets.**

We specifically **focus on debt financing**, as the equity financing gap has already received a lot of attention from both scholars¹ and policy-makers (European Commission, 2016a). However, only a small minority of growth oriented companies want or are able to attract equity financing: while approximately 187,000 high-growth enterprises were identified in the EU in 2017 (Flachenecker et al., 2020), only some 4,000 companies raised venture capital in the same year (Invest Europe, 2019). Equity funding may either be undesirable for entrepreneurs, due to issues of sharing control with new shareholders, or be unavailable due to extremely high return expectations of early stage equity investors like venture capital or business angel investors, driven by high levels of business risk and information asymmetries.

The availability of sufficient and adequate financing for high-growth companies may be even more acute in today's economic climate, where the current COVID-19 pandemic is causing significant liquidity and cash flow shocks in the financial system and in companies worldwide. Companies heavily suffer from lower consumer demand, high uncertainty and supply shocks from both supply chain disruptions and reduced labour forces (European Commission, 2020a). While governments were quick to respond, this crisis will without doubt have a detrimental economic impact. Growth companies might be most heavily impacted and might hence suffer disproportionately from funding gaps. All the above problems may cause further pressure on growing firms' investments, especially those in intangibles, and jeopardise future economic development.

¹ For example, Gualandri and Venturelli (2009) find an equity gap of €147,000 for innovative Italian SMEs, Harding and Cowling (2006) find an equity gap between £150,000 and £1.5 million for U.K. high growth potential entrepreneurial firms. The Commission has recently launched ESCALAR, a new investment approach, developed together with the European Investment Fund (EIF), that will support venture capital and growth financing for promising companies, enabling them to scale up in Europe and help reinforce Europe's economic and technological sovereignty (European Commission, 2020b).

A minority of growth companies – more specifically high-growth companies and scale-ups – account for more than half of the growth in employment and output in high-income countries (Grover Goswami, Medvedev, & Olafsen, 2019). Research has therefore particularly focused on high-growth companies and scale-ups, which makes data on these companies more readily available. Accordingly, the present analysis also relies strongly on data from high-growth companies and scale-ups.

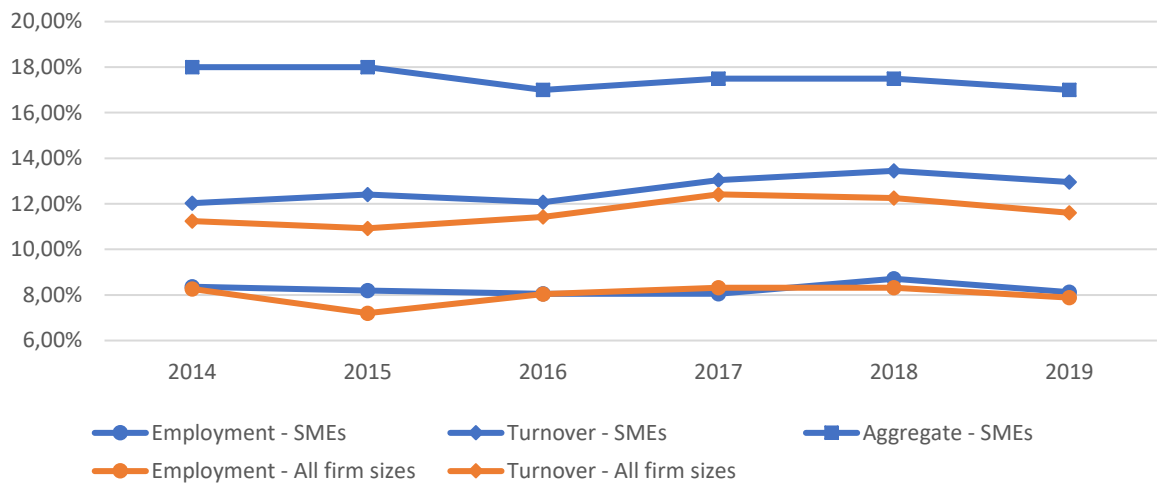
This study starts with defining key concepts such as ‘growth companies’ and ‘intangible assets’. Then, we document existing evidence on how much growth companies invest in intangibles and how firms currently finance their investments, with a focus on debt financing. Next, we review policy interventions and elaborate on the theory and reasoning behind the financial constraints growth companies might experience. Further, we review how the current literature measures funding gaps. Finally, we develop and present a method for measuring possible debt funding gaps.

2. Definitions

2.1. What are growth companies?

Without converging on an explicit, well-established definition, research and practice commonly consider growth companies as those that have stronger levels of growth than comparable peer companies. Growth is typically measured as growth in sales or turnover, employees, total assets or cash flows (Delmar, Davidsson, & Gartner, 2003). For reasons of data availability, our analysis focusses on high-growth companies or scale-ups. The terms scale-up and high-growth company are frequently used interchangeably—as we also do in this study. The most widely used definition of scale-ups—by professionals, policy makers and academics—is the OECD-Eurostat definition: **“all enterprises with average annualised growth greater than 20% per annum, over a three-year period. Growth can be measured by the number of employees or by turnover.”** (Eurostat, 2007, p. 61). Figure 1 shows the proportion of European scale-ups in the overall population of companies of all sizes and in the population of European SMEs, respectively (using the OECD-Eurostat definition). Approximately 8% of companies are scale-ups when growth in employment is considered and some 10-13% when growth in turnover is considered. Taken together, **between 17 and 18% of all SMEs can be considered scale-ups** (i.e., they either realized high growth in employment and/or in revenues).

Figure 1: Proportion of scale-up companies in Europe



Source: Survey on the Access to Finance of Enterprises (SAFE), 2019. Associated question: Over the past three years, how much did your enterprise grow on average per year? Only 'over 20% per year' is considered.

2.2. Intangible assets

Defining and measuring intangible assets, also referred to as 'intangible capital', is challenging. Table 1 presents the definition of intangible capital introduced by Corrado, Hulten, and Sichel (2005) and used by the OECD. Without being exhaustive, table 1 presents frequently used examples to measure a firm's overall intangible capital (Hunter, Webster, & Wyatt, 2005; Pastor, Glova, Liptak, & Kovac, 2017). The main categories of intangible capital are **computerized information, innovative property and economic competencies**. This highlights that intangible capital is much more comprehensive than only formal intellectual property rights like patents, trademarks or copyrights. The intangible intensity of a company should be measured on a continuous scale² rather than crudely separating companies investing in intangibles from those that do not (see for example Andrews & De Serres, 2012; Hunter et al., 2005; Sun & Xiaolan, 2019). Some companies might invest in intangible assets, but only to a limited extent, while others might invest heavily in intangible assets.

² By, for instance, the share of investments in intangible assets relative to total investments.

Table 1: Intangible capital, examples and firm-level measurements

	Examples	Survey measurements	Other measurements
Computerized information	Software; databases	<ul style="list-style-type: none"> Investment in software, data, IT networks and website activities (EIBIS, 2019) Engagement in in-house software development (CIS, 2019) 	Software expenses
Innovative property	R&D; patents; copyrights; trademarks	<ul style="list-style-type: none"> Investment in R&D, including acquisition of IP (EIBIS, 2019) Proportion of machinery and equipment (incl. ICT) that is state-of-the-art (EIBIS, 2019) Introduction of innovative products, innovation percentage of total turnover, engagement in R&D (CIS, 2019) Possession, licencing out³ or licencing in⁴ of patents, copyrights or trademarks (<i>Kaufmann Firm Survey, 2011</i>). Number of employees working in R&D (<i>Kaufmann Firm Survey, 2011</i>) 	R&D expenses, patenting data, copyrights, trademarks
Economic competencies	Firm-specific human capital; structural resources;	<ul style="list-style-type: none"> Investment in firm-specific human capital (CIS, 2019) 	Wage and salary costs of employee training

3. Scale-ups' investments in intangible assets

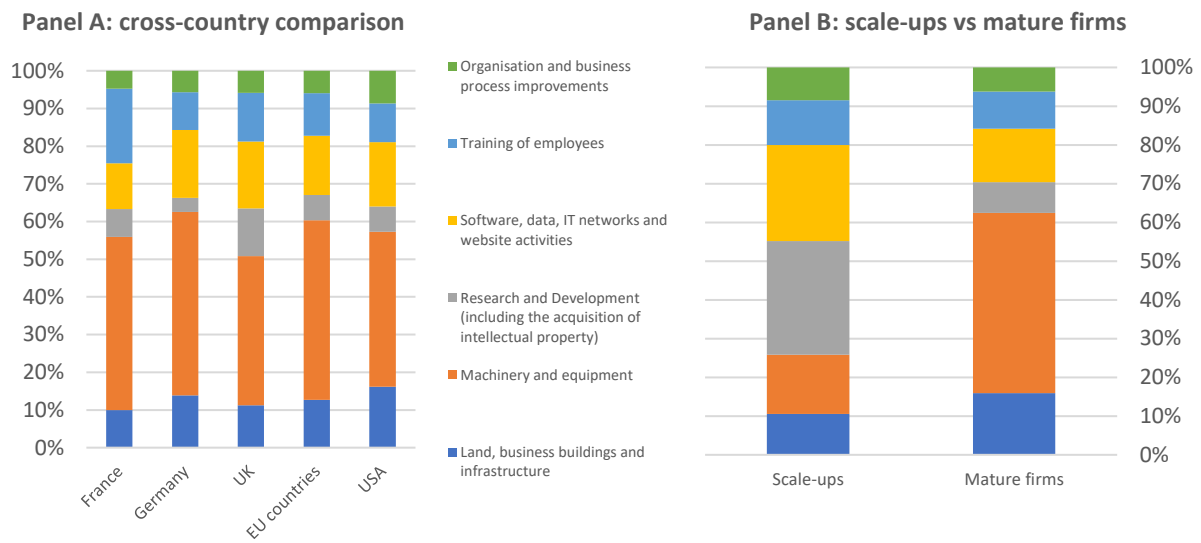
The European Investment Bank's Investment Survey (EIBIS) 2019 gives an indication of the relative importance of intangible investments in the overall investment activities of SMEs. Figure 2 (Panel A) compares E.U. countries with the U.S.A.. As much as 40% of SME investments, both in the E.U. and the U.S.A., are in intangible assets (the top four categories in Figure 2). Panel B zooms in on European scale-ups⁵ and compares the relative importance of their investments to those of more mature companies (companies older than ten years). **Almost 75% of all scale-ups' investments are in intangible assets** (R&D, software, data IT networks and website activities), which is substantially more than mature companies whose investments are only for 40% comprised of intangible assets. Mature companies mainly invest in tangible assets (land, buildings, infrastructure, machinery and equipment). **Surprisingly, only 9% of European SMEs protect their intangible capital by means of intellectual property rights (IPR), compared to 90% of large companies** (EUIPO, 2015). These figures highlight that a focus on the financing of scale-ups' intangible investments is warranted.

³ This is defined in the Kauffman Survey (2011) as "licensing patents, copyrights, or trademarks owned by the business to other parties under a licensing agreement".

⁴ This is defined in the Kauffman Survey (2011) as "acquiring the right to use intellectual property such as patents, copyrights, or trademarks created by someone outside the business through a licensing agreement".

⁵ The EIB Investment Survey categorizes scale-ups as young (less than 10 years old), high-growth companies.

Figure 2: Average share of investment in different asset types



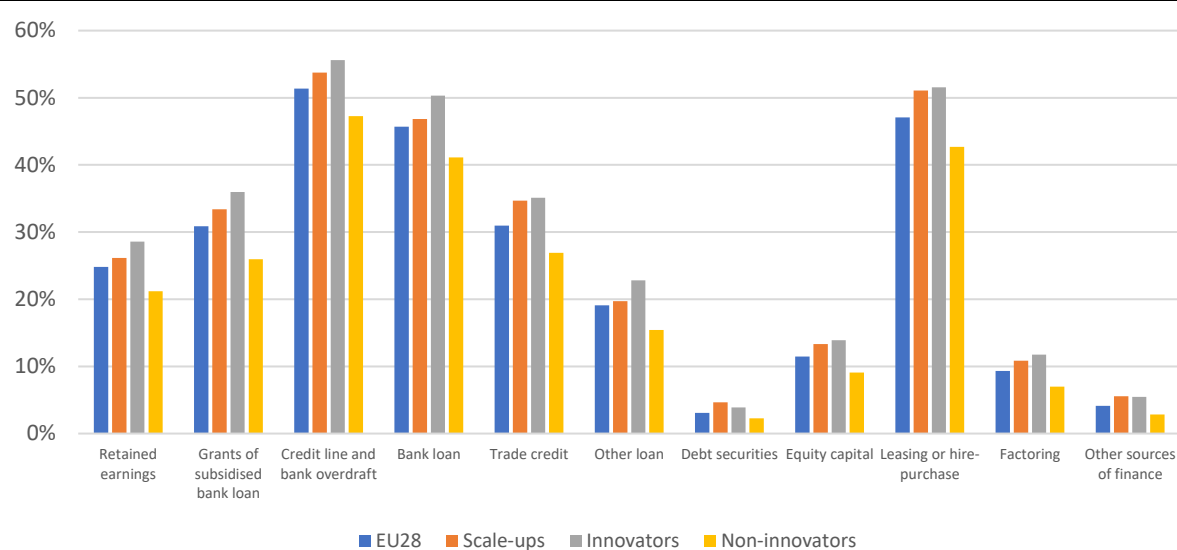
Source: European Investment Bank: EIBIS 2019. Associated question: “In the last financial year how much did your business invest in each of the following with the intention of maintaining or increasing your company’s future earnings?”. Mature companies are companies older than 10 years.

4. The financing of scale-ups

4.1. Financing mix

Figure 3 indicates how European firms finance their investments in general (SAFE, 2019). It shows the proportion of firms that stated to find a specific financing type relevant, meaning they have used it in the past, or consider using it in the future. The financing policy of the EU28 average firm is compared to that of scale-up firms, innovators and non-innovators, as defined in the SAFE (2019) report. **The most relevant sources of funding for all types of companies, each considered relevant by more than 40% of the firms, are the traditional bank-related funding (overdrafts and loans) and leasing. Innovators and scale-ups consider all of the listed financing options to be more relevant compared to the other type of firms, suggesting that they need to raise funding from a more varied array of sources. However, equity financing is only relevant for slightly more than 10% of the innovators and the scale-ups.**

Figure 3: European firms' use of financing



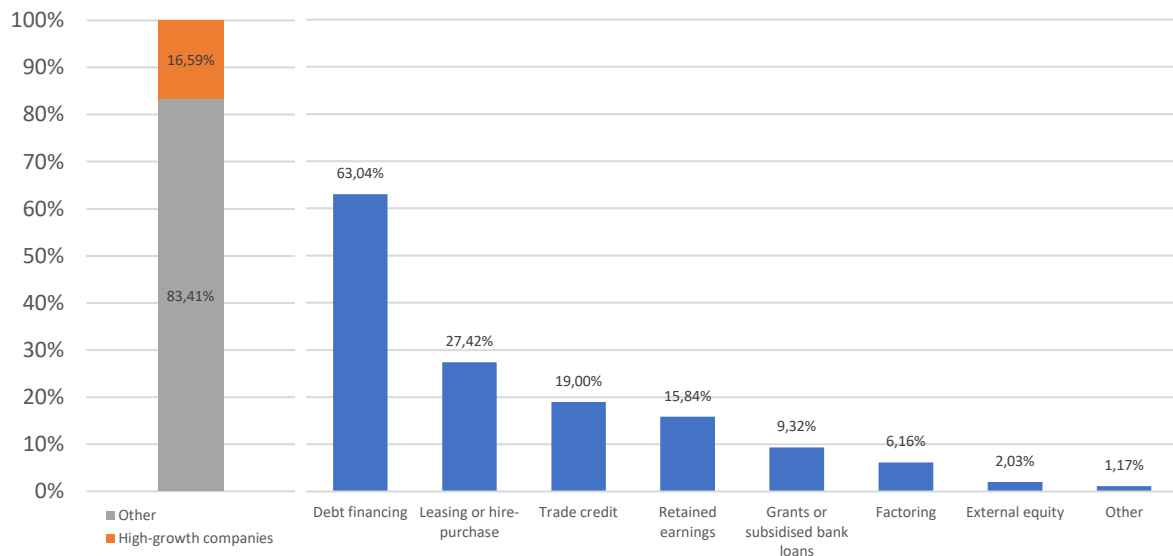
Source: Survey on the Access to Finance of Enterprises (SAFE), 2019

Related question: Are the following sources of financing relevant to your firm, that is, have you used them in the past or considered using them in the future?

Figure 4 delves deeper into the use of different financing sources in high-growth companies. While VC investors target firms with high growth potential, only a small fraction of high-growth companies raise VC funding. Indeed, only 2.03% of high-growth firms (16.59% of all firms) in the SAFE survey raised external equity (i.e., VC, business angel) over the last 6 months. This evidence also corresponds with Flachenecker et al. (2020), who identify approximately 187,000 high-growth enterprises in the EU in 2017, while in the same year only some 4,000 companies raised venture capital according to Invest Europe (2019). VCs require high rates of return which not all growth companies can provide (Cochrane, 2005).⁶ Moreover, not all growth companies are willing to raise VC funding as this implies both giving up control and a higher cost of equity (Catalini, Guzman, & Stern, 2019; Da Rin, Hellmann, & Puri, 2013). Overall, while external equity in general and venture capital in particular are undeniably important to stimulate the growth of firms with high potential, many high-growth companies do not raise (or do not want to raise) external equity. In contrast, the SAFE survey shows that 63.04% of high-growth firms raised debt over the last 6 months.

⁶ It is also important to acknowledge that many venture capital backed companies eventually fail to realize their high growth ambitions.

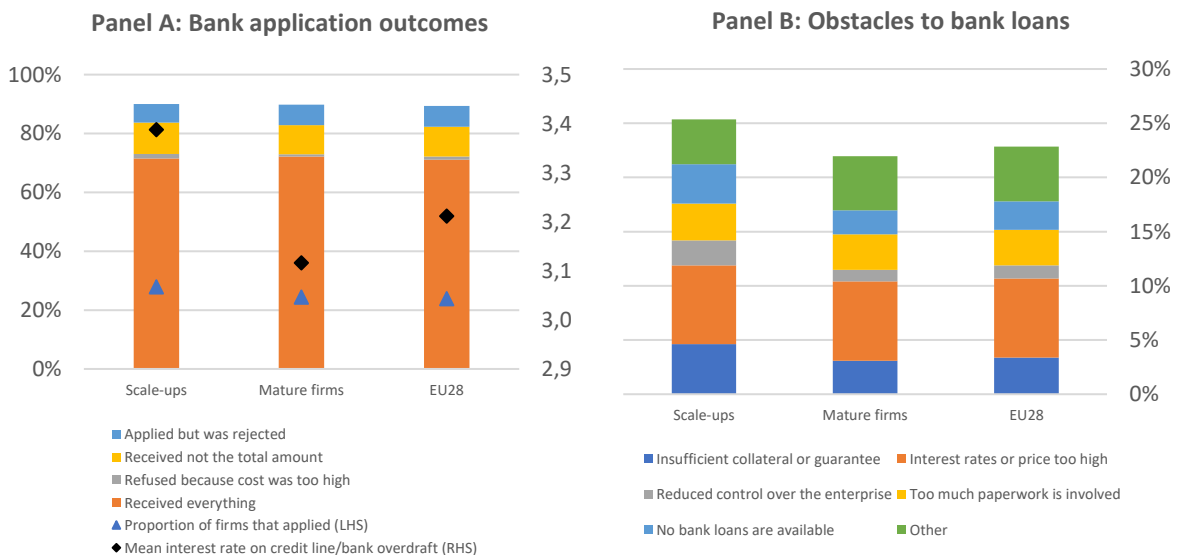
Figure 4: High-growth firms' use of financing



Source: SAFE (2019). Debt financing consists of bank loans, credit lines, bank and credit cards overdrafts and debt securities. Related question: Have you obtained the following sources of financing in the past 6 months?

Interestingly, while scale-ups (28%) applied slightly more often for bank loans than mature firms (24%), the proportion of scale-ups that eventually received the total amount of bank financing applied for is equal to that of mature companies (72%) (Figure 5, Panel A). However, high-growth firms pay higher than average interest rates on their credit lines and bank overdrafts. Moreover, 25% of all scale-ups report obstacles, compared with 22% of the mature companies (22%). More specifically, **scale-ups report insufficient collateral or guarantees and unavailability of bank loans more often as an obstacle to receiving bank financing** (Panel B).

Figure 5: Bank application outcomes and reasons for bank financing being irrelevant



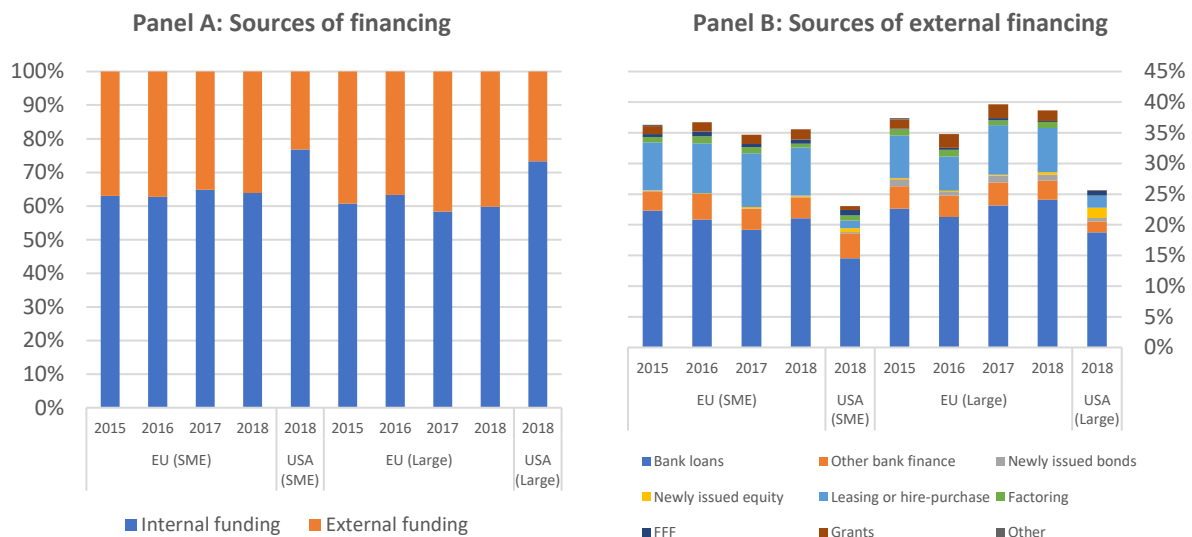
Source: SAFE (2019)

Related question panel A: "Bank loan (excluding overdraft and credit lines) - If you applied and tried to negotiate for this type of financing over the past 6 months, what was the outcome?"; related question panel B: "You mentioned that bank loans are not relevant for your enterprise. What is the most important reason for this?"

4.2. A further focus on bank financing

While figure 3 highlighted the proportion of firms that find a particular source of finance relevant, figure 6 shows how much of a particular funding type is used (EIBIS, 2019). Between 60% (European firms) to 76% (U.S. firms) of all investments are financed by internal means, including retained earnings and internal funds (Figure 6, Panel A). Figure 6, Panel B, zooms in on the importance of different external financing sources. This panel again highlights the importance of traditional bank loans, especially in Europe. Bank loans, leasing and other bank financing even account for more than 90% of all SME external financing in Europe. This evidence is in line with the pecking order theory, which states that companies will finance investments with the financing method least subject to information asymmetries (i.e., internal funds) first, followed by debt finance and only then external equity finance as a last resort (Myers & Majluf, 1984). Newly issued equity and founders, family and friends (FFF) are not important for the average SME, and even less so in Europe compared to the U.S.A..

Figure 6: Financing sources for European and U.S. SMEs versus large firms



Source: EIBIS 2019

Related question: "Approximately what proportion of your investment in the last financial year was financed by each of the following?" – we have excluded intra-group lending, as this is only a small proportion and not relevant to this report.

The evidence above focuses on the importance of bank debt for all SMEs, including high growth and low growth companies. Evidence from Belgian high-growth firms provides a similar picture. More specifically, in their study on the financing events of the top 1% high-growth firms in Flanders and Brussels over the 1997-2004 period, Vanacker and Manigart (2010) show that financial debt is the most common financing route, accounting for almost 45% of the financing events in their sample. Internal finance is the second most frequently used way to finance growth: nearly 39% of the financing events are increases in retained earnings. Only 16% of the financing events relate to raising external equity financing. Overall, although external equity is undeniably an important source of finance for those scale-ups that do raise equity, almost 85% of the financing events relate to retained earnings and financial debt.

While there is ample evidence of the importance of traditional financing sources for scale-ups (SAFE, 2019; Vanacker & Manigart, 2010), the limited academic literature on scale-up finance has focussed primarily on equity financing, arguing that debt is less important for these companies (Duruflé, Hellmann, & Wilson, 2017; Wilson, 2011; Wilson, Wright, & Kacer, 2018). Some academics argue this is because scale-up companies' investment projects are not well suited for debt financing due to their high risk profile and the intangible nature of their investments, limiting the importance of tangible assets which could serve as collateral (Berger & Udell, 1998; Gualandri & Venturelli, 2009; Hellmann et al., 2016). More than the "average" firm, intangible-rich scale-ups are subject to information asymmetries, exacerbated by the scarcity of collateral assets, as highlighted in Figure 5. Intangible-rich companies are more likely to finance their new investments with external equity, rather than with debt or retained earnings (Vanacker & Manigart, 2010).

In spite of general scholarly belief that intangible assets are poor collateral and in spite of scale-ups reporting a lack of tangible collateral as an obstacle to receiving bank loans, some academic studies nevertheless suggest that intangible assets may be linked with debt financing. For example, Loumioti (2012) showed that 21 percent of U.S.-originated syndicated secured loans⁷ were backed by intangibles as collateral and that these loans did not perform worse than other secured loans. Factors associated with a stronger use of intangibles as collateral are their redeployability and borrower reputation. Interestingly, intangible assets are also positively related to long-term debt levels for Dutch SMEs in 2002-2005 (Degryse, de Goeij, & Kappert, 2012).⁸ In line with this evidence, the OECD emphasizes the need for policy to foster the use of intangible capital as collateral for innovative, fast-growing SMEs in their debt financing needs (OECD, 2019b). The British Business Bank (2018) furthermore advocates for lower interest rates for intangible-rich firms since they have lower default rates than firms without intellectual property.

4.3. Availability of venture debt financing

A relatively recent phenomenon to finance young and/or scale-up firms is venture debt lending (De Rassenfosse & Fischer, 2016; OECD, 2020). Venture debt lenders rely on a scale-up's patents as collateral, using warrants to overcome the agency problems associated with debt. Recently, bank divisions as well as larger assets managers and smaller funds founded by ex-industry professionals have started to focus on the venture debt market (Kraemer-Eis, Botsari, Gvetadze, Lang, & Torfs, 2019). Venture debt might be a desirable funding source for growth firms because it is non-dilutive, but prior venture capital funding serves as a certification towards venture debt lenders.

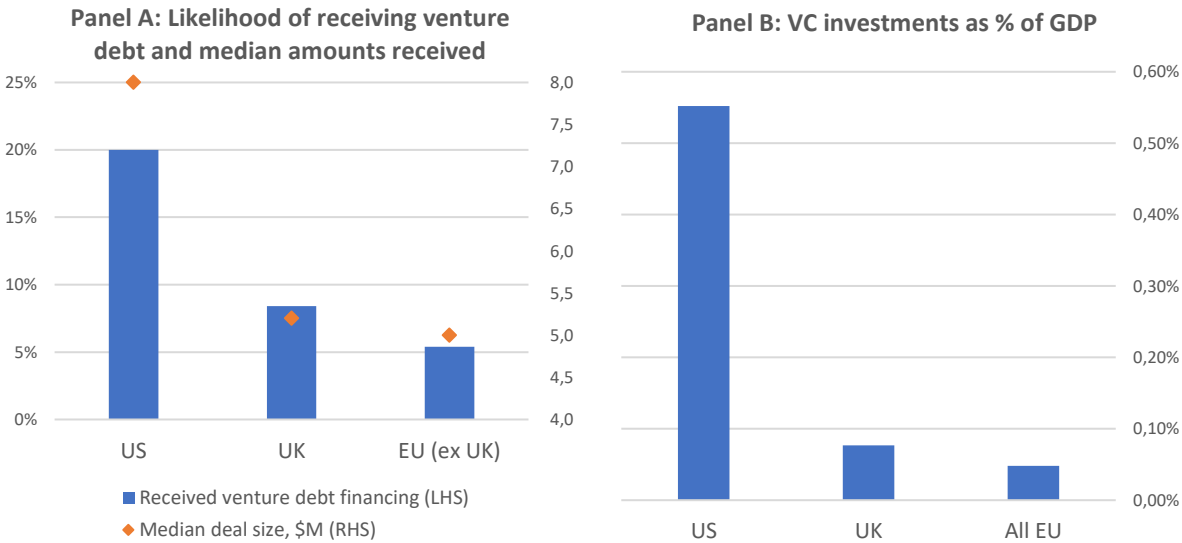
Data on venture debt is hard to find, however, because of the recency of the phenomenon. As such, there is little systematic data collection yet on debt amounts, performance of loans or repayment ratios. Based upon Preqin data, figure 7 panel A indicates that **some 20% of VC-backed companies in the U.S. received venture debt financing at some point in their funding history, compared to only 8.4% for U.K. companies and 5.4% for non-**

⁷ The OECD (2019b), however, shows that a substantial part of all U.S. patent-based loans are large transactions from large corporations flooded with current assets (such as accounts receivables).

⁸ These authors, however, also caution that very few SMEs in their sample use intangible assets as collateral. Moreover, they find that intangible assets are less impactful than tangible assets as drivers of SMEs' leverage ratios.

U.K. European companies (Hellmann et al., 2016). The median venture debt contract amounted to \$8M for U.S. VC-backed scale-ups, \$5.2M for U.K. scale-ups and \$5M for scale-ups in the rest of Europe. It is clear that European scale-ups have access to less venture debt than U.S. scale-ups. Further, **companies that received venture debt financing are able to raise larger equity rounds**, which refutes the concern that venture debt would merely be a substitute for venture capital (Hellmann et al., 2016). Figure 7 (panel B) shows that this wide difference found between the U.S. and E.U. venture debt market is comparable with that in the venture capital markets.

Figure 7: Comparison between venture debt and venture capital



Source (panel A): Hellmann et al. (2016); source (panel B): Invest Europe, OECD. Panel B is based on data for 2018.

Regulatory changes in capital requirements for banks could foster the growth of the European venture debt market. According to the current MiFID framework, venture debt is considered a high risk loan. Given the complementarities with traditional bank lending services, relaxing those requirements for venture debt could make banks more eager to support growth companies by providing them with venture debt financing (Duruflé et al., 2017). Nevertheless, it is important to note that venture debt in the U.S. is almost exclusively provided by specialized venture capital investors, not by banks.

As not all companies are able or willing to raise equity financing, and are hence hampered in their growth (OECD, 2019a), the OECD (2019b) argues that it is crucial for policy to specifically address the problem of collateralisation of intangibles. More research is therefore needed on how to address this potential financing gap for intangible-rich growth companies (OECD, 2019b). Nevertheless, some public policy initiatives worldwide already focus on addressing intangible-based debt funding; these are presented in the next section.

5. Public policy interventions in the venture debt market

Provided there is a debt funding gap for (European) intangible-rich growth companies, government intervention might be a way to – indirectly – restore the credit market equilibrium by increasing growth companies’ access to debt financing (Arping, Lóránth, & Morrison, 2010). However, there is no single policy that can conclusively

mitigate all financing constraints. Rather, different policy interventions are targeting different components of the funding gap, both at the supply and demand sides of debt funding. Supply-side policy intervention through credit guarantee schemes or direct government funding is commonly used and a high priority in most OECD countries (OECD, 2010). However, this is often not specifically targeted towards (high-)growth companies⁹ (Grover Goswami et al., 2019).

Policy responses sometimes explicitly focus on intellectual property rights (IPR), which legally protect the intangible capital of a company, especially those intangibles resulting from R&D, branding and artistic work (OECD, 2013, 2015). As IPRs are legally protected, they are tradeable, licensable and provide salvage value in case of default (Harhoff, 2011; OECD, 2015). Moreover, IPR can reveal valuable information on a company's quality and potential as the associated quality signal is easily observable and expensive to obtain for low quality companies (Bloom & Van Reenen, 2002; Hoenen, Kolympiris, Schoenmakers, & Kalaitzandonakes, 2014), thereby reducing information asymmetries. IPRs may hence address insufficient collateral concerns.

Table 2 gives an overview of the policy interventions specifically targeting growth and intangible-rich companies. Having emerged in recent years, these policy initiatives are mainly concentrated in Asia (European Commission, 2016b; OECD, 2019b).

The most elaborate financing scheme to address intellectual property (IP) and intangible-based financing is found in China. The Chinese government apportions collateral value to IP rights and acts as a central registry thereof. It encourages commercial lenders to provide intangible-rich SMEs with debt funding based upon this collateral value. Dedicated IP funds have furthermore been established to specifically target IP-backed lending in key industries (e.g., mobile internet and biotechnology). In many cases these funds are established by private companies with support from the government which covers up to 100% of the net loss. In response to the 2008 financial crisis, the Shanghai government launched a scheme focussing on short term lending for average loan amounts of RMB 3 million (equal to 316,000 in 2009 euros). By the end of 2013, RMB 1.8 billion had been provided (equal to 220 million in 2013 euros) through this scheme. While only patents were originally considered as collateral, trademarks, and to a lesser extent copyright assets, have also been considered since 2016 (OECD, 2019b). Other prominent countries providing state-backed collateralisation of intangible assets are Korea (backing up to 95% of the IP value) and Singapore (backing up to 50% of the IP value). Malaysia backs up to 50% of the loans provided by the government's IP Financing Scheme (APEC, 2018).

A second intervention, mostly used in Japan and Korea provides subsidised IP evaluation reports to business lenders (APEC, 2017). These reports are provided by independent researchers and are primarily based on public data as well as information provided by the SME (JPO, 2017). The Japanese scheme specifically targets SMEs and subsidises up to 150 evaluation reports per bank annually. The Japanese government also provides IP education – and hence familiarisation – to local business lenders. Early indications point to more in-bank incorporation of similar IP valuation techniques (OECD, 2019b).

⁹ Exceptions are the Netherlands, Scotland, Finland, and more recently Australia, Hungary and Italy (Mason & Brown, 2013).

A third policy initiative is to directly provide government loans to businesses willing to purchase or commercialise IP, or with IP as collateral. The Development Bank of Korea is a prominent user of this system and targets between-firm IP transactions to boost technology exchanges (IPO, 2018). Schemes in France also support intangible-rich companies through uncollateralised loans and guarantees between €50,000 and €3 million (Business France, 2017).

Finally, the OECD further states that governments have acknowledged the funding gap, especially the one for intangible-rich scale-up companies, but urges governments to further adequately tailor policies to tackle any remaining hurdles (OECD, 2019b). The European Union Intellectual Property Office (EUIPO) further highlights that most SMEs with registered IPRs never tried to leverage their intangible assets (EUIPO, 2019). Therefore, policy should also be tailored to sufficiently inform growth companies of their options.

Table 2: Public policy interventions

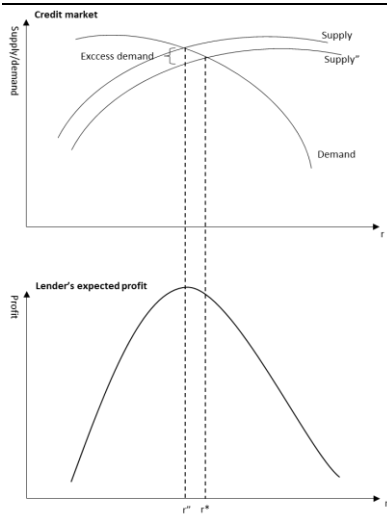
	Prominent users	Type of IP	Guaranteed proportion
Apportion of collateral value for IP and intangible-based financing	China	Patents, copyright, trademarks	Up to 100% of value of IP
	Korea		95% of value of IP
	Singapore		50% of value of IP
	Malaysia		50% of IP loan value
Government subsidized IP evaluation reports for business lenders	Japan	Patents	
	Korea		
	Malaysia		
Provision of loans for purchasing, commercialising and collateralising of IP	Korea	Patents	<i>Info unavailable</i>
	Malaysia		80% of value of IP
	France		Max €3 million

6. Is there a debt funding gap?

6.1. Mechanisms behind a possible debt funding gap

A debt funding gap for growth companies occurs when high-quality demand does not meet supply for credit. In line with the definition of the equity gap provided by Wilson et al. (2018), a debt funding gap can be defined as the amount of debt that would have been provided under perfect information minus the actual amount of debt provided. **A debt funding gap is hence primarily driven by information asymmetries.** The value and risk of a project for which the entrepreneur seeks bank financing is only (partially) known to insiders of the firm. The bank often does not have sufficient information to correctly assess the value and risk of the project. Asymmetry of information between high-quality demand and supply of funding leads to adverse selection and moral hazard problems.

Figure 8: Credit rationing



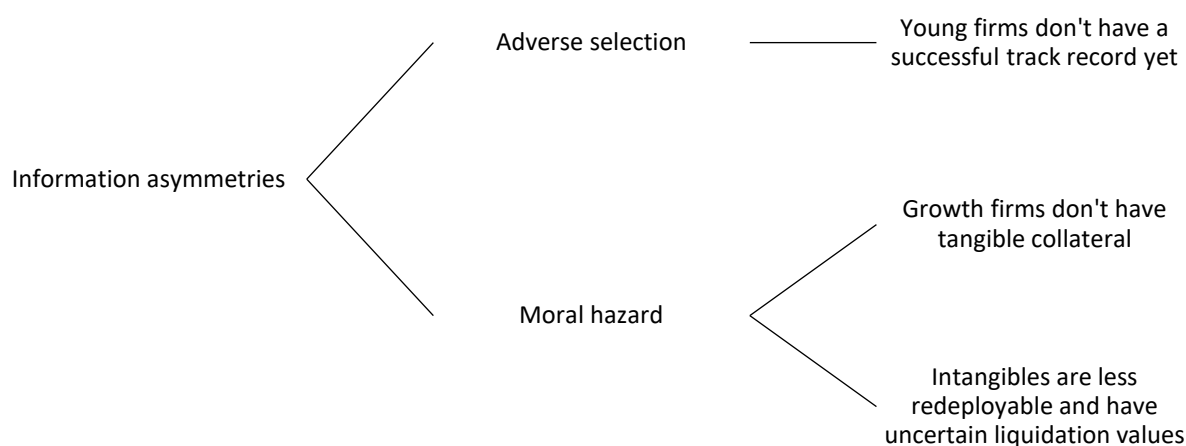
Adverse selection occurs when banks cannot set apart bad projects from good projects. In the case of symmetric information, banks would simply charge higher interest rates to riskier projects. Unfortunately, information asymmetries and the ensuing “lemons problem” prevent this. Banks are reluctant to charge higher interest rates to all firms, since the healthier projects would drop out of the credit market and the riskier projects would hence be overrepresented leading to the problem of adverse selection. Banks therefore prefer to adjust the supply of credit downwards by not letting firms lend beyond a certain interest rate (Jaffee & Russell, 1976; Stiglitz & Weiss, 1981). This is summarized in figure 8. The credit market has an equilibrium for $r = r''$, where supply meets demand. However, banks decrease the credit supply by not allowing risky firms to

lend beyond a certain interest rate. This results in an excess demand, since demand is lower in the new equilibrium. This supply adjustment further results in an increased interest rate r^* . This however leads to less profits for the banks, as r^* is not profit-maximizing, as highlighted in the second graph in figure 8.

A second problem driven by information asymmetries is the moral hazard problem, which occurs when entrepreneurs take on excessive risk, misuse the funds or when their commitment to the project decreases once the credit has been approved because of the induced limited liability in case of default (Holmstrom, 1979). Information asymmetries lead to a funding gap because despite requesting credit and being able to afford it, banks are reluctant to provide debt financing to entrepreneurs. The moral hazard problem is somewhat mitigated by credit providers through monitoring by using covenants and demanding collateral (Rajan & Winton, 1995).

The debt funding gap is even larger for intangible-rich growth companies because information asymmetries are larger for those firms (Freel, 2007; Lee, Sameen, & Cowling, 2015; Schneider & Veugelers, 2010). Figure 9 provides an overview of information asymmetries for intangible-rich growth firms. Firstly, intangible assets are of lower value for lenders since they are less redeployable and have uncertain liquidation values (in case of default) (Gilson, John, & Lang, 1990; Myers, 1977; Williamson, 1988). However, Dutch and U.S. findings suggest that banks do provide IP-based debt financing to some extent (Degryse et al., 2012; Loumioti, 2012; OECD, 2019b). Secondly, high-growth companies are inherently riskier as they are commonly young companies. A firm’s age is negatively related to information asymmetry because young companies cannot provide lenders with a track record of successful lending history (Hall, 2010).

Figure 9: Information asymmetries in intangible-rich growth companies



6.2. Measuring the debt funding gap and identifying growth companies

In measuring a funding gap, a researcher will try to determine whether a group of firms has more and easier access to (external) capital markets than other firms. A debt funding gap may manifest itself through high quality firms getting more expensive credit, not receiving the full amount requested, being rejected and/or discouragement (EIBIS, 2019; Ferrando & Mulier, 2017; Jappelli, 1990). If that is the case, firms are financially constrained.

The classification of measures for financial constraints in table 3 below is predominantly based on Silva and Carreira (2012) and Gualandri and Venturelli (2009). While older literature mainly relied on indirect measures that link firm characteristics to financial constraints, more recent studies focussed on direct measures by surveying relevant stakeholders. Each approach has its advantages and disadvantages, as is briefly discussed in table 3. Because the growth company literature is not abundant, literature on their financial constraints is even less so. Nevertheless, for each method, relevant studies are presented in footnotes.

Indirect (quantitative) measures include Q equations, investment to cash flow sensitivity analyses and Euler equations. The first measure argues that q (which measures the company's investment opportunities) should be the only predictor for investment activities for unconstrained firms. This method is however not applicable in the context of (mainly) unquoted growth firms, since the calculation of q requires a firm's market value. Furthermore, q has been shown to have low explanatory power, even for allegedly constrained firms. Investment to cash flow sensitivity analyses estimate the sensitivity of firms' investment activities to their internally generated cash flows. If cash flow is strongly correlated with investments, then firms' investment activities depend on the level of cash flow, suggesting that these firms are financially constrained. The cost of internal and external funds are different, otherwise these companies would simply request debt funding when investment opportunities arise. Finally, Euler equations are complex econometric models in which the parameter restrictions are met for unconstrained firms.

The advantages of these measures is that they rely on objective and reliable data. A drawback is that the econometric models rely on strong assumptions which do not always hold in reality. Moreover, while these measures have been used in the past, empirically they cannot decisively separate a *debt* funding gap from an *overall* funding gap. They further rely on a – heavily debated – a priori classification of constrained versus unconstrained firms. Omitted variable bias further hampers the robustness of their results. Overall, indirect measures would not be recommended to be used for measuring whether intangible-rich growth companies' debt are experiencing a debt funding gap.

Direct measures directly ask firms whether or not they are financially constrained. They can therefore specifically target a debt funding gap. A first measure relies on textual analyses of companies' annual reports. This would not be the measure of choice for growth companies since only few publish (detailed) annual reports. A second, more recent, direct measure relies on survey data. Advantages of surveys are that (i) it also captures discouraged borrowers and (ii) both the demand side and the supply side of debt funding can be questioned. Disadvantages is that the data are all self-reported, increasing the potential for biases, and that they present perceptions, which do not always match reality.

Combined measures combine firm characteristics from large-scale datasets with survey data. Firms are asked whether or not they face financial constraints in a survey, which is afterwards linked to their accounting data. Given that both indirect and direct measures have their advantages and disadvantages, combined measures may represent "the best of both worlds". Studying the debt funding gap through combined measures would therefore be **our recommend approach**.

In theory, a pure experimental design might be considered, but it would be challenging to implement this in a valid way in the context of growth companies. However, **natural and quasi-experimental designs**, where an exogenous financing shock has been induced, have been used in prior literature. An example of such a possible financing shock is a change in policy, for example a legal change in the loan application costs which lowers the discouragement probability (Ferrando & Mulier, 2017), or the current coronavirus crisis. Due to the coronavirus outbreak, firms are currently operating under extraordinary circumstances. Arguably, this also leads to an exogenous financing shock highly suitable for quasi-experimental designs. It can, for example, be expected that growth companies will have more difficulties to finance their investment in intangible investments due to a lack of internal cash flows and a lack of debt resulting from a liquidity shock in the financial system. As such, the high levels of information asymmetries associated with intangible investments may make it even more difficult to finance them, compared to financing tangible assets or working capital.

It is clear that measuring (debt) funding gaps is not easy. For one, not all firms experience financial constraints equally. There is firm-specific heterogeneity that cannot correctly be accounted for when only relying on indirect measures that associate firm characteristics to financial constraints. Secondly, financial constraints are time-varying as a firm can move from one state to another – and even come back – over time (Cleary, 1999; Hubbard, 1997). Thirdly, there is no explicit 'black or white' criterion to categorize firms in either constrained or

unconstrained groups (Musso & Schiavo, 2008). There are degrees to this concept that most studies cannot capture.

Next to measurement issues, another challenge is to identify the relevant firms. **Identifying growth companies with varying intangible capital levels** is difficult when relying on indirect measures. Few growth companies are publicly listed and not all intangible assets are correctly represented in large scale databases such as those with accounting information. For example, high-quality data on R&D or firm-specific human capital is often unavailable, or not available for all firms of interest, in large-scale databases. Some studies identify intangible-rich (growth) companies through industry classifications (see for example Wilson et al., 2018). For European firms, this method relies on the Eurostat indicator of high-tech and knowledge-intensive industries. A summary of this classification is provided in annex 1. However, such approach is by definition crude and ignores the possibility that firms may differ significantly within industries. Some intangible-rich growth companies may operate in industries with low knowledge intensity (e.g., agriculture), while some growth companies in high knowledge-intensive industries may have few intangibles.

Combining survey and indirect measures is therefore more suitable. To do so, it is recommended to combine data from large-scale databases (e.g., Orbis, PATSTAT, EUIPO registers) and survey evidence. Some information on intangible capital and firm characteristics can be captured through accounting data or patent data. Additional information can be captured through survey data. While database information allows to assess a situation (e.g., the proportion of debt financing in the financing structure of a firm), survey information is more useful to understand the “why” of a situation (e.g., was a firm unable to attract debt financing? What factors affected this inability? Or was a firm unwilling to attract debt financing?). This combined approach allows to build a more comprehensive dataset containing information from different sources, as such mitigating potential common method bias issues (Podsakoff, MacKenzie, & Podsakoff, 2012). Survey data also allows for verification of database information and vice versa. A combined approach would enable a two-stop analysis, with a general analysis on growth companies in Europe using databases in a first step, complemented by an in depth analysis combining database and survey data for the survey respondents in a second step. Furthermore, the combined approach would allow to detect diversity in the data, such as differences between countries, industries, types of company and types of innovator (radical versus incremental, process versus product innovators). Finally, while this paper focussed on the debt funding gap, the proposed methodology would also allow to incorporate the existence and impact of an equity gap, and if and how this equity gap affects the debt funding gap.

Relevant European surveys are discussed in annex 2, while annex 3 proposes the structure and topics for an example survey.

Table 3: Measuring methods for funding gaps

	Methodology	Advantages	Disadvantages
Indirect measures			
Q theory of investment ¹⁰	Q (which summarizes a firm's investment opportunities) should be the only predictor for investment. For constrained firms, it is not. Cash flow variables will have higher prediction power.	<ul style="list-style-type: none"> • Easy to compute 	<ul style="list-style-type: none"> • Requires stock data. Few scale-ups are publicly listed • Reliability of q • Not firm specific
Investment to cash flow sensitivities ¹¹	Financial constrained firms are sensitive to cash flow in their investment decisions, unconstrained firms are not.	<ul style="list-style-type: none"> • Easy to compute 	<ul style="list-style-type: none"> • Large debate on a priori classification of constrained firms in the models • Relies on q to control for investment opportunities • Firms can move between being constrained and unconstrained based on the a priori classification¹² • Not firm specific
Euler equations ¹³	For unconstrained firms, the cost of investing today equals future's marginal cost of postponing investment. The equations' parameter restrictions are met if a firm is not financially constrained.	<ul style="list-style-type: none"> • Data availability • Does not rely on q 	<ul style="list-style-type: none"> • Large debate on a priori classification of constrained firms in the models • Not firm specific • Complex to compute
Direct measures			
Company reports ¹⁴	Does the firm state in its annual reports that it is financially constrained?	<ul style="list-style-type: none"> • Firm specific • Rich information 	<ul style="list-style-type: none"> • Few growth companies have annual reports • Few companies report equally detailed

¹⁰ Examples include Blundell, Bond, Devereux, and Schiantarelli (1992); Fazzari, Hubbard, and Petersen (1988); Poterba and Summers (1983).

¹¹ Examples include Almeida and Campello (2001); Carpenter, Fazzari, and Petersen (1998); Chapman, Junor, and Stegman (1996).

¹² E.g., If firm size is the a priori classification of financial constraints, this would mean that a firm becomes unconstrained simply because it grows beyond a certain threshold.

¹³ Examples include Bond and Meghir (1994); Whited (1992)

¹⁴ Examples include Hadlock and Pierce (2010); Kaplan and Zingales (1997)

Table 3: Measuring methods for funding gaps – continued

	Methodology	Advantages	Disadvantages
Survey data ¹⁵	Ask firms directly whether or not they are financially constrained.	<ul style="list-style-type: none">• Firm specific• Rich information• Also identifies discouraged borrowers	<ul style="list-style-type: none">• Availability of data• Actual constraints do not always match perceived constraints• Self-reporting bias
	Ask banks to what extent credit was denied and why.	<ul style="list-style-type: none">• Rare supply-side information and effects	<ul style="list-style-type: none">• Seldom used: difficult to obtain data from bank/ financial institutions (exception: ECB Bank Lending Survey).• Difficult to match with firm-specific behaviour since loan applications are confidential.
<u>Combined measures</u>			
Linked data ¹⁶	Linking survey data to balance sheet data.	<ul style="list-style-type: none">• Firm specific• Rich information	<ul style="list-style-type: none">• Availability of data
<u>Experimental measures</u>			
Experiments	Using experimental methods to determine financial constraints based on firm characteristics.	<ul style="list-style-type: none">• Firm specific• Constraints can be exogenously determined	<ul style="list-style-type: none">• Strictly randomized experiments are unavailable to date. Natural and quasi-experiments however are common¹⁷.• Only a very limited amount of variables can be adjusted across firms as part of the experiment.• Not generalizable.

¹⁵ Examples include Beck, Demirgüç-Kunt, Laeven, and Maksimovic (2006); Brown, Ongena, Popov, and Yeşin (2011); Savignac (2008).

¹⁶ Examples for the U.S. include Hadlock and Pierce (2010); Lamont, Polk, and Saaá-Requejo (2001); Whited and Wu (2006). An E.U. example is Ferrando, Pal, and Durante (2019).

¹⁷ Examples include Ferrando and Mulier (2017); Gan (2007); McKenzie and Woodruff (2008); Uchino (2013).

7. Conclusion

Growth companies – including scale-ups – are vital for economic growth and employment. These companies, however, report significant difficulties in obtaining external funding to finance their growth. Because almost 75% of their investments are made in intangible assets, these companies generally lack sufficient tangible collateral (EIBIS, 2019). This situation is worrisome because scale-ups report that bank financing is their most relevant financing source (SAFE, 2019). Next to paying higher interest rates on credit lines and overdrafts, insufficient collateral or guarantees can further obstruct their access to bank financing. Due to the scarcity of what are commonly considered to be more collateralizable tangible assets, intangible-rich growth companies are likely subject to higher information asymmetries, making banks particularly reluctant to provide them with debt financing. New financing sources such as venture debt and policy interventions targeting intangible-rich companies have emerged to address this potential financing gap.

This report developed a methodology to assess whether European growth companies whose main assets are intangibles suffer from a financing gap.

- 1) We have argued that given the complex nature of what intangible assets are, a combination of data sources, including accounting data, patent data and survey data, will be required to adequately measure this concept.
- 2) To measure potential financing constraints, various methods are identified and assessed. Indirect measures such as q equations, investment to cash flow sensitivity analyses and Euler equations rely on firm characteristics, accounting and market data to assess whether or not firms are financially constrained. This methodology is, however, not appropriate because it requires information that is only available for a limited number of growth companies (e.g., market data is only available for publicly-held firms) and because potential *debt* financing gaps cannot be isolated or distinguished from equity funding gaps. Direct measures rely on a firm's own assessment of constraints via annual reports or surveys and are hence capable of specifically targeting a potential debt funding gap. Survey data can additionally capture discouragement in the lending process. Combined measures include both survey data and objective data like accounting and patent data and are therefore able to combine the “best of both worlds”—that is, they provide direct and indirect insights on a possible debt financing gap.

Overall, **a combination of survey data and large-scale databases (including accounting information and patent data, such as Orbis Europe) is the recommend method to (i) identify growth companies, (ii) measure their intangible assets and (iii) investigate whether they experience a debt funding gap.** Such an approach was also taken by Ferrando et al. (2019) who rely on the EIB's Investment Survey and link this with Orbis data, although their study does not specifically focuses on the financing of growth companies' intangible assets.

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Annex 1: Eurostat indicators on high-tech industries and knowledge – intensive services¹⁸

Manufacturing industries	Two-digit NACE code	
High-technology	21 26	Manufacture of basic pharmaceutical products and pharmaceutical preparations;
Medium-high-technology	20 27 to 30	Manufacture of computer, electronic and optical products Manufacture of chemicals and chemical products; Manufacture of electrical equipment; Manufacture of machinery and equipment n.e.c. ; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment
Medium-low-technology	19 22 to 25	Manufacture of coke and refined petroleum products; Manufacture of rubber and plastic products; Manufacture of other non-metallic mineral products; Manufacture of basic metals; Manufacture of fabricated metals products, excepts machinery and equipment;
Low technology	33 10 to 18 31 to 32	Repair and installation of machinery and equipment Manufacture of food products, beverages, tobacco products, textile, wearing apparel, leather and related products, wood and of products of wood, paper and paper products, printing and reproduction of recorded media; Manufacture of furniture; Other manufacturing

¹⁸ Source: http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf.

Knowledge-based services	NACE Rev. 2 codes (2-digit level)	
Knowledge-intensive services (KIS)	50 to 51	Water transport; Air transport;
	58 to 63	Publishing activities; Motion picture, video and television programme production, sound recording and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy and related activities; information service activities (section J);
	64 to 66	Financial and insurance activities (section K);
	69 to 75	Legal and accounting activities; Activities of head offices, management consultancy activities; Architectural and engineering activities, technical testing and analysis; Scientific research and development; Advertising and market research; Other professional, scientific and technical activities; Veterinary activities (section M);
	78	Employment activities;
	80	Security and investigation activities;
	84 to 93	Public administration and defence, compulsory social security (section O); Education (section P), Human health and social work activities (section Q); Arts, entertainment and recreation (section R).
	50 to 51	Water transport; Air transport;
	69 to 71	Legal and accounting activities; Activities of head offices, management consultancy activities; Architectural and engineering activities, technical testing and analysis; Advertising and market research; Other professional, scientific and technical activities;
	73 to 74	Employment activities;
Knowledge-intensive market services (excluding high-tech and financial services)	78	Security and investigation activities;
	80	
	59 to 63	Motion picture, video and television programme production, sound recording and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy and related activities; Information service activities;
High-tech knowledge-intensive services	72	Scientific research and development;
	64 to 66	Financial and insurance activities (section K).
Knowledge-intensive financial services	58	Publishing activities;
	75	Veterinary activities;
	84 to 93	Public administration and defence, compulsory social security (section O); Education (section P), Human health and social work activities (section Q); Arts, entertainment and recreation (section R).

Annex 2: Relevant European surveys

Table A discusses how **several relevant European surveys** included a classification question based on the growth of the participating firms. As such, high-growth firms could be identified. As stated before, research – and surveys – specifically on growth companies are almost non-existent, we therefore only report on high-growth surveys.

A first survey is the annual EIB Investment Survey (EIBIS), which surveys around 12,500 businesses through telephone interviews. Every three years a Start-up and Scale-up module is added. Results for the most recent Start-up and Scale-up survey are included in the 2019 EIBIS report and have frequently been referred to in this document. Important findings are that compared to their U.S. counterparts, European scale-ups report the limited availability of finance more often as a barrier to growth and that this is especially true for SMEs rather than for larger firms. More specifically, 61% of EU27 scale-ups see the availability of external finance as an obstacle to growth, compared to 51% of U.S. scale-ups. Policy recommendations focus on the development of the European venture capital and debt market to foster the availability of finance for these companies.

The second survey is the Survey on the Access to Finance for Enterprises (SAFE), conducted twice a year since 2008. Contrarily to the EIBIS, this survey asks *all* companies whether or not they are a scale-up. They are able to identify 17% of all companies as scale-ups and show that 9% of these companies indicate access to finance being their most pressing problem, notwithstanding having experienced improved interest rates over the past six months.

The third survey by Collewaert, Manigart, and Standaert (2019) identifies 80,451 scale-ups based on Orbis Europe, Zephyr and Crunchbase. The selection criteria are based on both the OECD definition and a second definition identifying scale-ups as companies having raised at least 1 million USD in funding since foundation. Additionally they survey 124 scale-ups. Results from this survey suggests that 38% of scale-ups remain fully internally funded, scale-ups that seek external finance most often seek bank financing. For those scale-ups that already raised external finance, additional funding and market access remain their largest challenges to growth.

Other relevant surveys include the Eurostat's Access to Finance survey (2011), the ScaleUp Institute's Annual Scale-up review (2019) and the ECB's Bank Lending Survey (2020). The first survey was conducted in 2010 and asked 25,000 SMEs about their access to finance during the global financial crisis. While success rates in obtaining financing severely decreased for all firms, high-growth firms sought more access to finance, especially bank loans. The ScaleUp Institute surveyed 509 scale-ups for her Annual Scale-up review and confirmed that access to finance is a key barrier for these companies. Lastly, the ECB surveys bank representatives on a quarterly basis. While the setup of this supply side survey is most interesting, it does not address scale-ups nor intangible-rich firms.

Table A: European surveys on the access to finance

	Sample description	Target selection methodology	History and future intentions	Latest relevant findings
EIBIS: <i>Start-up and Scale-up Survey Add-on (2019b)</i>	12,500 businesses ¹⁹ , incl. 1,100 start-ups and scale-ups (EU: 499; U.K.: 120; U.S.: 482). Conducted through telephone interviews.	<ul style="list-style-type: none"> All businesses: via ORBIS²⁰ Start-up and scale-up via Crunchbase²¹ <ul style="list-style-type: none"> Founded between 2008 and 2018 Still active 	<ul style="list-style-type: none"> Conducted every year since 2016. Start-up and scale-up survey is one of three add-on modules that vary every year. 	<p>EU scale-ups report the limited availability of finance more often (61%) as a barrier to growth than U.S. scale-ups (51%), but rely less on debt financing.</p> <p>SMEs report twice as much being financially constrained than large firms.</p> <p>The report suggests that policy should address the under-developed venture capital and debt market.</p>
ECB and EC: <i>Survey on the access to finance for enterprises (2019)</i>	18,159 interviews, incl. high-growth companies (17%) and gazelles ²² (1%) Conducted through telephone interviews.	<ul style="list-style-type: none"> Random stratified sample from Dun & Bradstreet business register (country, size, industry). 	<ul style="list-style-type: none"> Half-yearly study since 2008 	<p>9% of high-growth companies see finance as their most pressing problem.</p> <p>High-growth companies and gazelles more often experienced a decrease in the interest rates than the EU28 average over the past six months.</p>

¹⁹ The survey has a minimum required sample size of around 12,300 firms, but is able to interview more than the required amount in nearly all countries.

²⁰ Firms were selection based on country, industry and employment. Only enterprises from the 28 EU Member States, with at least 5 employees and belonging to one of NACE categories C to J were selected (see methodology at <https://www.eib.org/en/about/economic-research/surveys-data/about-eibis.htm>). The final telephone sample was selected by random stratified sampling by country, industry, size and region

²¹ The EIB argues that the Crunchbase Database accounts for nearly the whole population of young firms with high growth ambitions (EIB, 2019a). It reported 250,000 firms founded between 2008 and 2018 that are still active. For a review of the database for economic and managerial research, see Dalle, Den Besten, and Menon (2017).

²² High-growth companies no older than five years.

Table A: European surveys on the access to finance – continued

	Sample description	Target selection methodology	History and future intentions	Latest relevant findings
Vlerick Business School: <i>Scale-Up Report (2019)</i>	80,451 scale-ups, incl. 124 surveyed.	<ul style="list-style-type: none">• Eight European countries• All relevant²³ firms from Orbis Europe, Zephyr and Crunchbase• Founded between 2007 and 2013	<ul style="list-style-type: none">• One-off survey	<p>38% of surveyed scale-ups remain fully internally funded, bank debt is the most frequently used external financing method.</p> <p>Funding is the biggest challenge to growth for the surveyed scale-ups that already raised external equity.</p>
Eurostat: <i>Access to finance (2011)</i>	25,000 SMEs, incl. high-growth companies and gazelles (respective numbers not available)	<ul style="list-style-type: none">• Non-financial companies• Independent• 10+ employees in 2005• Still active in 2008• However not clear how sample was obtained.	<ul style="list-style-type: none">• Survey conducted 2010.• Will not be repeated.	<p>Focussing on the financial crisis, high-growth firms and gazelles are more likely to seek funding than other types of firms. This was primarily bank loan financing.</p>
ScaleUp Institute: <i>Annual Scale-up review (2019)</i>	26,510 U.K. scale-ups, incl. 509 interviews	<ul style="list-style-type: none">• ONS data, not clear however how interview sample was constructed.	<ul style="list-style-type: none">• Yearly report since 2014	<p>Access to finance is a key challenge. The study did not address debt funding gap.</p>
ECB: <i>Bank Lending Survey (2020)</i>	Representatives from 150 banks	<ul style="list-style-type: none">• 150 eurozone banks	<ul style="list-style-type: none">• Four times a year since 2003.	<p>Credit standards for SMEs tightened while those of large companies remained unchanged.</p> <p>Not specifically targeted towards scale-up companies.</p>

²³ The authors defined scale-ups either using the aforementioned OECD definition, or as having raised at least \$1 million in funding since foundation and having had at least one funding event since 2013.

Annex 3: Structure for a survey on a debt financing gap in intangible-rich growth companies

This annex proposes a topics for a survey for measuring a debt financing gap for intangible-rich growth companies in Europe.

Part I: Firm-level information

1. Industry
2. Demographic information (e.g., location, age, size, stage of development)
3. Level of innovativeness and type of innovations (e.g., process versus product innovations, radical versus incremental innovations)

Part II: Financing (gap)

4. Sources of financing
5. Barriers to obtain financing (e.g., cost, collateral, lack of knowledge of IP and IP valuation with debt providers)
6. Cost of financing
7. Financing gap consequences (e.g., growth, investments)

Part III: Intangibles

8. Types of intangibles
9. Level of investment in intangibles
10. Reasons for (lack of) IP protection
11. Impact of IP protection (e.g., growth, access to finance)
12. Valuation of IP