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Abstract A constrained access to external financing has a negative effect on firm growth. This is even more problematic for SMEs, as smaller firms are more prone to having financing constraints. Drawing on the resource dependence theory, we argue that firms with constrained access to external financing seek to become less dependent on their access to external financing. Firms can introduce cost-saving management innovations, which are innovations in the form of new organizational processes, practices and structures with the goal of reducing the firm's costs and increasing its efficiency. Relying on survey data of 2,973 observations of SMEs among 34 European countries, our results show that SMEs with constrained access to external financing are indeed more likely to introduce such cost-saving management innovations. We also find evidence that cost-saving management innovations positively affect firm growth. Hence, we find a positive indirect effect of constrained access to external financing on SME revenue growth through cost-saving management innovations. This positive indirect effect suppresses the negative direct effect of constrained access to financing on revenue growth, pointing to a potentially important role of cost-saving management innovations as a coping strategy for constrained access to external financing for SMEs.

Plain English Summary Although constrained access to external financing is a well-known barrier to innovation and growth, we find that constrained access to external financing induces cost-saving management innovations that subsequently stimulate SME growth. SMEs seek to reduce their dependence on external capital when they hold no power over external capital providers. Among our sample of 2,973 observations of European SMEs, a quarter of SMEs introduced cost-saving management innovations, which increased to one-third if the firm perceived its access to external financing as its most important problem. These innovations consequently increased revenue growth and suppressed the negative effect of a constrained access to external financing on growth. This is an important insight for managers in SMEs who seek to stimulate firm growth even when dealing with financing constraints. Policymakers may note that not all SMEs are affected equally negative by financing constraints.

Keywords: financing constraints; SMEs; management innovation; firm growth
JEL Classifications: D25, G32, M54

1. Introduction

Constrained access to external financing (CATEF) is an essential impediment to SME growth (Beck and Demirguc-Kunt, 2006; Bottazzi et al., 2014; Coluzzi et al., 2015; Huber, 2018; Moscalu et al., 2020; Rahaman, 2011). Firms with CATEF (i.e., constrained access to both bank financing and alternative sources of financing) must resort to internal financing to fund growth opportunities (Rahaman, 2011). As internal financing is often insufficiently available, SMEs frequently forgo their growth opportunities (Carpenter and Petersen, 2002). Hence, it is common among SMEs that growth is negatively impacted by CATEF (e.g., Moscalu et al., 2020).

Firms' response to financing constraints is crucial for firm growth and survival. Yet only few studies have addressed how firms themselves (i.e., instead of policymakers) can cope with a constrained access to all types of financing sources, so that the negative consequences of those constraints can be suppressed (Williamson and Yang, 2021). Instead, prior literature has uncovered several decisions made by SMEs in response to financing constraints. Such research has uncovered that these decisions, such as cutting R&D spending (Czarnitzki and Hottenrott, 2011) or reducing export initiatives (Pietrovito and Pozzolo, 2021), mainly affect long-term firm growth in a negative way. Therefore, we address the research question whether SMEs can respond to their financing constraints in such a way that firm growth is positively affected.

As depicted by the resource dependence theory developed by Pfeffer and Salancik (1978), firms should seek ways to reduce their dependence on an external party if the relationship with such party is unfavorable to the firm. If access to bank credit is constrained, firms may seek alternative types of financing instead (Casey and O'Toole, 2014; Mol-Gómez-Vázquez et al., 2020). However, if a firm is also unable to obtain financing from any of the available external capital providers (i.e., the firm has CATEF), we argue that the firm could seek to reduce its dependence not just on a particular type of financing source, but on external capital in general.

Reducing dependence on external capital can be accomplished through cost-saving management innovations. These are changes in the firm's organizational processes, practices, and structures with a focus on reducing organizational costs and increasing organizational efficiency (e.g., just-in-time inventory, lean production) (Edquist et al., 2001). We explore whether SMEs who perceive access to external financing as their most important problem are, indeed, more probable to introduce cost-saving management innovations with the purpose to increase firm growth in spite of the negative effects of financing constraints.

To test our hypotheses, we use survey data of 2,973 observations among European SMEs from 2012 to 2019. Our analyses confirm that SMEs with financing constraints are more inclined to introduce cost-saving management innovations that subsequently increases firm growth.

We make contributions to the literature on CATEF and the innovation literature. First, by drawing on the resource dependence theory, we theorize about the coping mechanisms for financing constraints in SMEs. While an extensive body of research has documented how firms can cope with a constrained access to bank financing, little research has documented coping strategies for constrained access to overall external financing (Williamson and Yang, 2021). We aim to fill this gap by documenting a coping strategy for SMEs with CATEF that supports firm growth and, thus, suppresses the negative effect of CATEF on firm growth.

Second, our study adds to the innovation literature by showing that CATEF can have a positive effect on innovation, specifically cost-saving management innovations. This provides additional nuance to the large body of research that has documented a negative effect of CATEF on several types of innovations. As in most innovation literature (Crossan and Apaydin, 2010; Keupp et al., 2012), innovation scholars investigating CATEF have mainly focused on technical (i.e. product and process) innovations, which carry a more uncertain pay-off and often require large capital investments. This study is the first to document the relation between financing constraints and the less expensive and less risky cost-saving management innovations strategy (Aravind, 2012; Edquist et al., 2001; Vaccaro et al., 2012), which provides further insights on the effect of financing constraints on innovation activity. In doing so, we also address calls to uncover performance outcomes of management innovations (Damanpour, 2014). While the positive performance effects of management innovations, in general, are well-established (Corsi et al., 2019; Morone and Testa, 2008; Sapprasert and Clausen, 2012), the management innovations construct comprises of a wide range of actions (Damanpour, 2014; Hamel, 2006) which may all have distinct effects (Armbruster et al., 2008; Walker et al., 2015). One distinction that results in different outcomes of management innovations, is whether they have the goal of cost-cutting or gaining legitimacy (Wei et al., 2020; Westfall et al., 1997). Hence, our study advances our understanding of management innovations by specifically documenting the effect of management innovations with a cost-cutting goal on firm growth and its relation to financing constraints.

2. Theory and hypotheses

2.1 Constrained access to external financing and firm growth

Many SMEs face difficulties accessing both bank and alternative financing and can be defined as having CATEF (Bańkowska et al., 2020; Kraemer-Eis et al., 2021). Such constrained access is generally the result of information asymmetries (Binks et al., 1992). Compared to larger (listed) firms, privately held SMEs have typically limited historical financial information available (Berger and Udell, 1998), which implies that monitoring the firm or gathering financial information is much more costly for privately held SMEs (Beck and Demirguc-Kunt, 2006). At the same time, private SMEs

are less able to employ any of the solutions used by larger firms, such as pledging collateral, securing third-party certification, or conveying their credit quality via signaling (Kraemer-Eis and Passaris, 2015; Mac an Bhaird and Lucey, 2010; Stiglitz and Weiss, 1981). Therefore, adverse selection and moral hazard problems are more prevalent in SMEs (Hyytinen and Väänänen, 2006). Consequently, CATEF is more common among SMEs.

When access to external capital is constrained, firms have problems finding external financial resources to invest in growth opportunities (Campello et al., 2010; Cingano et al., 2016), forcing them to resort to internal finance as a funding mechanism (Rahaman, 2011). This is problematic for SMEs, as they seek to grow the business for a variety of reasons (Delmar & Wiklund, 2008; Wiklund et al., 2003). As internal financing is often insufficiently available in SMEs, they frequently must forgo their growth opportunities as a result (Carpenter and Petersen, 2002). Such passed-up opportunities comprise of, for example, a decrease in investments in research and development (Czarnitzki and Hottenrott, 2011; Hottenrott and Peters, 2012), a decrease in employment (growth) (Bentolila et al., 2018; Siemer, 2019), or a reduction in export activities (Pietrovito and Pozzolo, 2021; Paeleman et al., 2017). By reducing (risky) investments, future growth is impeded. Therefore, CATEF will have a negative effect on growth (Beck and Demirguc-Kunt, 2006; Bongomin et al., 2017; Coluzzi et al., 2015; Huber, 2018; Moscalu et al., 2020; Rahaman, 2011).

Given that our study aims to document a coping mechanism for this negative effect of CATEF on revenue growth, we depart from the following hypothesis:

H1: Constrained access to external financing has a negative impact on revenue growth.

2.2 A resource dependency view on constrained access to external financing

From credit constraints to financing constraints

We draw on the resource dependence theory to predict SME behavior in response to financing constraints. The resource dependence theory may be particularly suited as it is concerned with the relationship between the firm, the related parties in its environment (i.e., external capital providers), and the firm's need to access resources from these parties in its environment (Pfeffer and Salancik, 1978). It describes how constrained access to such resources (i.e., capital) forces organizations to pursue new innovations and new relationships with stakeholders that reduce the firm's dependence on those resources (Pfeffer and Salancik 1978; Sherer and Lee 2002). A large body of empirical findings with regards to financing constraints supports the resource dependence theory.

Most of the literature is concerned with constrained access to *bank* financing (bank loans, bank overdrafts, credit lines, or credit card overdrafts). In line with the resource dependence theory, it has been found that firms with constrained access to such type of financing seek to become less

dependent on their relationship with *banks* by establishing relationships with providers of *alternative financing*. Examples of alternative types of financing that are considered by SMEs in response to having credit constraints are leasing, trade credit, and factoring.

Mol-Gómez-Vázquez et al. (2020) showed that discouraged borrowers and SMEs with a deteriorating debt level are more likely to make use of *leasing*. This is in line with a survey conducted by the EBRD Evaluation Department (2011), in which respondents answered that the most important reason to use leasing was its relative speed to obtain compared to bank financing. Moreover, financing asset purchases through leasing seems like a successful coping strategy with respect to growth, as 80% of the respondents agreed that the firm had been able to grow thanks to using leased equipment (EBRD Evaluation Department, 2011). Another source of alternative financing that is tapped by SMEs with constrained access to bank financing, is *trade credit*. Love et al. (2007) argue for a "redistribution view", which states that bank financing is redistributed by firms with unconstrained access to bank financing through the provision of trade credit to firms with constrained access to bank financing. Casey and O'Toole (2014) showed that SMEs with constrained access to bank financing are more likely to make use of, and apply for, trade credit. Ferrando and Mulier (2013) showed that younger and smaller firms, which are more susceptible to having constrained access to bank financing, benefit more from the use of trade credit (both extending and receiving) with respect to the growth of added value, compared to larger and older firms. Also, obtaining trade credit can help firms to obtain bank financing, as it can signal creditworthiness to the financial institution (Biais and Gollier, 1997). As another alternative to bank financing, Ivanovic et al. (2011) present *factoring*. Mol-Gómez-Vázquez et al. (2018) showed that SMEs are more likely to use factoring in countries where creditor protection rights are weaker, and access to bank financing is thus more constrained.

However, access to alternative financing can be constrained as well for SMEs. Andrieu et al. (2018) found a complementary, rather than substitutive, relation between bank financing and the use of trade credit, implying that SMEs with constrained access to bank financing are also more likely to be constrained from trade credit. Palacín-Sánchez et al. (2019) also found a complementary relation between long-term bank loans and trade credit, as only constrained access to short-term bank loans would be substituted with trade credit. Casey and O'Toole (2014) showed that the likelihood a firm with constrained access to bank financing applies for alternative financing increases with firm size, implying that smaller firms are less likely to seek alternative financing. Hence, some SMEs with a constrained access to bank financing are unable to reduce their dependence on bank financing by establishing relationships with providers of alternative sources of financing. These SMEs have, thus, constrained access to both bank financing and alternative financing and can be defined as having CATEF. These firms are the focus of this study and will have to undertake action which reduces their dependence on external financing altogether.

To summarize, a large body of empirical studies in line with the resource dependence theory shows that SMEs with CATEF can seek to reduce their dependence on a capital provider to which access is constrained, by attracting capital from an alternative provider of financing. However, it might be that access to such alternative providers of capital is also constrained. Therefore, we draw further on the resource dependence theory to establish an alternative solution.

From financing constraints to management innovation

Changes in the organization of management are another action that Pfeffer and Salancik (1987) suggested firms could pursue to reduce their dependence on an external party (Hillman et al., 2009). Focusing on large firms, Pfeffer and Salancik (1987) argued this would result in "administrative succession" (i.e., CEO turnover). In SMEs, however, management and ownership often overlap. Hence, we argue that those firms who seek to adapt their management in order to reduce dependence on external capital providers may do so through changing the *way* the firm is managed (i.e., instead of *by whom* the firm is managed).

Such change that "alters the way the work of management is performed" is defined as a *management innovation* (Hamel, 2006: 75). Management innovations comprise new approaches to devise strategy and structure in the organization, modify the organization's management processes, and motivate and reward its employees (Walker et al., 2015) and should be distinguished from technical innovations such as product or process innovations (Boer and During, 2001; Gopalakrishnan and Damanpour, 1997). Indeed, product and process innovations are postulated to follow R&D activities, where management innovations play a crucial part in firm strategy (Damanpour and Aravind, 2012). Management innovations usually comprise of the introduction of a new or significantly improved way of managing the firm, but may differ in their respective goals. For example, managers may adopt management innovations because it gives them legitimacy, but they may also introduce management innovations in search of efficiency gains (Westphal et al., 1997).

This study focuses on the latter, management innovations with a cost-saving goal. These are innovations in the organization of the management through which the firm aims to reduce the capital requirements of the firm's operations. These innovations (e.g., just-in-time inventory, lean production) seek to increase organizational efficiency by improving the organization of work (Mol and Birkinshaw 2009; Wei et al., 2019).

Prior literature has shown that, in line with resource dependence theory, constrained access to external resources may stimulate management innovations. A well-known example is the study of Sherer and Lee (2002). They showed that law firms that abided to the up-or-out HR practice started to pursue HR-oriented organizational innovations once access to elite law students became constrained.

We believe that this reasoning may also hold for SMEs with CATEF. Following the resource dependence theory, they may seek to introduce management innovations that reduce their dependence on financial resources. The main goal of the management innovations introduced in response to financing constraints would be the reduction of the firm's dependence on the availability of financial resources, or cost-saving management innovations. Hence, we argue that:

H2: SMEs with a constrained access to external financing are more likely to introduce cost-saving management innovations than unconstrained SMEs.

Given that financing constraints reduce firm growth and firms are hypothesized to respond by introducing management innovations, the effect of such innovations on firm growth is of interest. Although prior innovation literature has mostly focused on product and process innovations instead of management innovations (Damanpour et al., 2009), it is argued that management innovations are similar to product and process innovation with regard to their positive effect on firm growth (Sanidas, 2005). Indeed, existing empirical evidence points to a positive effect of management innovations on firm growth, and even more so in SMEs.

Morone and Testa (2008) found that out of the several types of innovations studied (i.e., process innovations, product innovations, management innovations, marketing innovations), management innovations and process innovations had the largest positive effects on firm growth in Italian SMEs. Corsi et al. (2019) also show that management innovations have a positive effect on firm growth, and that this effect is more positive for smaller firms. Both findings are supported by the work of Sapprasert and Clausen (2012), who also show that larger firms adopt more management innovations, although the smaller firms are the ones that benefit most thereof.

However, cost-saving management innovations are in the first place focused on increasing efficiency and reducing (working) capital requirements (Edquist et al., 2001). At the same time, improving organizational efficiency implies that the same amount of output can be produced with less financial input. In the long run, this may lead to SMEs needing fewer financial resources to fulfill their output demands, resulting in a surplus of financial resources (Musso and Schiavo, 2008). These surplus financial resources may, subsequently, be invested in growth opportunities. We argue, therefore, that cost-saving management innovations will benefit firm growth.

H3: Cost-saving management innovations have a positive impact on revenue growth.

Given that we hypothesize that (i) SMEs with CATEF are more likely to introduce cost-saving management innovations, and that (ii) cost-saving management innovations have a positive effect on

revenue growth, it follows that CATEF may have a positive indirect effect on revenue growth. This positive indirect effect could suppress the negative direct effect of CATEF on revenue growth. Therefore, SMEs could cope with their CATEF by improving organizational efficiency by introducing cost-saving management innovations.

H4: The negative relationship between constrained access to external financing and firm growth is mediated by cost-saving management innovations.

The research model for the empirical analyses is graphically represented in Figure 1.

[Insert Figure 1 here]

3. Methodology

3.1 Data

Our data originates from the "Survey on the Access to Finance of Enterprises" (SAFE) run jointly by the ECB and the European Commission. It is a semi-annual survey on the financial conditions faced by non-financial firms[1] in all euro area countries. The sample is randomly drawn from the Dun & Bradstreet database and stratified by firm-size class, industry, and country. We focus on privately held, for-profit, independent SMEs, defined as firms with less than 250 employees and a maximum revenue of 50 million euros (European Commission, 2020).[2] Firms are categorized in four major economic activities: manufacturing, construction, trade and services. The individual that is surveyed in each firm is a top-level executive, usually a CFO or CEO, or the owner of a smaller enterprise. The response rate is around 10%, and no signs of non-response bias have been found (for more details we refer to Bańkowska et al., 2015). The questionnaire is administered in the local language. See Ferrando et al. (2017) or Bongini et al. (2021) for more details on the SAFE data set. The data is available upon request at the SAFE access team of the European Central Bank.[3]

The SAFE has a rotating panel data structure, meaning only a selection of surveyed firms are re-surveyed in a subsequent wave. Moreover, the wave during which a firm is re-surveyed, is not necessarily consecutive to the wave during which the firm was last surveyed (ECB, 2023). There may, therefore, be gaps between firms' "consecutive" responses. Also, while some firms are never

[1] The following industries are excluded (NaceRev 2 industry classification): agriculture, forestry and fishing (A), financial and insurance activities (K), public administration and defense, compulsory social security (O), education (P), human health and social work activities (Q), activities of households as employers; undifferentiated goods- and services-producing activities of households for own use (T), activities of extra-territorial organizations and bodies (U), holding companies (NACE 64.20) and private non-profit institutions.

[2] Our data does not allow to make a distinction based on total assets.

[3] More detailed information about SAFE, and the possibility to request the data, is available at: https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html#dd (Opened on March 23, 2023)

re-surveyed, others are re-surveyed in one, two, or more waves. We make use of this rotating panel structure by matching the responses over time of each firm. This matching procedure follows a specific timeline that accounts for the duration that is related to the survey questions of interest (e.g., "over the past 12 months,…", or "in the last 3 years, …"). Table 1 describes, next to the variables of interest, the followed timeline.

[Insert Table 1 here]

The independent variable, i.e., CATEF, and the control variables are measured in year t. In year t + 1 (or one year (i.e., two waves) later)), we ask whether the firm has introduced cost-saving management innovations during the last year. This time lag helps us to limit reverse causality bias and test the causal effect of CATEF on the propensity that the firm introduces cost-saving management innovations. Revenue growth is measured in year t + 3 (or three years (i.e., 6 waves) later after measuring CATEF in year t). As cost-saving management innovations are measured only one year after measuring CATEF, there remain 2 years during which the innovations can impact revenue growth. Only a subset of the whole SAFE database has answered in waves that align with this timeline, as is shown in table 2.

[Insert Table 2 here]

Of the total 252,833 survey responses, only 193,689 responses included an answer to the CATEF question. Only 28,597 of these 193,689 responses can be matched with a response from the same firm two waves (i.e., one year) later that includes a response to the cost-saving management innovations question. Of these 28,597 matches, 5,931 can then be matched with a response to the revenue growth question, 6 waves after the CATEF question. Finally, of these 5,931, only 2,973 responses were from private, independent, profit-oriented SMEs that have also answered all survey questions related to our control variables. Our final dataset, therefore, consists of 2,973 matched responses of independent, private, profit-oriented SMEs across 34 European countries[4], starting in wave 11 (April-September 2014), and ending in wave 21 (April-September 2019).

3.2 Dependent variable: revenue growth

We follow prior scholars who investigated the relation between access to external financing and growth, by studying the firm's *revenue growth* (Coluzzi et al., 2015; Ferrando and Mulier, 2013). We rely on the survey question "by how much has revenue grown over the past 3 years", which is asked 3 years after the wave in which the firm is asked about its access to external financing (CATEF

[4] There were no observations of firms in Bosnia & Herzegovina or Kosovo. The distribution of the sample among the different countries is displayed in Table A1 in the Appendix.

question). Firms' answers can be 1 out of the 4 ordinal answer categories. Following prior scholars (e.g., Idris et al., 2020; Morone and Testa, 2008), we construct an ordinal revenue growth variable. The variable takes the value of 1 if the firm's revenue decreased, 2 if there was "no revenue change", 3 if "growth [was] less than 20% per year" and 4 if "growth [was] more than 20% per year".

3.3 Mediating variable: cost-saving management innovations

In general, management innovations are concerned with the firm's structure, administrative systems, and management practices. Given that innovations related to these areas comprise of a wide range of actions, management innovations have been conceptualized in several ways (Damanpour, 2014), which have led to significantly different results even within the same samples (Armbruster et al., 2008; Walker et al., 2015). One solution to tackle this "conceptual ambiguity" (Damanpour, 2014: 1265), is to specify the goal of the management innovations. Westfall et al. (1997) have shown that some firms introduce management innovations in order to increase efficiency, while others adopt management innovations in order to gain legitimacy. Depending on the goal, management innovations may have different effects on firm performance (Wei et al., 2020).

We focus on the management innovations that have a goal of increasing efficiency by including a survey-based measure of management innovations which allows us to identify actual innovation actions by asking the respondent the following question: "During the past 12 months, have you introduced a new organization of management" with the following explainer: "for example a reorganization of different parts of the enterprise or reporting hierarchy to increase efficiency or reduce costs". The variable takes the value of 1 when the respondent answers "yes" and 0 when "no". The survey question only mentions the efficiency-increasing or cost-cutting goal of the management innovations as an example. According to the "focusing hypothesis" (Tourangeau et al., 2017), examples in a survey question bias the respondent's response towards answering the example (e.g., Aizpurua et al., 2021). Hence, while the survey question may also have captured management innovations with other goals than cost-saving, we believe many respondents kept the cost-saving focus in mind when responding to the survey question.

3.4 Independent variable

The survey attempts to identify *CATEF* by asking the respondent to rate "how important of a problem, on a scale of 1-10, has the firm's access to external financing been in the past six months", while also asking to rate five other crucial topics: finding customers, dealing with competition, costs of production or labor, availability of skilled staff or experienced managers, and regulation. We categorize the firm as having CATEF if its access to finance is rated as the most important problem out of these six different topics (i.e., if the score for access to external financing is as high or higher

than the score of each of the five other topics). Prior scholars have used a similar variable, based on the firm rating its access to finance as its most important problem (e.g. Ferrando and Griesshaber, 2011; Ferrando and Mulier, 2015; Siedschlag et al., 2014).

We believe our measure has three advantages. First, we measure the firm's perception of access to external financing, as opposed to inferring it from balance-sheet data. Strategic actions frequently emerge from managers' cognitive processes and reflections (Kahneman, 2011; Markowska et al., 2019), which depend on their perceptions (Edelman and Yli-Renko, 2010). Therefore, managers' perception of access to finance may be a better predictor than the firm's "actual" access to financing when studying managerial actions (Schauer et al., 2019). Moreover, Birkinshaw and Mol (2006) proposed that a negative perception of the current situation is the first step towards management innovations. Second, our variable measures access to *external financing*, which is broader than just bank financing. Measuring the firm's access to external financing allows us to identify SMEs who are unable to rely on a coping strategy of obtaining alternative financing, as suggested by, among others, Ferrando and Mulier (2013). Third, constrained access to external finance is not for all firms equally *problematic*. Firms shift from using external financial resources towards using internal financial resources when access to external finance becomes more constrained (Rahaman, 2011). Some firms may have sufficient internal funds to finance all growth opportunities. For these firms, CATEF should be less problematic than for firms with equally CATEF but with insufficient internal funds.

3.5 Control variables

The selection of the firm-level controls draws on existing research that estimates the determinants of management innovations and growth. Availability of *internal funds* has been shown to positively affect growth among firms with CATEF (Carpenter and Petersen, 2002; Moscalu et al., 2020; Rahaman, 2011). We follow Moscalu et al. (2020) and use the survey question "have you used retained earnings or sold assets in the past six months?" to determine whether the firm has internal funds to draw on. We construct a dummy variable equal to 1 if the firm answers "yes" to the survey question. *Firm age* may influence firms' ability to change and responsiveness (Kelly and Amburgey, 1991; Reed, 2021). The number of years since incorporation are surveyed through an ordinal variable, equal to 1 if the firm is "younger than 2 years", equal to 2 if the firm is "between 2 and 5 years old", equal to 3 if the firm is "between 5 and 10 years old", and equal to 4 if the firm is "older than 10 years". As smaller firms are more flexible (Colombo et al., 2021) and have more often CATEF (e.g. Casey and O'Toole, 2014), we control for *firm size* by including an ordinal variable measuring the firm's revenue. The variable is equal to 1 if revenue was "up to €500,000", equal to 2 if revenue is "more than €500,000 and up to €1 million", equal to 3 if revenue is "more than €1 million and up to

€2 million", equal to 4 if revenue is "more than €2 million and up to €10 million", and equal to 5 if revenue is "more than €10 million and up to €50 million". Family firms seek socio-emotional wealth next to economic wealth (Gómez-Mejía et al., 2007), which could impact the propensity of management innovations. We control for *family ownership* by including a dummy variable that takes the value of 1 if the largest number of shares is owned by "family or entrepreneurs" (Casey and O'Toole, 2014). We also control for ownership of Venture Capitalists or Business Angels, as these firms could receive strategic advice (Colombo and Grilli, 2010; Hellmann and Puri, 2002). We include a dummy variable *VC/BA ownership* that is equal to 1 if the largest number of shares is owned by "venture capital enterprises or business angels". We follow Ferrando and Mulier (2013), who show that past growth is an important control variable when documenting the relation between access to finance and growth, and control for *past revenue growth.* This control variable is also a good predictor of future growth aspirations (Delmar and Wiklund, 2008; Kolvereid, 1992). We construct an ordinal value using the survey question, which is surveyed in the same wave during which CATEF is surveyed, that asks the respondent to indicate by how much revenues have grown over the past three years. The variable is equal to 1 if revenues have "decreased", equal to 2 if revenues "have not changed", equal to 3 if revenues have "grown by less than 20% annually", and equal to 4 if revenues have "grown by more than 20% annually". We also control for the firm's *recent revenue evolution* using the survey question that asks how firm turnover has evolved in the past six months. We construct an ordinal variable that is equal to 1 if revenue "decreased", equal to 2 if revenue "remained unchanged", and equal to 3 if revenue 'increased" in the past six months. We also include a variable which describes the firm's *recent interest expenses evolution*, as it might impact the firm's access to external financing. We use the survey question that asks how interest expenses have evolved in the past six months. We construct an ordinal variable that is equal to 1 if interest expenses "decreased", equal to 2 if interest expenses "remained unchanged", and equal to 3 if interest expenses "increased" in the past six months. We also include a variable that depicts the firm's *recent FTE evolution*, as this may impact future revenue growth. We use the survey question that asks how the number of employees has evolved in the past six months. We construct an ordinal variable that is equal to 1 if the number of employees "decreased", equal to 2 if the number of employees "remained unchanged", and equal to 3 if the number of employees "increased" in the past six months. Finally, firms with strong international ties may have more growth opportunities, and may also get in touch with more potential management innovations. Hence, we include an *export intensity* variable, or the percentage a firm's revenue is accounted for by exports.

Given the panel structure of our data, we would, ideally, use firm-specific fixed effects to eliminate any potential impact of firm-specific unobservable variables. However, as is the case in other studies that rely on a rotating panel survey dataset (e.g., Fossen, 2021), we are limited to

including *country, year (wave), and industry dummies*. Indeed, it is very difficult to implement firm-specific fixed effects due to the ordinal nature of the survey questions (e.g., firm size, firm age, revenue growth), combined with the rotating panel structure of the survey. Not many firms change ordinal categories in a limited period of time. For example, when surveyed in two consecutive waves, more than 90% of firms report no revenue change, given that the ordinal revenue categories are broad (e.g., one answer category is "between 10 and 50 million euros"). Moreover, many other variables, among our CATEF and cost-saving management innovations variables, are binary (internal funds, family ownership, VC/BA ownership, country, industry), which results in only few changes in such a relatively short period. Therefore, there would be no sufficient temporal variation in order to include firm-specific fixed effects or for first-differencing our data (Wooldridge, 2010). This issue could be resolved by increasing the number of waves in which firms have responded, as this would introduce greater temporal variation. However, the number of waves in which firms have responded is constrained by the rotating panel structure of the survey, as only a selection of the firms currently included in our sample have been surveyed in additional waves. Therefore, we do not make use of firm-specific fixed effects or first-differencing techniques.

3.6 Empirical models

Figure 1 describes the hypothesized negative relationship between CATEF and revenue growth, suppressed by cost-saving management innovations. We first measure the direct impact of CATEF on revenue growth (hypothesis 1). Then, we measure the impact of CATEF on cost-saving management innovations (hypothesis 2) and the impact of cost-saving management innovations on revenue growth (hypothesis 3). Last, we test whether the indirect effect of CATEF on revenue growth through cost-saving management innovations is significant (hypothesis 4).

Our dependent variable, i.e., revenue growth, is measured using a 4-point ordinal scale. We initially use a traditional OLS estimation to test hypotheses 1 and 3. However, Daykin and Moffatt (2002) discuss that the use of linear regression techniques for modeling ordinal data is inappropriate, because the differences between the different levels of the observed outcome variable are not equal in size and ordered probit models should be used. We, therefore, also employ a standard ordered probit model, following prior scholars measuring SME growth as an ordinal variable (Idris et al., 2020; Morone and Testa, 2008). The ordinal probit model assumes that the error term is independent of the independent variables and normally distributed across the firms in the sample. As some firms are included more than once, which could lead to correlation in the error term among the observations of such firms, we cluster the robust standard errors at the firm level, as suggested by Cameron and Miller (2015).

To test our hypothesis 2, estimating the firm's propensity to complete cost-saving management innovations, we use a probit approach, given the dichotomous nature of the cost-saving management innovations measure (Hosmer et al., 2013). We report the average marginal effects of the independent variables. Marginal effects indicate the percentage point change in the probability that the dependent variable is equal to 1, for an instantaneous increase of the predictor while the other variables are held constant. The average marginal effect is the average of the marginal effects of a regressor, that are calculated for each set of the other regressors. It gives an estimation of how much the probability that the firm introduces cost-saving management innovations changes when a firm has CATEF.

Finally, to test our hypothesis 4, we make use of the Karlson–Holm–Breen (KHB) mediation method developed by Karlson et al. (2012) and Kohler et al. (2011).[5] This is in line with recent management scholars who have estimated an indirect effect when the mediating variable is binary (e.g., Buyl et al., 2015; Calic and Mosakowski, 2016; Ingram, 2022; Ingram and Oh, 2022; Rietveld and Hoogendoorn, 2022). The KHB method solves a problem with traditional mediation analyses in non-linear models, such as (ordinal) probit. In non-linear models, the coefficients are not separately identified from the error variance. This means that the extent to which the change in the coefficient of the CATEF-variable is due to the inclusion of cost-saving management innovations in the regression, cannot be calculated in a straight way. The KHB method resolves this variance rescaling issue (Karlson et al., 2012), so that the total effect of CATEF on revenue growth can be attributed to a direct effect and an indirect effect through cost-saving management innovations. The KHB model compares the estimated coefficients of two nested ordered probit models following a Sobel test approach (Sobel, 1982), estimating the extent to which a relationship is mediated by a binary variable and decomposing the total effect of CATEF into its direct and indirect effect (Breen et al., 2021).

Following hypothesis 4, we expect that the indirect effect between CATEF and revenue growth is significantly positive while the direct effect is significantly negative. The indirect effect should, thus, suppress the negative direct effect of CATEF on revenue growth (Agler and De Boeck, 2017; MacKinnon et al., 2000). Hence, when the indirect effect is included in the model, the absolute value of the coefficient of the direct effect increases. Indeed, following previous scholars (e.g., Cheung and Lau, 2008; Vilanova and Vitanova, 2020), a suppressor variable is defined as "a variable which increases the predictive validity of another variable by its inclusion in a regression equation" (Conger, 1974: 36-37). It is the opposite of a partial or full mediator, which decreases the predictive validity of the independent variable when it is included in the model.

[5] We use the STATA *khb* command as developed by Karlson et al. (2012).

4 Results

4.1 Descriptive statistics

Table 3 presents the descriptive statistics of the different variables. The means of the descriptives for the SMEs that did not introduce cost-saving management innovations are compared through a paired t-test to the means of the SMEs that did introduce cost-saving management innovations. A higher proportion of SMEs that introduced cost-saving management innovations (25%) report a growth above 20% per year in the three years after measuring CATEF than SMEs that did not introduce cost-saving management innovations (18%), while a higher proportion of these SMEs (21%) did not experience any revenue change compared to the SME that introduced cost-saving management innovations (15%). 19% of the SMEs indicate that access to financing has been their most important issue, similar to findings of Ferrando and Mulier (2015), which is significantly higher among SMEs that introduce cost-saving management innovations in the following year (25%). A larger proportion of these SMEs (24%) made use of internal funds, as compared to SMEs that did not introduce cost-saving management innovations (19%). While both groups of SMEs do not seem to differ regarding age, the smallest SMEs are less represented among the SMEs that introduce cost-saving management innovations (17% compared to 24%), while the opposite seems to hold for the largest SMEs (21% compared to 18%). While family owners are equally distributed among both groups, there does seem to be a higher proportion of VC/BA ownership among SMEs that introduce cost-saving management innovations (1% compared to 0%). Past revenue growth is also equally distributed among SMEs that did or did not introduce cost-saving management innovations. However, a greater proportion of SMEs that introduced cost-saving management innovations experienced recent revenue increase (53% compared to 44%). Regarding recent interest expenses evolution, a larger share of SMEs that introduce cost-saving management innovations experienced a recent interest expenses decline (24% compared to 16%). Also, more SMEs that introduced cost-saving management innovations experienced a recent FTE increase (38% compared to 27%). Finally, there does not seem to be a significant difference in the average export intensity between SME that did and did not introduce cost-saving management innovations. The variance inflation factors of all variables (except the year & country dummies) were below 2 (not reported), indicating that potential multicollinearity issues should be limited.

[Insert Table 3 here]

Table A2 in the Appendix reports the correlations between the variables of interest. Cost-saving management innovations are significantly positively correlated with both CATEF and future revenue growth. CATEF and future revenue growth are, on the other hand, significantly negatively correlated.

4.2 The effect of CATEF on revenue growth

Table 4 presents the effect of our variables of interest on revenue growth. Using an ordinal probit procedure, Model 1 estimates the effect of the control variables on revenue growth, while Model 2 estimates the total effect of CATEF on revenue growth.

With regards to firm-specific control variables (Model 1), firm age has a negative effect on revenue growth, while past revenue growth, recent revenue evolution and recent FTE evolution have positive effects on revenue growth.

Model 2 increases significantly in power upon the inclusion of CATEF (ΔChi2=8.79, $p<0.001$). Model 2 provides strong support for *hypothesis 1*, as CATEF has a significant negative effect on revenue growth. This result confirms prior findings on the negative impact of CATEF on growth (Coluzzi et al., 2015; Huber, 2018; Moscalu et al., 2020; Rahaman, 2011). Model 5, reporting the OLS estimation, also documents a significantly negative effect of CATEF on revenue growth.

[Insert Table 4 here]

4.3 The effect of CATEF on cost-saving management innovations

Table 5 illustrates the average marginal effect of CATEF on the propensity that the firm completes cost-saving management innovations. Model 1 estimates the effect of the control variables on cost-saving management innovations, while Model 2 estimates the effect of CATEF on cost-saving management innovations.

With respect to the firm-level control variables (Model 1), larger SMEs in terms of revenue are significantly more likely to introduce cost-saving management innovations, which is in line with the notion that smaller firms already have relatively fewer processes and a less complex structure (Meijaard et al., 2005), making cost-saving management innovations thus less enticing. SMEs with a venture capitalist or business angel as the largest shareholder are also more likely to introduce cost-saving management innovations, just as recently growing SMEs–both in terms of revenue and in terms of FTEs. SMEs where the interest expenses have recently increased, are less likely to introduce cost-saving management innovations.

Model 2 increases significantly in power upon inclusion of CATEF (ΔChi2=11.43, $p<0.001$). Model 2 provides strong support for *hypothesis 2*, as SMEs with CATEF are 6.7% more likely to introduce cost-saving management innovations ($p<0.001$). An increase of 6.7 percentage points is economically significant given that, on average, 27% of SMEs introduce cost-saving management innovations each year (see Table 2).

[Insert Table 5 here]

4.4 The effect of cost-saving management innovations on revenue growth

Model 4 in Table 4 presents the effect of cost-saving management innovations on revenue growth, using an ordered probit model. The model increases significantly in power compared to Model 1, upon inclusion of the cost-saving management innovations variable ($\Delta Chi2=12.97$, $p<0.001$). We find strong support for *hypothesis 3:* cost-saving management innovations have a significant positive effect on revenue growth. Model 5, reporting the OLS estimation, also documents a significantly positive effect of cost-saving management innovations on revenue growth. Note that this effect is more than half the size (in absolute terms) of the effect of CATEF on revenue growth. Figure 2 presents an overview of our results in support of hypotheses 1, 2, and 3.

[Insert Figure 2 here]

4.5 The indirect effect of CATEF on revenue growth

Model 4 in Table 4 hints at the existence of a suppression effect of cost-saving management innovations on the negative effect of CATEF on revenue growth. Indeed, compared to the effect size the total effect of CATEF on revenue growth (Model 2, Table 4), the effect size of CATEF on revenue growth *increases* when cost-saving management innovations is added to the model (Model 4, Table 4). This points to the existence of a suppression effect.

Using the KHB method (Kohler et al., 2011), Table 6 shows the significance of the suppression effect. This method compares the effect size of the indirect effect of CATEF on revenue growth through cost-saving management innovations to the total effect of CATEF on revenue growth, and tests the significance of this comparison. This is the extent to which the direct negative effect of CATEF on revenue growth is suppressed, because SMEs are more probable to introduce growth-enhancing cost-saving management innovations in response to their CATEF.

[Insert Table 6 here]

As displayed in Table 6, the KHB method shows that the indirect effect of CATEF on revenue growth through cost-saving management innovations is significantly positive ($p<0.05$). Moreover, the KHB method shows that the positive indirect effect suppresses 6.85% of the negative direct effect of CATEF on revenue growth. These findings support *hypothesis 4.* In other words, while the average growth rate of SMEs with CATEF remains lower than the average growth rate of SMEs without CATEF, the difference between the average growth rate of SMEs with and without CATEF is reduced by 6.85% because SMEs with CATEF are more likely to introduce cost-saving management innovations.

4.6 Two-stage estimation approach using instrumental variables

While we have identified financing constraints as causing management innovations, it may be possible that such observed relation is also subject to reverse causality or unobservable variable bias.

As our measure of CATEF compares the perceived importance of CATEF to a range of other firm-problems, it would only be affected by such reverse causality if management innovations would improve (deteriorate) the other issues relatively more (less) than it would improve (deteriorate) the perceived access to external financing. This seems implausible given the specific focus of cost-saving management innovations on reducing the need for financing. Still, we perform additional instrumental variable regressions to test the hypothesized relations.

To account for the endogeneity of CATEF and cost-saving management innovations, we employed a two-stage least squares estimation approach using instrumental variables. In the first stage of the model, we estimated the endogenous variable using the same factors used to predict the dependent variable of interest, but with one additional variable that served as the instrument. For an instrumental variable approach to correct for biases associated with endogeneity, the instrument used in the first stage must be established as both effective and valid (Semadeni et al., 2014). The validity of instruments are based on relevance and exogeneity. We test the three main hypotheses following this two-stage estimation approach using instrumental variables.

First, we estimate the effect of CATEF on cost-saving management innovations. In line with Ayyagari et al. (2008), we use the square of the percentage of firms with CATEF in the same industry, country and wave as an instrument, as causality is likely to run from the average to the individual firm and not vice versa. The use of the group average as an instrument is a common technique and has recently been applied to financial perceptions (Fang et al., 2022a; Fang et al., 2022b). The F test indicates that this instrument is strong (F=259.56), as the F value is significant and above the recommended threshold of 11.59. The results of the endogeneity test (p=.304) support the exogeneity of CATEF, while the Kleibergen-Paap rk LM statistic (123.07) is also significant (<0.001), thus confirming that the instrument is valid.

Second, we estimate the effect of CATEF on revenue growth. We also use the square of the percentage of firms with CATEF in the same industry, country and wave as an instrument.

Third, we estimate the effect of cost-saving management innovations on revenue growth. Given that industry-mimicking behavior is very relevant for management innovations (Westfall, 1997), it may very well be that industry peers mimic the focal firm when it introduces management innovations. We, therefore, use the square of the percentage of firms in a the same country and wave that have undertaken cost-saving management innovations as an instrument. The instrument was significantly related to cost-saving management innovations. The F test indicates that this instrument is strong (F=54.06), as the F value is significant and above the recommended threshold of 11.59. The results of the endogeneity test (p=.0.126) support the exogeneity of cost-saving management innovations, and the Kleibergen-Paap rk LM statistic (46.16) is also significant (<0.001), confirming that the instrument is valid.

Table 7 presents the results of the three instrumental-variable estimations. All three main hypotheses are confirmed.

[Insert Table 7 around here]

4.7 Robustness test: different measure for CATEF

Our measure of CATEF compares the firm's perception of its access to external financing as a problem to the firm to the 5 other problems listed in the survey. Our measure does, by definition, not identify firms with access to finance as an important, but not the most important, problem. Studying this sample might be insightful as well, hence we construct an alternative measure of CATEF, following prior scholars (Canton et al., 2013; Motta 2020). We classify the firm as having CATEF when it perceives "access to finance" as an important problem, i.e., rates it as an 8 out of 10 or higher.

Using this alternative measure yields nearly identical results. Following the alternative measure, SMEs with CATEF are 5.9% more likely to innovate. Also, 7.03% of the total negative effect of CATEF on revenue growth is suppressed through management innovations. Both numbers are very close to the findings based on our measure used in the main analyses. The results are presented in tables A3 and A4 in Appendix.

5 Discussion

5.1 Contributions to the literature

Our results show that SMEs who perceive access to external financing as their most important problem are significantly more likely to introduce management innovations focusing on cost-savings. This finding adds to prior studies that document a positive effect of CATEF on efficiency (Graziella et al., 2020) and firms' propensity to focus on efficiency (Sena, 2006). We argue that this behavior can be explained by the resource dependence theory (Pfeffer and Salancik, 1978), as it is in line with the notion that firms seek to become less dependent on external parties if they are not in a position of power (i.e., they are unable to obtain financing from their external capital providers). Doing so, our study sheds new light on the ongoing discussion about the effects of financing constraints on firm growth and innovation.

The negative effect of financing constraints on firm growth is well established in the literature (Campello et al., 2010; Carpenter and Petersen, 2002; Cingano et al., 2016). It can partially be attributed to firms' reduced tendency to invest in opportunities with an uncertain pay-off, such as R&D, leading to lower levels of innovation (Hottenrott and Peters, 2012). However, our results show that financing constraints may not always have a negative effect on innovation. CATEF may act as an external pressure that stimulates firms to reduce the capital requirements of their operations, as they seek to become less dependent on their access to external financing. This goal can be

accomplished by introducing cost-saving management innovations. This finding may have gone unnoted thus far, given that the vast majority of innovation literature has focused on technical (i.e. product or process) innovations rather than management innovations (Crossan and Apaydin, 2010). Investments in these innovation outcomes carry a higher level of uncertainty and up-front investments, making them more difficult to finance with external financing. Our study contrasts the few prior findings on the relation between financing constraints and management innovations (Khan et al., 2021; Madrid-Guijarro et al., 2009). These studies, however, have documented management innovations on an aggregate level. Khan et al. (2021) asked respondents whether the firm had introduced new organizational structures or management practices, while Madrid-Guijarro et al. (2009) asked the respondent whether the firm had introduced management innovations, without further explanation. Instead, we focus on management innovations with a cost-saving goal, which have been shown to be impacted differently from management innovations with different goals (e.g., Westphal et al., 1997).

Moreover, not only do our findings show that financing constraints can have a positive effect on cost-saving management innovations, they also show that, although counter-intuitive, a constrained access to external financing may even indirectly benefit firm growth by increasing firms' propensity to introduce cost-saving management innovations. Some firms with CATEF introduce cost-saving management innovations in response to their financing constraints, which they would not have introduced, if they had not been constrained. However, ultimately, firm growth would still be higher if the firm would not have had CATEF, as the positive effect of cost-saving management innovations on growth seems to be smaller (in absolute terms) than the negative direct effect of CATEF on growth.

Yet, not all firms with financing constraints respond by introducing cost-saving management innovations. Moreover, some firms with CATEF would have introduced cost-saving management innovations if they had not been constrained. Therefore, the positive indirect effect of CATEF on firm growth over our whole sample only suppresses 6.85% of the negative total effect of CATEF on firm growth. This effect would be greater if more firms would respond to their CATEF by introducing cost-saving management innovations.

Further, our study provides evidence for the reasoning of Sawang and Unsworth (2011) that innovation adoption in SMEs is driven more strongly by external pressures, compared to large firms. They argue that adopting innovations is relatively more expensive for SMEs, hence why they need "to be pushed". Our findings may be interpreted along this line, as CATEF may be the "external push" that drives the adoption of cost-saving management innovations.

Last, our findings contribute to our knowledge on the performance effects of management innovations, and in particular cost-saving management innovations. While the performance effects of

technical innovations (i.e. product or process innovations) are widely documented, only a handful of studies have documented the effects of management innovations (Walker et al., 2015). Our results are in line with these studies (i.e., Corsi et al., 2019; Morone and Testa, 2008; Sapprasert and Clausen, 2012) as they point to a positive effect of management innovations on firm growth. More, this positive effect on revenue growth appears to be economically very significant, as its seems to be more than half the size of the negative effect (in absolute terms) of CATEF on revenue growth.

5.2 Limitations and further research opportunities

Although our study clarified the effect of CATEF on cost-saving management innovations and consequently the suppressing effect of such innovations on the negative effect of CATEF on revenue growth, there are promising avenues for further research. As our study was limited to the use of survey data only, follow-up studies could use accounting data to make three improvements. First, researchers could document several accounting-based effects of cost-saving management innovations, such as return on assets, productivity, the evolution of costs of goods sold, or profit. This would allow the testing of further potential suppression effects of cost-saving management innovations as a response to CATEF. Second, the SAFE survey has a rotating panel component, meaning that only some firms are re-surveyed. Due to our limited sample size, our study was limited to studying the impact up to three years after measuring the firm's access to external financing. Using accounting data could allow for more long-term inference. It could be insightful to document whether the suppression effect of cost-saving management innovations fades out, remains constant or increases over time (i.e., financing constraints may then even have a positive effect on firm growth over time). Third, other measures for (revenue) growth could be documented. Our study used an ordinal measure that indicated the average increase in revenue per year over the prior 3 years, and classified respondents in 1 out of 4 categories. Future studies could be more precise by using actual revenue growth measures, as inferred from accounting data or use other growth measures such as total assets or employment growth.

5.3 Implications for practice and policy

We find that cost-saving management innovations have a positive effect on firm growth that is more than half the size of the negative effect of CATEF on firm growth. However, only one-third of SMEs in our sample introduce cost-saving management innovations when perceiving access to external financing as their most important problem. As such, the total negative effect of CATEF on firm growth is only a fraction (i.e., 6.85%) less negative than the direct negative effect of CATEF on firm growth. Indeed, as a selection of SMEs respond to their CATEF by introducing cost-saving management innovations that increase firm growth, the average negative effect of CATEF on firm

growth lowers by 6.85%. If more SMEs would respond to their CATEF by introducing cost-saving management innovations, the average negative effect of CATEF on firm growth would decline even more. Policymakers, therefore, may consider promoting cost-saving management innovations among SMEs with CATEF, as our study also shows that this action is attainable for firms with CATEF, who, otherwise, have difficulties financing different growth opportunities. If more firms with CATEF would respond by introducing capital-saving management innovations, the need for policy that is focused on easing access to external financing is reduced, which could be relevant in an environment of rising interest rates. Next to the insights for policymakers, the study carries insights for practitioners as well. Our findings show that cost-saving management innovations have a positive effect for all firms, whether or not it has CATEF. Yet, SMEs seem to need an "external push" in order to introduce such an innovation. Hence, managers in firms with and without CATEF alike, may consider whether they can change the way work is organized in order to increase efficiency or reduce costs.

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Tables & figures

Figure 1: Hypotheses

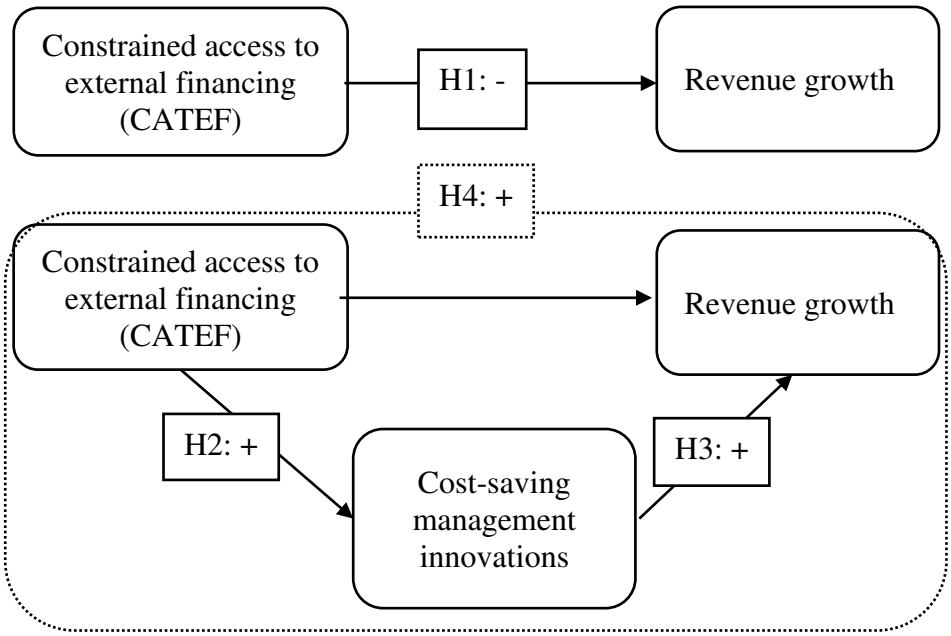

Figure 2: Results of Hypotheses 1, 2, and 3 (based on Tables 4 and 5)

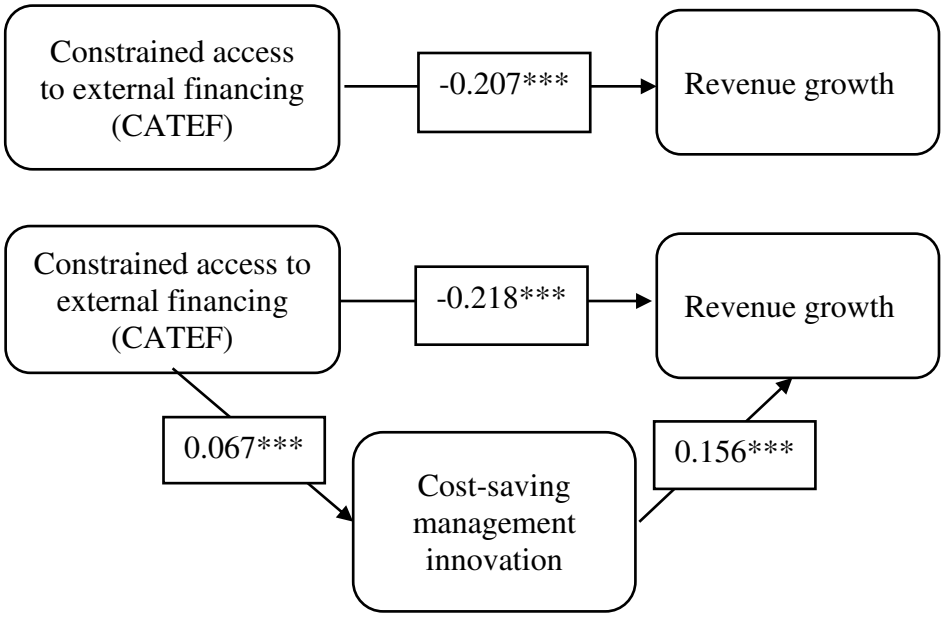

Table 1: Summary of variables of interest

Measure	Definition	measured in year (or wave)
Revenue growth	Survey question "over the past three years, how much did your enterprise grow per year in terms of revenue?". Equal to 1 if revenue "got smaller", equal to 2 if there was "no growth", equal to 3 if revenue increased by "less than 20% per year", and equal to 4 if revenue increased by "over 20% per year".	Year t + 3 (or wave W + 6)
Cost-saving management innovations	Equal to 1 if the firm has introduced during the past 12 months "a new organization of management, for example a reorganization of different parts of the enterprise or reporting hierarchy to increase efficiency or reduce costs".	Year t + 1 (or wave W + 2)
Constrained access to external financing (CATEF)	Equal to 1 if the rating attributed to "how important of a problem has access to finance been to the enterprise in the last 6 months" is higher than, or equal to, the ratings attributed to each of the following topics: "finding customers", "dealing with competition", "costs of production or labor", "availability of skilled staff or experienced managers", "regulation".	Year t (or wave W)
Control variables	Internal funds, firm age, firm size, family ownership, VC/BA ownership, past revenue growth, recent revenue evolution, recent interest expenses evolution, export intensity, recent FTE evolution, country dummies, year dummies, industry dummies	Year t (or wave W)

Table 2: Data selection procedure

wave	(a)	(b)	(c)	(d)	(e)	(f)
1	9,063					
2	5,320					
3	5,312					
4	7,532					
5	15,216					
6	7,511	396				
7	7,514	3,708	1,047	326		
8	7,510	7,409				
9	14,859	14,583	2,405	800		
10	7,520	7,442				
11	17,075	16,425	5,161	1,982	1,487	1,255
12	11,720	11,362				
13	17,979	17,321	5,175	1,550	1,206	981
14	11,725	11,439				
15	18,257	17,737	5,228	1,273	931	737
16	11,724	11,376				
17	17,534	16,879	4,773			
18	11,733	11,424				
19	17,848	17,256	4,808			
20	11,722	11,384				
21	18,159	17,548				
Total	252,833	193,689	28,597	5,931	3,624	2,973

Number of firms that… (a) were surveyed in this wave; (b) and have responded to the CATEF question; (c) and have responded 2 waves later to the cost-saving management innovations question; (d) and have responded 6 waves later to the revenue growth question; (e) and have responded to all control variable questions; (f) and were private, independent, and profit-oriented SMEs.

Table 3: Descriptive statistics

Variable	full sample, n= 2,973		No cost-saving management innovations introduced n=2,158		Cost-saving management innovations introduced n= 815		Difference (Paired t-Test)
	mean	s.d.	mean	s.d.	mean	s.d.	
Revenue growth							
Decline	0.12	0.33	0.12	0.33	0.13	0.33	0.00
No change	0.19	0.39	0.21	0.41	0.15	0.36	0.06***
Increase <20%	0.53	0.50	0.53	0.50	0.53	0.50	0.00
Increase >20%	0.16	0.36	0.14	0.35	0.20	0.40	-0.06***
CATEF	0.19	0.40	0.18	0.38	0.25	0.43	-0.07***
Cost-saving management innovations	0.27	0.45	-	-	1.00	-	-1.00
Internal funds	0.21	0.40	0.19	0.40	0.24	0.43	-0.04*
Firm age							
Less than 2 years	0.01	0.09	0.01	0.09	0.01	0.08	0.00
2-5 years	0.05	0.21	0.05	0.22	0.04	0.21	0.01
5-10 years	0.12	0.33	0.12	0.33	0.13	0.34	-0.01
more than 10 years	0.82	0.38	0.82	0.38	0.81	0.39	0.01
Firm size							
0 - 500k EUR	0.22	0.42	0.24	0.43	0.17	0.38	0.07***
500k - 1M EUR	0.12	0.33	0.13	0.33	0.12	0.32	0.01
1M - 2M EUR	0.14	0.35	0.14	0.35	0.15	0.36	-0.01
2M - 10M EUR	0.32	0.47	0.31	0.46	0.35	0.48	-0.04*
10M - 50M EUR	0.19	0.39	0.18	0.39	0.21	0.41	-0.03
Family ownership	0.50	0.50	0.50	0.50	0.51	0.50	-0.01
VC/BA ownership	0.01	0.08	0.00	0.07	0.01	0.11	-0.01*
Past revenue growth							
Over 20%	0.13	0.33	0.13	0.33	0.12	0.33	0.00
Between 0 and 20%	0.21	0.41	0.21	0.41	0.20	0.40	0.01
No change	0.50	0.50	0.50	0.50	0.49	0.50	0.01
Decline	0.17	0.38	0.17	0.37	0.18	0.39	-0.02
Recent revenue evolution							
Decline	0.20	0.40	0.21	0.41	0.19	0.39	0.02
No change	0.34	0.47	0.35	0.48	0.29	0.45	0.07***
Increase	0.46	0.50	0.44	0.50	0.53	0.50	-0.09***
Recent interest expense evol.							
Decline	0.18	0.39	0.16	0.37	0.24	0.43	-0.08***
No change	0.61	0.49	0.63	0.48	0.56	0.50	0.08***
Increase	0.21	0.40	0.21	0.41	0.20	0.40	0.00
Recent FTE evolution							
Decline	0.12	0.32	0.12	0.32	0.13	0.33	-0.01
No change	0.58	0.49	0.62	0.49	0.49	0.50	0.13***
Increase	0.30	0.46	0.27	0.44	0.38	0.49	-0.12***
Export intensity	0.18	0.29	0.17	0. 29	0.19	0.28	-2.22
Industry							
Manufacturing	0.30	0.46	0.29	0.45	0.33	0.47	-0.05*
Construction	0.13	0.33	0.13	0.34	0.11	0.32	0.02
Trade	0.27	0.45	0.28	0.45	0.26	0.44	0.02
Services	0.30	0.46	0.30	0.46	0.29	0.45	0.01

Table 4: Models of constrained access to external financing and cost-saving management innovations on revenue growth (Hypotheses 1 and 3)

	Model 1	Model 2	Model 3	Model 4	Model 5
Estimation method	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	OLS
Dependent variable	Revenue growth	Revenue growth	Revenue growth	Revenue growth	Revenue growth
Cost-saving management innovations			0.144***	0.156***	0.102***
			(0.049)	(0.049)	(0.036)
CATEF		-0.207***		-0.218***	-0.180***
		(0.056)		(0.057)	(0.043)
Internal funds	0.067	0.062	0.062	0.057	0.042
	(0.052)	(0.052)	(0.052)	(0.052)	(0.039)
Firm age	-0.227***	-0.230***	-0.227***	-0.230***	-0.161***
	(0.039)	(0.039)	(0.039)	(0.039)	(0.027)
Firm size	0.018	0.017	0.015	0.014	0.016
	(0.016)	(0.016)	(0.016)	(0.016)	(0.012)
Family ownership	0.025	0.030	0.028	0.034	0.029
	(0.043)	(0.043)	(0.043)	(0.043)	(0.033)
VC/BA ownership	0.064	0.080	0.037	0.051	0.011
	(0.294)	(0.298)	(0.292)	(0.295)	(0.224)
Past revenue growth	0.111***	0.113***	0.111***	0.114***	0.082***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.018)
Recent revenue evolution	0.250***	0.252***	0.246***	0.248***	0.189***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.023)
Recent int. expenses evolution	0.046	0.025	0.054	0.032	0.026
	(0.035)	(0.035)	(0.035)	(0.035)	(0.026)
Recent FTE evolution	0.185***	0.182***	0.179***	0.175***	0.131***
	(0.036)	(0.036)	(0.036)	(0.036)	(0.027)
Export intensity	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Country dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Wald Chi2	320.98	329.77	333.95	343.35	
ΔChi2 (compared to Model 1)		8.79***	12.97***	22.37***	
R^2					0.118
Observations	2,973	2,973	2,973	2,973	2,973

Clustered robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Probit estimations of CATEF on the propensity to introduce cost-saving management innovations (Hypothesis 2)

	Model 1 Cost-saving management innovations	Model 2 Cost-saving management innovations
CATEF		0.067***
		(0.022)
Internal funds	0.032	0.034
	(0.021)	(0.021)
Firm age	-0.009	-0.007
	(0.014)	(0.014)
Firm size	0.021***	0.021***
	(0.006)	(0.006)
Family ownership	-0.023	-0.024
	(0.017)	(0.017)
VC/BA ownership	0.200*	0.192*
	(0.111)	(0.110)
Past revenue growth	0.001	0.000
	(0.009)	(0.009)
Recent revenue evolution	0.029***	0.029***
	(0.011)	(0.011)
Recent int. expenses evolution	-0.049***	-0.042***
	(0.013)	(0.013)
Recent FTE evolution	0.040***	0.041***
	(0.014)	(0.014)
Export intensity	0.000	0.000
	(0.000)	(0.000)
Country dummies	Yes	Yes
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Wald Chi2	208.20	219.63
ΔChi2		11.43***
Observations	2,973	2,973

Average marginal effects are reported
Clustered robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: KHB decomposition of total effect into direct and indirect effect (Hypothesis 4)

	Model 1
Dependent Variable	*Revenue growth*
Predictor Variable	*CATEF*
Mediating Variable	*Cost-saving management innovations*
Total effect	-0.211***
	(0.055)
Direct effect	-0.225***
	(0.056)
Indirect effect	0.014**
	(0.006)
Observations	2,973
% Suppression effect	-6.85%

Clustered robust standard errors in parentheses
Model controls for all control variables.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Two-stage estimation approach using instrumental variables

Estimation method	Model 1 IV probit	Model 2 IV OLS	Model 3 IV OLS
Dependent variable	Cost-saving management innovations	Revenue growth	Revenue growth
Cost-saving management innovations			0.478*
			(0.260)
CATEF	0.396*	-0.300**	
	(0.210)	(0.129)	
Internal funds	0.112*	0.042	0.035
	(0.066)	(0.039)	(0.041)
Firm age	-0.021	-0.164***	-0.155***
	(0.046)	(0.027)	(0.027)
Firm size	0.070***	0.017	0.010
	(0.021)	(0.012)	(0.013)
Family ownership	-0.082	0.029	0.033
	(0.056)	(0.032)	(0.034)
VC/BA ownership	0.534*	0.043	-0.082
	(0.292)	(0.228)	(0.221)
Past revenue growth	-0.001	0.083***	0.080***
	(0.029)	(0.018)	(0.018)
Recent revenue evolution	0.093***	0.193***	0.177***
	(0.036)	(0.023)	(0.024)
Recent int. expenses evolution	-0.116**	0.009	0.063**
	(0.047)	(0.029)	(0.029)
Recent FTE evolution	0.133***	0.133***	0.118***
	(0.045)	(0.027)	(0.029)
Export intensity	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Instruments			
Squared country-wave-industry average CATEF	1.274***	1.274***	
	(0.079)	(0.079)	
Squared country-wave average of cost-saving management innovations			1.241***
			(0.169)
First-stage test of excluded instruments			
Weak identification test – Kleibergen-Paap Wald rk F statistic	259.555	259.555	54.057
Underidentification test – Kleibergen-Paap rk LM statistic	123.070	123.070	46.159
Endogeneity test	1.055	1.055	2.337
Weak instrument robust inference – Anderson Rubin Wald test F	3.08	5.19	3.43
Observations	2,973	2,973	2,973

Clustered robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A1: Number of observations at time of CATEF surveyed per country and wave

Country	Wave 11	Wave 13	Wave 15	Total
Albania	0	5	7	12
Austria	38	22	11	71
Belgium	29	6	9	44
Bulgaria	36	29	22	87
Cyprus	2	5	3	10
Czechia	28	30	6	64
Germany	110	71	55	236
Denmark	34	28	33	95
Estonia	3	2	2	7
Spain	136	79	48	263
Finland	43	22	13	78
France	123	77	44	244
Greece	42	14	10	66
Croatia	9	14	8	31
Hungary	35	40	38	113
Ireland	35	26	17	78
Iceland	3	7	8	18
Italy	193	67	41	301
Lithuania	10	16	17	43
Luxembourg	6	7	5	18
Latvia	4	7	3	14
Montenegro	10	10	6	26
North Macedonia	0	3	3	6
Malta	5	4	3	12
Netherlands	57	23	16	96
Poland	86	134	125	345
Portugal	28	14	6	48
Romania	27	37	37	101
Serbia	0	0	11	11
Sweden	25	24	16	65
Slovenia	10	11	13	34
Slovakia	28	21	13	62
Turkey	0	24	18	42
United Kingdom	60	102	70	232
Total	1,255	981	737	2,973

Table A2: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Cost-saving management innovations	1.00												
2	CATEF	0.08	1.00											
3	Revenue growth	0.06	-0.08	1.00										
4	Internal funds	0.05	-0.06	0.03	1.00									
5	Firm age	0.00	-0.03	-0.11	0.06	1.00								
6	Firm size	0.08	-0.05	0.04	0.22	0.19	1.00							
7	Family ownership	0.01	0.04	0.00	0.05	0.08	0.14	1.00						
8	VC/BA ownership	0.04	0.01	0.00	0.01	-0.02	0.02	-0.08	1.00					
9	Past revenue growth	0.01	0.01	0.11	0.02	-0.01	0.05	0.02	0.04	1.00				
10	Recent revenue evolution	0.06	0.00	0.23	0.03	-0.05	0.09	0.03	-0.01	0.11	1.00			
11	Recent interest expense evolution	-0.06	-0.17	0.04	0.10	0.03	0.15	-0.02	0.00	0.01	0.04	1.00		
12	Recent FTE evolution	0.08	-0.03	0.18	0.06	-0.04	0.11	0.02	0.00	0.10	0.33	0.04	1.00	
13	Export intensity	0.03	0.00	0.01	0.04	-0.01	0.21	0.07	0.05	0.04	0.04	0.02	0.07	1.00

Correlations >0.036 or <-0.036 are significant at the 95% confidence level

Table A3: Effects of different measure of CATEF

VARIABLES	OLS Revenue growth	Probit Cost-saving management innovations
CATEF	-0.116***	0.0587***
	(0.038)	(0.0185)
Cost-saving management innovations	0.099***	
	(0.037)	
Internal funds	0.044	0.0332
	(0.039)	(0.0211)
Firm age	-0.160***	-0.0076
	(0.027)	(0.0144)
Firm size	0.016	0.0216***
	(0.012)	(0.0065)
Family ownership	0.027	-0.0233
	(0.033)	(0.0172)
VC/BA ownership	0.021	0.1829
	(0.217)	(0.1115)
Past revenue growth	0.079***	0.0013
	(0.018)	(0.0091)
Recent revenue evolution	0.190***	0.0285**
	(0.023)	(0.0111)
Recent int. expenses evolution	0.034	-0.0430***
	(0.026)	(0.0130)
Recent FTE evolution	0.130***	0.0412***
	(0.027)	(0.0140)
Export intensity	-0.001	0.0002
	(0.001)	(0.0003)
Country dummies	Yes	Yes
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
R-squared	0.115	
LR Chi2		205.00
Observations	2,973	2,973

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: KHB decomposition of total effect into direct and indirect effect using different measure of CATEF

	Model 1
Total effect	-0.129***
	(0.050)
Direct effect	-0.136***
	(0.050)
Indirect effect	0.009**
	(0.004)
Observations	2,973
% Suppression effect	-7.03%

Clustered robust standard errors in parentheses
Model controls for all control variables.
*** p<0.01, ** p<0.05, * p<0.1